

PHYSICAL THERAPISTS' ADOPTION OF THE LUMBOPELVIC MANIPULATION  
CLINICAL PREDICTION RULE AND LUMBOPELVIC MANIPULATION  
FOLLOWING A MULTI-COMPONENT TRAINING PROGRAM

by

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Physical Therapists' Adoption of the Lumbopelvic Manipulation Clinical Prediction Rule  
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A dissertation submitted in partial fulfillment of the requirements for the degree of  
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## **Dedication**

This is dedicated to my loving wife Brittany, and my two wonderful children Elliott and Austin. I could not have done it without your support and patience.

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## List of Abbreviations

American Physical Therapy Association .....	APTA
Central Posteroanterior .....	CPA
Chief Executive Officer .....	CEO
Clinical Practice Guideline .....	CPG
Clinical Prediction Rule .....	CPR
Commission on Accreditation in Physical Therapy Education .....	CAPTE
Communities of Practice .....	CoP
Continuing Education .....	CE
Continuing Education Unit .....	CEU
Continuing Medical Education .....	CME
Design Based Research .....	DBR
Electronic Community of Practice .....	eCoP
Fear Avoidance Belief Questionnaire .....	FABQ
Fear Avoidance Belief Questionnaire Physical .....	FABQP
Fear Avoidance Belief Questionnaire Work .....	FABQW
Fellow American Academy of Orthopaedic Manual Physical Therapists .....	FAAOMPT
Integrated Learning Design Framework .....	ILDF
Internal Rotation .....	IR
Journal of Orthopaedic and Sports Physical Therapy .....	JOSPT
Low Back Pain .....	LBP
Lumbopelvic Manipulation .....	LM
Lumbopelvic Manipulation Clinical Prediction Rule .....	LMCPR
Mechanical Low Back Pain .....	MLBP
Modified Oswestry Disability Index .....	MODI
No Data .....	ND
North American Institute Orthopaedic Manual Therapy .....	NAIOMPT
Orthopaedic Certified Specialist .....	OCS
Passive Range of Motion .....	PROM
Physical Therapy .....	PT
Pragmatic Training Transfer Program .....	PraTT
Research Question .....	RQ
Straight Leg Raise .....	SLR
Sub Question .....	SQ
Thrust Joint Mobilization .....	TJM
Transitional Doctorate in Physical Therapy .....	tDPT

## **Abstract**

### **PHYSICAL THERAPISTS' ADOPTION OF THE LUMBOPELVIC MANIPULATION CLINICAL PREDICTION RULE AND LUMBOPELVIC MANIPULATION FOLLOWING A MULTI-COMPONENT TRAINING PROGRAM**

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George Mason University, 2013

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Low Back Pain is a common and costly condition in the United States. Unfortunately standard management and treatment of low back pain in our healthcare system, including that provided by physical therapists, is less than optimal. Two relatively new innovations in physical therapy have been widely supported in research as effective at improving low back pain; these innovations are the lumbopelvic manipulation clinical prediction rule (LMCPR) and lumbopelvic manipulation (LM). Despite their proven effectiveness, these innovations have not been widely adopted by physical therapists. Knowing why physical therapists are adopting or not adopting the LMCPR and LM could provide insights that may lead to more targeted and effective training interventions that increase adoption. This mixed methods study followed 10 outpatient orthopedic physical therapists' over a twelve week period to look at their process of adoption of the LMCPR and LM following a multi-component training program on those topics. The results confirmed low adoption

rates of the two innovations after prior training, and favorable perceptions and high self-reported adoption rates of both innovations following this study's multi-component training program. Most importantly, looking at the adoption process revealed common facilitating factors related to training design (e.g. post-training support), trainee characteristics (e.g. feeling accountable to try and/or adopt the innovations), and work environment (e.g. attending training with co-workers). The most important adoption barriers were related to trainee characteristics (e.g. use of non-LMCPR criteria (i.e. screening criteria) when making clinical decisions), and work environment factors (e.g. limited use opportunities). Future LMCPR and LM training programs that address the common facilitators and barriers identified in this study, may result in higher levels of adoption into practice.

## **Chapter One: Introduction**

Low back pain (LBP) is a costly and debilitating condition among patients in the United States, and the most common ailment seen by physical therapists (Dagenais, Caro, & Haldeman, 2008; Kent & Keating, 2005). Unfortunately, frequently used treatments are less than optimal, and newer, more effective treatments are often not adopted in a timely manner, if at all (Fritz, Cleland, & Childs, 2007; Jette & Delitto, 1997; McGlynn, Asch, & Adams, 2003; Mikhail, Korner-Bitensky, Rossignol, & Dumas, 2005; Poitras, Blais, Swaine, & Rossignol, 2005; Willett, Johnson, & Jones, 2011). Research supports two innovations in caring for patients with low back pain: 1) lumbopelvic manipulation clinical prediction rule (LMCPR); and 2) lumbopelvic manipulation (LM) (Armstrong, McDonough, & Baxter, 2003; Brennan, Fritz, & Hunter, 2006).

LMCPR is a decision tool that allows clinicians to identify patients that will most likely benefit from being treated with LM. A more detailed description of LMCPR and the role this innovation plays in addressing the LBP problem is outlined in Appendix V. LM is a treatment technique where the clinician administers a quick stretch to a patient's low back region. This technique and supporting literature is explained in more detail in Chapter 2 of this work. Despite their proven effectiveness, and increased training on these innovations in entry level physical therapy education programs and continuing education courses, use of these innovations by physical therapists remains minimal

(Bekkering, Van Tulder, & Hendriks, 2005; Bero, Grilli, & Grimshaw, 1998; Feuerstein, Hartzell, Rogers, & Marcus, 2006; Flynn, Wainner, & Fritz, 2006; Fritz, 2012; Jette & Delitto, 1997; Mikhail et al., 2005; Poitras et al., 2005; Sharma & Sabus, 2012; Struessel et al., 2012; Willett et al., 2011).

Low adoption of new innovations after training (i.e. low use, or lack of practice changes) is a well-documented problem in healthcare and other professions (Baldwin & Ford, 1988; Brennan et al., 2006; Cleland, Fritz, Brennan, & Magel, 2009; Davis, O'Brien, & Freemantle, 1999). However, very little research is available specifically on physical therapists' adoption of LMCPR and LM (Willett et al., 2011). In order to better address the low LMCPR and LM adoption problem, it would be helpful to know more about why physical therapists adopt or do not adopt these innovations after training. Clarifying this process may provide insights (e.g. common facilitators and barriers) that could guide researchers and trainers in designing comprehensive LMCPR and LM training programs that result in increased adoption. Note that in this study evidence of adoption (i.e. training transfer) is based on use of various components of each innovation (LMCPR and LM) during the study period as operationally defined in the introduction to table 5 in chapter 4.

Therefore, this study was designed to explore “why” physical therapists adopt or do not adopt LMCPR and LM following a training program on these topics. This was accomplished by first designing and iterating a multi-component training program, exposing physical therapists to this intervention, and then studying their adoption process over a twelve week period. Rich case studies were then created from the data that

provided a clear picture of the adoption process, including the major facilitators and barriers to adoption. This body of work provides a detailed picture of why ten case study participants did or did not adopt LMCPR and/or LM into their practice.

## **Chapter Two: Literature Review**

This dissertation focuses on the adoption of innovations in physical therapy. Therefore, the following literature review first introduces the research related to the innovations, and then presents research on the adoption of these innovations among physical therapy students and physical therapists. Also presented is literature on the topic of training transfer (problem, process, and solutions), and design based research (which played a role in the iterative development of this dissertations intervention).

### **The Innovations (LMCPR and LM)**

The Lumbopelvic Manipulation Clinical Prediction Rule (LMCPR) is a clinical decision tool that identifies LBP patients that should improve with LM treatment (see Appendix V). Since the LMCPR is a relatively new decision making tool (i.e. validated in 2004), and quite different from widely used traditional pathoanatomical decision making techniques, I am considering it as an innovation in physical therapy. No research has been published that I am aware of that indicates current wide spread outpatient physical therapist use rates of this CPR, but in a small sample (n=43) study Willett et al. (2011) identified that only 7% of their study physical therapists were familiar with the LMCPR. In addition, in my pilot studies only 1 of 10 participants adopted the LMCPR after training. This was consistent with my personal experience as a physical therapists working with other physical therapists that would rarely use this CPR after training.

Low back spinal manipulation, or lumbopelvic manipulation (LM), is commonly defined as a passive end-range high-velocity low-amplitude force applied by a provider to a patient's low back region which may or may not result in an audible "pop" (or cavitation). A simple way of thinking of this treatment is as a quick stretch performed on a patient. LM has long been promoted as one of the most effective treatments for acute (i.e. new symptoms) low back pain (Armstrong et al., 2003; Delitto, Cibulka, Erhard, Bowling, & Tenhula, 1993; Erhard, Delitto, & Cibulka, 1994; Fritz & George, 2000). However, its indiscriminate use for all LBP patients (e.g. acute and chronic) has been shown to result in only 30-45% of patients improving by at least 50% over one week of treatments (American College Physicians Clinical Practice Guidelines, 2007; Childs et al., 2004; Flynn et al., 2002; Willett et al., 2011).

While getting 30-45% of LBP patient's at least 50% better with manipulation is good, as described in Appendix V, this rate could be improved by using an evidence based decision making tool such as the LMCPR. For example, if a patient has at least 4 of the 5 LMCPR criteria, then manipulation has a 95% chance of success (68% if at least 3 criteria are present) (Childs et al., 2004; Flynn et al., 2002). Knowing this information would allow a therapist to target the use of manipulation to only those that are very likely to improve with this treatment approach (i.e., manipulation subgroup). Also, patients that would be unlikely to improve from manipulation (those with 2 or fewer LMCPR criteria) can be identified and treated with alternatively better matched treatments from the start of therapy, likely improving long-term outcomes and potentially lowering health care costs from prolonged use of ineffective unmatched treatments.

Despite manipulation being used in medicine since before the 1600's, in the 1970s only 17.5% of all entry level physical therapy programs reported teaching manipulation in their programs (Hood, 1871; Stephens, 1973). Not until 2004 did the American Physical Therapy Association (APTA) establish a normative model that suggested that all physical therapy entry level education programs should teach manipulation as part of their standard curriculum (APTA, 2009). Then, only in 2006, did the Commission on Accreditation in Physical Therapy Education (CAPTE) actually require that all physical therapy programs include manipulation in the curriculum for program certification (APTA, 2009).

According to Struessel et al. (2012), currently 95% of all physical therapy entry level education programs have implemented this manipulation training into their curriculums. Despite these efforts to train new physical therapists on using manipulation in practice, current use rates of manipulation among licensed physical therapists in the United States and Canada are still quite low, and are reported at 3.5%- 5% (Flynn et al., 2006; Jette & Delitto, 1997; Mikhail et al., 2005; Willett et al., 2011). Given the historically low manipulation training in entry level physical therapist education programs, and the current low use rates of manipulation by licensed physical therapists, I am considering manipulation as a relatively new innovation among the physical therapy masses.

American Physical Therapy Association Vision 2020 demands that physical therapists are “obligated to engage in the continual acquisition of...skills” and should “master to provide best practice” (APTA, 2007). The LMCPR and LM were reported in

the 2012 Clinical Guidelines for Low Back Pain as having high levels (I) and grades (A) of evidence, and certainly should be considered best practice for evaluating and treating acute LBP (Delitto, et al., 2012). Therefore, it would be consistent with the APTA Vision 2020 for physical therapists to use LMCPR and LM when evaluating and treating LBP patients.

### **Low Adoption among Physical Therapy Students**

In 2008-2009, despite 87% of surveyed physical therapy students feeling academically prepared to perform manipulation, only 48% of these physical therapy students even attempted a LM during their clinical internships, and most of these reported “minimal use” despite indications for its use (Sharma & Sabus, 2012, p. 13). Further analysis indicated that only 28% tried a manipulation when their clinical instructor (i.e., experienced licensed physical therapist responsible for the student’s clinical education) was not using manipulation in their practice (Sharma & Sabus, 2012).

Fortunately this same study, as well as a second by Struessel et al. (2012), did look at the reasons behind the low use of LM by physical therapy students during their clinical affiliations. Both studies found that low use of manipulation among students was largely related to low use (i.e. Struessel et al. (2012) reported 43% of clinical instructors either never or rarely used manipulation) by their clinical instructors (e.g., students modeled their clinical instructors clinical practice, which often did not include manipulation), lack of supervision from trained clinical instructors, lack of appropriate patients, low confidence, and lack of personal skills (Sharma & Sabus, 2012; Struessel et al., 2012). Other less frequently cited factors that were self-reported as reasons for not

using manipulation when clinically indicated included safety and liability concerns (Struessel et al., 2012).

These studies do imply a low use rate of LM by experienced physical therapists (e.g. clinical instructors); however, it is still not clear why this is the case. Why would clinical instructors, highly trained and experienced physical therapists, not practice in a way that our national association and research suggests they should? These reasons could be similar to the student's barriers (e.g. lack of appropriate patients and low confidence), or quite different. Unfortunately, no research exists that answers this question, as we do not know why physical therapists trained in LMCPR and LM are not widely adopting these innovations. However, these physical therapy student studies are still valuable in informing the barriers that should be explored in physical therapist's adoption (e.g. low use of LMCPR and LM among peers, low confidence, and lack of opportunities to use). Therefore, these constructs have been added to the focus of this study.

### **Current Physical Therapy Studies**

Researchers are now paying attention to this problem of low LMCPR and LM adoption, and are suggesting that more research be done to ultimately improve adoption through ongoing training of licensed physical therapists (Brennan, et al., 2006; Cleland et al., 2009; Fritz, 2012). Only three studies that I am aware of have looked at the adoption of CPRs (or classification based systems) by licensed physical therapists (2 studies looking at neck classification based systems for manipulation following a 2 day long workshop and post-training support, and one study looking at LMCPR and LM use following a blended course program) (Brennan et al., 2006; Cleland et al., 2009; Willett

et al., 2011). The results of the Brennan et al. (2006) and Cleland et al. (2009) studies were consistent with the training transfer literature, and showed that a traditional continuing education training program (2 day workshop) on these topics resulted in no change in patient outcomes compared to control groups (note that neither study measured reaction, learning, and behavior change). Whereas Willett et al. (2011) did show some short term increases (from 3% pre-training to 25% post-training) in self-reported preferences for the use of LM following the blended training course on these topics. However, these gains greatly diminished (back to 11%) over a 6 month period. None of these researchers explored why adoption occurred or did not occur among their participants.

### **Training Transfer Problem**

As more continuing education (CE) training programs are being offered to teach physical therapists how to use the lumbopelvic manipulation CPR and manipulation, ideally we should see an increase in both of these innovations uses (Fritz, 2012). The concept that professional development, or CE, should be an effective means of updating practice patterns, and in this case adopting innovations, is based on the key assumption that learning (knowledge, skills, and attitude changes) during professional development education and training events is applied and maintained on the job (i.e., persistent behavior change), a process commonly referred to as training transfer (Baldwin & Ford, 1988). Adoption is the behavior change (e.g. use of LMCPR) that occurs after training, indicating that successful training transfer has occurred.

In an ideal world, a professional would attend a training event on some evidence based current topic, and then if they felt it would help their practice (or if mandated by their organization) they would return to work and implement their newly gained knowledge, skills, and attitude as behavior changes (i.e., changed professional practice patterns). In turn, these behavior changes would then result in improved outcomes. For example, a physical therapist might attend a course on the lumbopelvic manipulation CPR and manipulation, and then return to the clinic to offer this procedure to his patients. Presumably this new superior clinical decision making tool and related treatment should then lead to improved patient outcomes (e.g. the patient fully recovers in less than the normal time expected and at a reduced cost). This would not only benefit the patient, but also our healthcare system in the form of reduced expenditures and improved efficiencies.

Unfortunately, much research has shown that this ideal scenario is not so common, and training transfer success (i.e. changed practice patterns consistent with training received) is quite variable, but certainly often less than 100%. This lack of complete training transfer to practice is considered by many as a training transfer problem (Baldwin & Ford, 1988). Experts disagree with the extent of this “transfer problem”, or the degree to which training fails to result in behavior change. Georgenson (1982) wrote an often quoted article rhetorically suggesting training directors often find transfer rates as low as 10%, whereas others have more rigorously determined initial transfer rates in a variety of industries and organizations to be higher (62%), with one-year post-training transfer rates down to 34% (Saks & Belcourt, 2006).

This variability in training transfer also seems to be present in healthcare training. Davis et al. (1999) looked at the impact of 14 randomized controlled trials of primarily physician-focused professional development events between the years of 1993 to 1999. They reported that 0% (0 of 3) of purely didactic lecture-based, 67% (4 of 6) of interactive (i.e., learning activities designed to enhance participation), and 71% (5 of 7) of mixed (i.e., didactic combined with interactive) training interventions resulted in at least one targeted changed physician behavior. When looking at the intensity of the training events, single event training sessions (range of 2 to 6 hours) had a 28% (2 of 7) occurrence of change in physician performance compared to 89% (8 of 9) for multiple sessions (at least 2 events with a range of 2 to 48 total hours) (Davis et al., 1999). It is important to keep in mind that successful behavior change was defined by many researchers as at least one targeted behavior (Davis et al., 1999). In fact, many of these “successes” only resulted in one behavior change, when in reality many more behavior changes had been targeted. Bottom line, the training transfer range, of at least one targeted behavior change, following healthcare training is likely between 0% to 89%, and positive learner reactions are more common than learning changes, and learning changes are more common than behavior changes, and behavior changes are more common than result changes. Finally, most of these changes decline with time (Bloom, 2005; Brennan et al., 2006; Davis et al., 1999; Oxman, Thomson, Davis, & Haynes, 1995; Saks & Belcourt, 2006; Umble & Cervero, 1996).

## **Training Transfer Process and Relevant Theories**

Baldwin and Ford (1988) described the training transfer process in terms of training inputs, training outputs, and conditions of transfer. Training inputs are all the things that influence the training outcome (learning and retention), and can also determine the conditions of transfer (generalization and maintenance of any transfer). These training inputs are divided into three categories: 1) trainee characteristics (ability, personality, and motivation); 2) training design (principles of learning, sequencing, and training content), and; 3) work environment (support, and opportunity to use) (Baldwin & Ford, 1988).

Everett Rogers described the complex process of adoption in his seminal book *Diffusion of Innovations* (2003). He suggested that the individual process of adoption occurs in five steps: knowledge, persuasion, decision, implementation, and confirmation. This process is influenced by prior conditions such as previous practice, felt needs/problems, innovativeness, and norms of the social system. It is also impacted by the characteristics of the decision maker such as socioeconomic characteristics, personality variables, and communication behavior. Finally, the decision to adopt an innovation is influenced by the perceived characteristics of the innovation (i.e., relative advantage, compatibility, complexity, trialability, and observability). Rogers (2003) reported that innovations perceived as having high relative advantage, high compatibility, low complexity, high trialability, and high observability were more likely to diffuse across a system and be widely adopted.

In his Diffusion of Innovations theory Rogers (2003) suggested innovations are adopted by different groups of individuals at different points along a S-shaped diffusion curve, and that these groups, through various social mechanisms, can influence the adoption of an innovation by other groups (e.g. “early adopters help trigger the critical mass when they adopt an innovation”) (p. 283). These groups are innovators (2.5% of the adopter distribution), early adopters (13.5%), early majority (34%), late majority (34%), and laggards (16%) (Rogers, 2003). Consistent with this social process, he found that peers play an important role in adoption and stated, “most individuals do not evaluate an innovation solely or perhaps at all on the basis of its performance as judged by scientific research. Rather, they decide whether or not to adopt on the basis of the subjective evaluations of the innovations conveyed to them by others like themselves (peers).” (Rogers, 2003, p. 247).

Supporting this statement, Rappolt & Tassone (2002) interviewed physical therapist on the topic of their adoption process after CE courses and quoted one therapist as stating, “when I get enough opinions to feel that it’s rational enough, I’ll probably do it [use the new clinical skill]” (p. 174). Other training transfer researchers within the healthcare field also agree with Rogers’ description of the social nature of the adoption process. For example, Umble and Cervero (1996) wrote, “human performance is a complex social act, performance change requires social as well as individual change” (p. 169). This statement alludes to the importance of the social aspect of adoption, and social reinforcement after training as a part of facilitating lasting behavior change. Clearly, adoption is an individual and social process. However, in my experience very

seldom have physical therapy training programs addressed the social process of adoption, particularly after the training event.

Social Learning Theory, developed by Albert Bandura (1977), further explains the important role of social influence on learning, and how people change behaviors. This theory explains that people can learn and change their behaviors through observing and modeling others (Sims & Manz, 1982). This theory hints at the importance of including peers in the adoption process, particularly if they have mastered a behavior being adopted by others and can serve as models. This theory also supports the common finding in training transfer research that learning does not equate to behavior change, and that motivation is an important component of this process. Healthcare researchers suggest that social learning theories may help explain the process of training transfer among healthcare providers. Parboosingh, Reed, Palmer & Bernstein (2011) states, “social learning theories support networking, sharing of practice stories, and sense-making conversations among practitioners as effective methods of learning that lead to behavior change and practice improvement” (p. 124).

Another relevant theory, which also highlights the social nature of behavior change and the impact of peers, is the theory of reasoned action (Fishbein & Ajzen, 1975). First postulated by Martin Fishbein and Icek Ajzen (1975), they suggested that behavior intention (one’s intent to change their behavior) will be determined by a person’s attitude about the behavior and subjective norms (i.e., what a person thinks others who he respects thinks he should do/act) (Wergin, Mazmanian, Miller, Papp, & Williams, 1988). Wergin et al. (1988) pointed out that a person might have multiple

conflicting attitudes and subjective norms about a particular intention, all of which must be weighed by the individual considering change. This dynamic nature of behavior intention is one possible mechanism that explains why a trainee may initially fully intend to adopt a new skill, but then later fails to do so. This also explains the important role post-training support and social influences can have on improving training transfer if these bolster a trainee's behavior intention to adopt, and subjective norms support the new learned innovation.

In addition, researchers found that “behavioral change attributable to CME [continuing medical education] was subtle and often delayed. Immediate effects were often expressed as intentions to change rather than as change itself.” (Wergin et al., 1988, p. 156). This would seem to support the theory of reasoned action. These intentions to change behavior would be influenced by attitudes about the new behavior (e.g. using a new skill) and the subjective norms (“what do peers think about my use of such a new skill?”). Any behavior change would most likely happen over time following a training event, as post-training work environmental factors continuously influence the intent to change, and “therefore [would be] most effective in conjunction with other sources of influence, such as local colleagues.” (Wergin et al., 1988, p. 155).

Maxwell, Sandlow, and Bashook (1984) performed a study looking at physicians' behavior changes after participating in a medical care evaluation program, consisting of performing chart reviews with a team of peers and discussing results. Among many of their findings they stated, “this research has shown that awareness of a new development is usually not sufficient to cause a change in behavior and that communication with peers

is often a key part of the process by which someone decides to adopt a new development” (Maxwell et al., 1984, p. 37). These findings are consistent with Diffusion of Innovations and Reasoned Action theories.

One last concept that explains the process of professional ongoing development is communities of practice (CoP). This term was first coined by Lave and Wenger (1991), and is based on the social nature of learning, and thus suggests learning and application best takes place in social relationships. They observed that ongoing professional development was frequently a collaborative process between workers with various degrees of expertise. Working together, these members of an informal community were able to share valuable information, solve problems efficiently, and essentially create a symbiotic relationship where all participants improved their practice together (Lave & Wenger, 1991). In addition, Wenger, McDermott, and Snyder (2002) suggests that “a shared domain creates a sense of accountability to a body of knowledge and therefore to the development of a practice.” (p. 30). This sense of accountability between peers may be an important influence on training transfer, particularly where autonomous practitioners are not being pressured to adopt a new skill by their supervisors or organization (which, based on my observations and personal experience, I would argue is often the case in physical therapy and healthcare) (Rappolt & Tassone, 2002).

Wenger et al. (2002) described CoP as “groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis...they help each other solve problems.” (p. 4). These communities share in common three elements: domain,

community, and practice (Wenger et al., 2002). The domain is the body of common knowledge, topic of interest, and/or problem, the community is the group of people interested in the domain, and the practice is the skills and knowledge that are being developed to function better within the domain.

Li et al. (2009) analyzed CoP studies in healthcare and business between 1991-2005, and observed that in the healthcare studies a CoP was operationalized to mean essentially a group of health providers who are working together. “Examples of CoP groups [that were found in the studies] include[d] clinical placements where students interacted with and learned from expert practitioners, informal learning groups (e.g. journal clubs), health care agency collaboratives that aimed to achieve a common goal (e.g. to improve primary care for older people), and virtual communities where practitioners from different sites discussed work related issues” (p. 5). It is this last example (virtual communities), or as Wenger et al. (2002) calls them, distributed communities of practice (also known as electronic communities of practice, or eCoP), that suggests the possibility of using an online community forum for post-training support.

### **Training Transfer Solutions**

Training transfer models suggest that interventions will be most effective at maximizing adoption when they focus on trainee characteristics, training design, and the work environment, and also consider timing (pre-training, training, and post-training) (Baldwin & Ford, 1988; Burke & Hutchins, 2007; Saks & Belcourt, 2006). For example, Carnes (2010) Training Transfer Process Model describes training transfer as being

influenced by a learners' characteristics (e.g. Cognitive Ability, Self-efficacy, Pre-training motivation, positive emotional state, openness to experience, extroversion, perceived usefulness, career planning, commitment to the organization), training design (learning goals, content relevance, practice and feedback, behavior modeling, error-based examples, self-management strategies (goal setting and relapse prevention)), and organizational environment and support (Before and After training - Before: Strategic Link, supervisory support, accountability, and peer support; After: same as before plus: opportunity to perform, transfer climate) (Carnes, 2010).

Despite such models being useful in suggesting areas to focus on to improve adoption, Blume, Ford, Baldwin, and Huang (2010) stated that the “roughly equivalent predictive power of several individual and situational predictors reflects the reality that there are no magic bullets for leveraging transfer” (p. 1096). Even though not one magic bullet training intervention exists, research does suggest that interventions’ “effectiveness improved as more educational strategies were employed”, or a multi-component training program approach was most effective (Robertson, Umble, & Cervero, 2003, p. 152).

For example, adoption success following a CE was much more likely when an event was multi-component (e.g. many interventions vs. only one intervention), consisted of interactive learning activities (e.g. mix of hands-on, case-based, discussions), included reference learning materials or enabling factors (e.g. job aides, algorithms, patient-handout materials), and was spread out over time, or sequenced (Beaudry, 1989; Brennan et al., 2006; Davis et al., 1999; Marinopoulos, Dorman, & Ratanawongsa, 2007). In

addition, as the training transfer models suggest, pre-training and post-training factors can facilitate training transfer (Saks & Belcourt, 2006).

Research in physical therapy for classification based systems (similar to CPRs) and manipulation and non-manipulation treatments for the neck have shown promising results for using post-training support. For example, Brennan et al. (2006) and Cleland et al. (2009) both found improved patient outcomes from physical therapists who, following face-to-face training, received post-training support in the form of ongoing small-group training sessions (with the original instructors), and one-on-one worksite consultations by the original instructors. Such post-training support was based on the theory that “a longitudinal approach involving feedback and follow-up with clinicians” would affect clinical outcomes (presumably through the mechanism of improved training transfer) (Cleland et al., 2009, p. 39).

While these findings bolster the case for using post-training support, I would argue these post-training interventions were not pragmatic and would be difficult to add to existing traditional face-to-face training courses. In these cases, the post-training support provided was by the course instructor (and principal investigator) in the therapist’s work setting. I feel this logistically complex and resource intensive solution would be unlikely to be provided by continuing education companies without additional charges to the trainee (to cover the additional costs of offering such post-training support), and likely geographic dispersion of trainees would make attending post-training face-to-face sessions challenging and costly. So, looking at other cost-effective and pragmatic post-training solutions is warranted.

One alternative form of post-training support could be offered via communities of practice. Such a CoP would not require intense instructor led one-on-one consultations and small group classes, and could eventually be self-sustaining. While limited, research in using communities of practice post-training to facilitate training transfer in the healthcare field show some promise, but certainly this concept needs more exploration (Barwick, Peters, & Boydell, 2009; Fung-Kee-Fung et al., 2008; Ranmuthugala et al., 2011; Tax, Doucette, Neish, & Maillet, 2012). While trainee centric face-to-face CoP could provide an effective alternative to Brennan et al.'s (2006) and Cleland et al.'s (2009) instructor centric post-training support, such a method would still not address the barrier of trainee's geographic dispersion. This barrier certainly could be addressed by using eCoP, or online based community of practice. However, I was unable to find any studies in healthcare where post-training support was provided via eCoP, with the goal of improving adoption after a training program. However, there is theoretical support for such an eCoP post-training intervention.

According to Wenger et al. (2002), many such distributed CoP (i.e., eCoP) "use the web as their primary form of connection" (p. 128). In addition, "many communities use threaded discussions as one of their primary ways to connect members" (Wenger et al., 2002, p. 131). This simple tool can be a powerful way of connecting peers across geographical boundaries, offering an asynchronous means of group communication and problem solving.

So, what makes such a simple online threaded discussion an eCoP? Wenger et al. (2002) suggests that an eCoP must have the essentials of any CoP (domain, community,

and shared practice – or a “common set of situations, problems, or perspectives” (p. 25)), and in addition “build a rhythm strong enough to maintain community visibility” and “develop a private space” for the community (p. 124). In addition, he recommends that such an online CoP have a community coordinator help facilitate the threaded discussions. However, an eCoP is more than just its electronic tool. Wenger et al. (2002) suggests that the success of this eCoP is based not on the amount of posted material, or format, but rather on the relationships of the community and regular interaction. The more the community members participate and interact to support one another in achieving practice improvement, the more community members will perceive value in participating in such a community and the more it will thrive.

So, if the shared practice is adopting the newly learned practice (i.e., common problem), and the shared domain is the newly learned domain, then certainly a cohort class of trainees can serve as a community, and work together in an online post-training environment to help each other adopt a new skill into practice, possibly adding a sense of accountability to the community for improving one’s practice (or adopting). These peers could support one another in this endeavor of training transfer, share stories of success, and ask for help in overcoming barriers. As members succeed, they could presumably move to the center of the community and serve as resident experts in successful adoption, helping new members to the community move from the periphery to eventually full participation. Such an eCoP would require the support of a community coordinator (likely the course instructor), and initially the time commitment for creating a consistent rhythm of the community could be as simple as weekly postings and facilitation of

threaded discussions. However, once the community has taken ownership of its own activities and destiny, then the role of this community coordinator might be lessened.

In addition to post-training support, other facilitators and barriers to adoption following various CE training programs (i.e., not specific to LMCPR or LM) have been widely studied in healthcare (Brennan et al., 2006; Cleland et al., 2009; Davis et al., 1999; Price, Miller, Rahm, Brace, & Larson, 2010; Rappolt & Tassone, 2002; Salbach, Veinot, Jaglal, Bayley, & Rolfe, 2011; Wensing, Van Der Weijden, & Grol, 1998). A few of the well-supported facilitators include: learning goals, content relevance, practice and feedback, behavior modeling, providing theoretical principles, peer support, providing cues to action, protocols, reminders, and opportunity to perform (Beaudry, 1989; Blume et al., 2010; Burke & Hutchins, 2007; Facticeau, Dobbins, Russell, Ladd, & Kudisch, 1995; Marinopoulos et al., 2007; Saks & Belcourt, 2006; Salbach et al., 2011; Umble & Cervero, 1996). Some of the major barriers include: lack of time, lack of peer support, and a lack of practice or use of new skills (Hawley & Barnard, 2005; Price et al., 2010; Rappolt & Tassone, 2002).

Furthermore, qualitative research done on physical therapists suggests the importance of hands-on lab-based training events for learning new clinical psychomotor skills. One researcher wrote, “Many participants indicated they needed some form of participatory learning, either hands-on workshops or practice sessions with colleagues, before they felt confident enough to apply new knowledge or a skill to practice. This therapist explained: ‘If you don’t get a chance to actually practice it and have someone correct your hands, then you won’t be able to apply it later on.’” (Rappolt & Tassone,

2002, p. 174). Here one can see the mechanism of how an effective training design can begin to build post-course confidence to use a newly learned skill. The desire for face-to-face hands-on practice was also supported by Salbach et al. (2011), “to effect a change in clinical practice behavior, physical therapists preferred CE [continuing education] interventions that were face-to-face because this enabled opportunities for hands-on practice of new skills with guidance from an expert facilitator that could not be optimally achieved through an online experience.” (p. 791)

While there are many possible solutions (technology and non-technology based) to improving training transfer in healthcare, none of these are specific to the adoption of LMCPR and LM (Brennan et al., 2006; Cleland et al., 2009; Davis et al., 1999; Oxman et al., 1995; Robertson et al., 2003; Umble & Cervero, 1996). Thus, understanding the facilitators and barriers specific to the adoption of LMCPR and LM are likely to result in a more targeted and effective CE intervention design. Rogers (2003) says “defining a problem correctly and understanding individuals’ perceptions of the problem are important first steps in planning an intervention.” (p. 123) Therefore it makes sense that before researchers continue to test various interventions to improve adoption of LMCPR and LM, we should gain a better understanding of the process of adoption, and the facilitators and barriers to adoption of these two innovations.

### **Design Based Research**

In order to study why physical therapists adopt or fail to adopt LMCPR and LM into practice, it was necessary to expose them to a realistic training program on these topics. As a starting point my co-instructor and I designed a traditional eight hour (3

hours lab and 5 hours lecture) face-to-face lumbar clinical prediction rule training course which focused on teaching trainees a classification based system for the management of low back pain and related treatment procedures (much like the approach taken in the Cleland et al. (2009) study). Note that such a face-to-face course was supported in research as physical therapists' preferred mode of learning a new psychomotor skill (e.g. LM) as previously described (Rappolt & Tassone, 2002). This training course was based on an algorithm that we created which integrated three different low back pain clinical prediction rules (see Appendix H).

In this training course, trainees were instructed on how to determine which of the three treatment subgroups (directional specific, lumbar stabilization, or lumbopelvic manipulation) to place a patient in after their evaluation using clinical prediction rules. The trainees would then learn to treat the patient according to the treatment indicated for each subgroup. While one other LM CPR study had focused on only teaching the LM CPR and LM using a blended online and face-to-face lab course in 2 hours, I felt teaching one CPR in isolation (i.e., LM CPR) would not allow a physical therapists to learn how to use such a CPR in a real clinical environment, where it would need to be integrated into a comprehensive patient examination process (Willett et al., 2011). Therefore, I felt it was important to teach how the LM CPR could be used in conjunction with other lumbar CPRs, instructing the trainee on when to use the LM CPR and LM versus the other lumbar CPRs. This comprehensive lumbar CPR course framework is considered part of the supporting structure for the overall adoption of LM CPR and LM.

The focus of this study was on the adoption of only one of the three subgroup categories clinical prediction rule and related treatment (LMCPR and LM). My decision to focus this study on the adoption of LMCPR and LM only was based on several factors. First, the LMCPR was the most widely validated of all three CPRs, and LM was the most widely recommended as an effective treatment for acute low back pain. In addition, LM appeared to be the most underutilized, but effective treatment approach of the three, and therefore justified my attention as a problem that needed to be solved first.

With the face-to-face course as the foundation, I used training transfer research and a design based research (DBR) approach and plan (see Appendix T), specifically the Integrated Learning Design Framework (ILDF), which will be described below, to iteratively develop this single course based training program into a comprehensive multi-component training program (Bannan-Ritland, 2003). This multi-component training program was named the pragmatic training transfer (PraTT) program, based on its use of practical cost-effective post-training support.

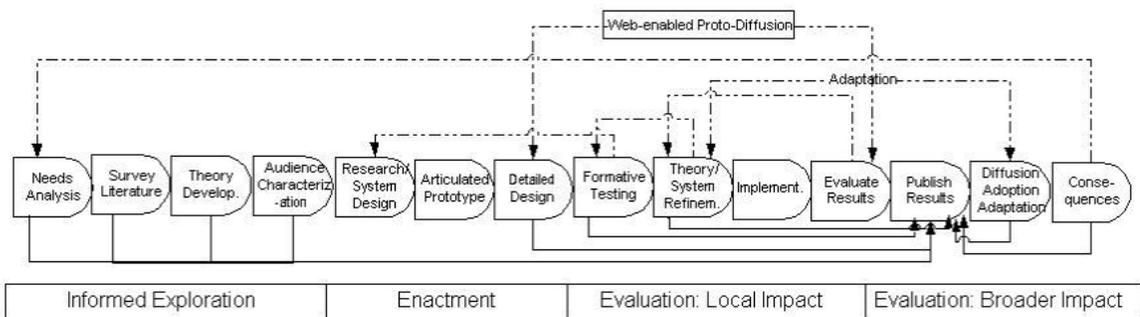
Design Based Research has been described as “disciplined investigation [in a realistic setting] conducted in the context of the development of a product or program for the purpose of improving either the thing being developed or the developer” (Hasan, 2003, p. 7). This is a research approach where the investigator also serves as designer, and in some cases (this case), instructor. This approach is most appropriate for poorly designed complex problems and is used for design of solutions, but also simultaneous research on the design process (Ellis & Levy, 2010). Salbach et al. (2011) described the “development of CE [continuing education] interventions [as] challenging because they

are considered as complex interventions comprised of a number of elements (e.g. instructor, setting, educational materials and methods, session duration and frequency, technology, participant interactions), making it difficult to isolate the active ingredient” (p. 787). Therefore, it seemed appropriate to use a DBR approach to iterate a multi-component training program (i.e. CE intervention) designed to maximize the adoption of LMCPR and LM.

### **ILDF and Iteration of Intervention**

As previously indicated this dissertation’s primary focus is to investigate why physical therapists adopt, or do not adopt, the LMCPR and LM following a multi-component training program on LMCPR and LM. However, at the same time, this dissertation study also provided the opportunity for the continued iteration and study of the PraTT based multi-component training program. The iterative development of such a training program is a cyclical process that can be accomplished using a DBR approach and a design based research plan (see Appendix T). I used the ILDF as a design based research frame to guide this iterative process.

“The integrated learning design framework (ILDF) proposed by Bannan-Ritland (2003) attempts to flesh out each step of DBR under the main headings of “(a) Informed Exploration, (b) Enactment, (c) Evaluation: Local Impact, and (d) Evaluation: Broader Impact” (Peterson & Herrington, 2005, p. 3). This four phase model is shown in figure 1.



*Figure 1. Integrative Learning Design Framework*  
(Bannan-Ritland, 2003, p.22)

The purpose of the first phase of the ILDF, informed exploration, is to simply gain an understanding of the problem and determine the design requirements. This involves performing a needs analysis, literature review, and developing conjectures, or humble theories, about what is going on in a given situation (Bannan-Ritland, 2003). The second phase, enactment, is focused on using the findings from the informed exploration phase to create a detailed design, develop a prototype, and begin the process of pilot testing in order to continue prototype/intervention iteration (Bannan-Ritland, 2003). The third and fourth phases of the ILDF both focus on the evaluation of the designed solution and whether or not it accomplishes its goal (either locally for the third phase, or broader for the fourth phase). In addition, the fourth phase looks at how well the designed solution, theory development, and designed principles learned are adopted into various systems (Bannan-Ritland, 2003).

It is important to note that this entire process is not only focused on the iterative development of a designed solution, but also on ongoing theory development and refinement and uncovering general design principles. Also, this framework is not a

purely linear model, and involves flowing between the phases throughout the design based research process; sometimes performing simultaneous activities in multiple phases (see Appendix T).

One practical way to put ILDF to use is to create a design based research plan, conducting iterative DBR cycles that focus on one or more phases of the ILDF. Using such a plan can lead to a solid foundational understanding of the problem at hand, grounded iterative design solutions, and simultaneously provide opportunities to learn more about the design process and share these findings with the design community.

The DBR plan that I established at this time includes five DBR cycles, with the 5<sup>th</sup> cycle being considered this dissertation. Prior to this dissertation, four cycles of design based research had been conducted (see Appendix T for key findings and design iterations for each cycle) resulting in a refined and grounded intervention (PraTT v5). It is this PraTT v5 model based intervention that will be simultaneously studied and used as an intervention during this dissertation. The DBR findings of this dissertation will then be used to iterate the design, and create a PraTT v6 model. The PraTT v5 based intervention includes the following components:

- 1) Pre-course:
  - a. Preparatory readings (APTA White paper on manipulation)
  - b. Online introductory blog/discussion board activities (i.e. reviewing online support website, reviewing blog/discussion board, and making a pre-course blog introductory posting).
- 2) Course: one-day eight hour face-to-face multi-component course.

- a. Hands-on lab – three hours of practicing skills related to CPRs and related treatments (e.g. LM)
- b. Lecture – five hours on theory, practical application, use of clinical prediction rules (CPRs) algorithm/tools using cases, other job aides (e.g. evaluation form)
- c. Training transfer lecture (group interaction) – short (fifteen minute) lecture and group interaction/discussion at the end of the day on the topic of training transfer.

3) Post-course:

- a. Serial questionnaires immediately, six, and twelve weeks post-course, serving as a data collection tool as well as an intervention (i.e., theoretically promoting learner feedback, serving as a post-training reminder, providing opportunities for reflection, and fostering metacognition of a learner’s own behavior and the related change in work outcomes (Harden, 2005)).
- b. Post-training job aides (CPR algorithm, evaluation form, Criteria form, and patient outcome measurement tools)
- c. Online post-training support system (i.e., designed to serve as an eCoP), which included posted course documents (e.g. course lecture and other forms used in the course), adoption metric/goal tracker, blog with weekly postings by the course instructor, and a discussion board.

- d. Weekly blog email reminder by course instructor (i.e. community coordinator/blog master).

The pre and post-training PraTT program components were designed to be easily added to any existing traditional face-to-face CE training program focused on teaching participants a new psychomotor skill with minimal additional cost and logistical support. As well as to compensate for expected barriers commonly seen in physical therapy settings: minimal supervisor involvement (e.g. one of my prior cycle pilot participants stated “physical therapy supervisors do not want to “dictate” practice”), minimal accountability for participant adoption, and geographic dispersion of course participants with little if any local support or expertise in the newly learned knowledge and skills (Rappolt & Tassone, 2002). Finally, the PraTT program was designed to leverage the social nature of learning with an increased post-training emphasis on the role of peers, through the use of an online post-training support system (e.g. blog and discussion board). This is grounded in such theories as Diffusion of Innovations, Social Learning Theory, Theory of Reasoned Action, and Communities of Practice. All these theories, as presented earlier, discuss the importance of peers (others) in the learning and adoption process.

Note that this PraTT v5 based training program has multi-components, includes interactive learning activities, provides enabling factors (e.g. job aides, algorithms, patient-handout materials), and is spread out over time via weekly blog postings by the leader instructor/researcher and post-training questionnaires. These are all elements that research suggests will improve adoption as presented earlier (Beaudry, 1989; Brennan et

al., 2006; Davis et al., 1999; Marinopoulos et al., 2007). This program also includes the use of a simple and cost-effective (i.e., pragmatic) technology (blog and discussion board) to facilitate post-training peer support and peer-to-peer accountability in an inexpensive and logistically simple format consistent with the concept of an eCoP.

## Chapter Three: Methods

The overarching research goal of this study is to determine why physical therapists adopt, or do not adopt, the LMCPR and LM following a multi-component training program on these topics. The below three main research questions (and related sub questions) are designed around understanding this adoption process and finding out the “why”.

Operational definitions for research questions: “course” is defined as the face to face 8 hour training event including training transfer group interaction/discussion.

“Training program” is defined as the pre-course components, course, and post-course components (e.g. online post-training support system and questionnaires).

RQ #1: What are participants’ knowledge, perceptions, and skills of the LMCPR and LM innovations?

- a. What are participants’ knowledge of LMCPR and LM prior to the course, and how do these change over time after the course?
- b. What are participants’ perception of LMCPR and LM, and how do these change over time?
- c. How competently can participants perform the LMCPR and LM by the end of the course?

RQ #2: What do participants reportedly do with the training once they return home?

a. What are the participants' intentions with respect to adopting LM CPR and LM into their practice, and how do these change over time?

b. How do participants' self-reported use of the LM CPR and LM change after participation in the course?

c. What factors do participants report as facilitators in adopting LM CPR and LM as part of their practice?

d. What difficulties/barriers do participants experience in adopting LM CPR and LM as part of their practice?

e. How do participants overcome (or recommend overcoming) reported difficulties/barriers in adopting LM CPR and LM?

f. What do participants report as reasons for failing to overcome reported difficulties/barriers in adopting LM CPR and LM?

RQ #3: What are participants' evaluations of the training program?

a. What are the participants' perceptions and reactions to the training program?

b. How were particular features of the training program perceived as helpful or not helpful in the adoption process?

c. Why do participants use or not use particular features of the training program?

## **Research Design**

The research design of this mixed methods study was to use both qualitative and quantitative data collection and analysis methods. The primary mode of qualitative analysis was conducted via case studies based on one formative cycle (i.e., Evaluation: local impact per ILDF) of design based research. The quantitative design can be described as a quasi-experimental longitudinal study with pre-post measures without a control.

## **Research Relationship**

I had no relationship to any course attendees prior to the pre-training activities. Throughout the training program I served as a co-instructor of the course (the other instructor is a physical therapy professor from Louisiana State University, but he has no role in the research study), blog/discussion board coordinator/author, and sole researcher. During the pre-training and training periods my relationship with the participants was one of primary co-instructor. I led all participants through all pre-training activities, and half of the training lectures/labs. The participants did not know me as a researcher until the end of the training course, when I explained the study to all training program attendees, and invited them to participate in my dissertation study. The recruiting script I used was as follows:

"In a moment we will have you complete our standard post-course knowledge test ("knowledge of LMCPR and LM questionnaire") and course feedback form ("baseline reaction and perception of program questionnaire").

I am a current PhD student at George Mason University in Virginia. So, in addition to these typical feedback forms we use to improve our training course, you have the opportunity to participate in a research study if you choose. This research study is looking at the impact of this course on your practice as determined by your responses to additional questionnaires, follow-up phone interviews, and observation of your use of the online post-training support system all over a 12 week period.

Participation in this research study is completely voluntary, and does not alter any post-course learning activity you are provided in any way. In other words, you will receive the same education experience and the same .8 CEUs regardless of your participation in the study. During the study you will be asked to complete several questionnaires and phone interviews. This would provide you additional contact with me as a researcher, which may or may not be helpful in your adoption process. You also will be asked to complete the post-course knowledge test and course feedback form regardless of your participation in this study. Please note that if you do not participate in this study, any data collected from your post-course knowledge test and course feedback form will not be included in the study data set, and will only be used for course improvement.

If you are interested in participating in the study, please see me at the back of the room after you have completed the post-course knowledge test and course feedback form, and received your course completion certificate. I will then quickly explain the data collection in more detail, and then ask you to sign an informed consent form (see Appendix I) if you are willing to participate. You would of course be allowed to stop participation in this study at any time."

During the post-training activities participants had a relationship with me as both an instructor and researcher. The post-training learning activities included online post-training support system interaction via a blog and discussion board. As an instructor they received weekly blog reminder emails from me. As a researcher, they received emailed questionnaires from me, and participated in phone interviews.

### **Intervention, Setting, and Participant Selection**

During this dissertation study my co-instructor and I conducted eight one-day (eight hour) training courses (along with the other pre-training and post-training intervention components as described in the ILDF and Iteration of Intervention section of chapter two of this dissertation) held in outpatient based physical therapy clinics in cities that were convenient, based on interest of two healthcare organizations in hosting the course for their employees, or close to co-instructor's residences during the period of September 2012 -January 2013 (see table 4). At the end of each face-to-face course, all course attendees that met the inclusion criteria were asked to participate in the study (sample of convenience). Inclusion criteria for this study included: licensed physical therapists that currently evaluate and treat low back pain patients on a weekly basis, who volunteer to participate in the study, and who sign the informed consent form. Exclusion from this study would be at the absence of the inclusion criteria. If they met inclusion criteria, and agreed to participate in the study, they were then asked to sign an informed consent form.

All study participants from each course comprised a study cohort group that was followed over a 12 weeks period. These eight study cohort groups overlapped at various

stages of data collection with one starting in September 2012, two in October 2012, two in November 2012, two in December 2012, and one in January 2013 (see table 4). Note that once this dissertation study started all component parts of the PraTT v5 based intervention training program remained the same throughout this entire study period.

On the surface this decision to not change interventions during the study period based on ongoing feedback may appear inconsistent with design research. However, as suggested earlier, I consider all participants of this dissertation study (i.e., 22 September 2012- 19 January 2013) as part of one design based research cycle (cycle 5, see Appendix T). Therefore, holding the intervention constant during this cycle, and then using the lessons learned from cycle analysis to iterate interventions after the cycle ends, and before the next cycle begins (i.e., cycle 6, post-dissertation work), would be consistent with design based research. In addition, keeping the intervention constant throughout the entire study period justifies combining their descriptive data across all eight training cohorts.

With this in mind, feedback gained during post-course follow-up questionnaires and interviews did provide me the opportunity to target future weekly blog content. However, this blog content was available to all study participants, so they all continued to be exposed to the same intervention.

Three of the courses (13 October, 3 November, and 19 January) were hosted by healthcare organizations that encouraged their employees to attend. These courses were only open to physical therapists that worked for the sponsoring organization. The other five courses were open to all physical therapists and physical therapy assistants,

regardless of employer, and advertised to all orthopedic physical therapists (i.e., those that typically work with LBP patients) in the state in which the course was being held.

The total number of physical therapy course attendees and the number from each course that qualified and then agreed to participate in the study are listed in table 4. Prior to the study, I had anticipated having 30 study participants, 10 of which would complete the entire 12 week study. By the end of the study, I actually had 22 study participants, 15 of whom completed half the study period (up to the six week questionnaire and six week interview), and 10 of which completed the entire 12 week study period (12 week questionnaires and 12 week interview). The 10 study participants who completed the entire study protocol were used to develop rich case studies in Ch. 5 of this dissertation. With that said, any data collected from all study participants (n=22) was analyzed and included whenever possible to support conclusions.

### **Data Collection**

During this study I collected data on study participants through multiple questionnaires, phone interviews, observing in class interactions and skill demonstration, and reading online blog/discussion board activity/posting. Questionnaires were selected as a data collection method in order to provide rich descriptive data for building cases, helping to guide the phone interview questions, serving to validate phone interview responses, and providing longitudinal data related to key constructs such as knowledge change, self-reported behavior changes (where direct observation of change behavior was not possible due to the geographic dispersion of study participants), and perceptions of LMCPR and LM innovations. The phone interviews were selected to provide me the

flexibility to probe deeply into the adoption process used and follow-up on questionnaire responses, all in a logistically feasible way given the geographical distribution of my study participants. Observations were selected as a means of insuring a base level of performance of the newly learned skills, and the only way to investigate online activities related to the blog and discussion board (note that web analytics were not available to me as a data collection tool). Finally, course observational notes and memorandums were continuously recorded in a field journal throughout the study period.

**Questionnaires.** I asked all study participants to complete five different types of questionnaires (#1-5 listed below). Some of these questionnaires (#1, #2, and #4 below) were completed in person immediately before and after the course, and the rest were sent and returned via email. For emailed questionnaires, one week prior to sending these out at six and twelve weeks, the respondent was sent a reminder letter in the mail along with a \$5 gift card. Dillman (2009) recommends that such a nominal gift can be used effectively to increase response rates by creating a social exchange. A total of 15 of the 22 study participants sent in their responses to the six week questionnaires, but only 10 sent in their twelve week questionnaires. My protocol did not call for me to investigate why study participants dropped out during the twelve week study period. However, my protocol did require that if a participant did not respond to the original email questionnaire, another was sent via email one week later, and then if still no response within 2 days, then a questionnaire and reminder letter was mailed. At that point, if no response was received, the participant was assumed to have self-disenrolled from the study and no further contact was initiated.

I asked all course attendees (including non-study participants) to complete three questionnaires. This was done to mimic a normal course experience (e.g. taking a pre-course / post-course knowledge test, and post-course reaction questionnaire), prior to asking if anyone was interested in participating in the study. Therefore, some data was collected on non-study participants, but was not included in the study data set. However, this data is presented in aggregate form in the chapter 4 tables 2, 6, 8, and 10 to allow a comparison of study participants to non-study participants in constructs such as knowledge change, course reaction, and competence of performing LMCPR and LM.

All questionnaire responses that changed over time (baseline vs. six weeks vs. twelve weeks post-course) were further investigated with the follow-up phone interview. Whenever a discrepancy existed between a questionnaire response and an interview response on the same question, then this was documented (see table 25 and Appendix P). In some cases these discrepancies were factual errors (e.g. a questionnaire response that indicated no prior training, but in the follow-up interview clearly indicating that prior training had actually occurred). When factual errors were identified, then the raw questionnaire data was corrected in my data base and this change was noted in each applicable table in this paper and also listed in Appendix P.

The five different types of questionnaires used included:

- 1) “Knowledge of LMCPR & LM” questionnaire (see Appendix A): This questionnaire was administered in person to all course attendees’ right before the start of the first course lecture (i.e. pre-course test). This same test was administered in person to all course attendees’ immediately after the last course lecture of the day (i.e. post-course

test). In addition, in order to assess the change of knowledge over time, the same knowledge test was sent via email to the remaining study participants at 12 weeks post-course. They were specifically instructed to not use any memory aides when taking the 12 week knowledge test. During follow-up phone interviews I asked if a memory aide was used during the 12 week knowledge test. Two of the Ten 12 week respondents indicated that they did use a memory aide, so their twelve week knowledge test scores were not included in mean calculations (see table 9). Pre-course and immediate post-course data was collected on all 48 course attendees (including on the 22 initial study participants). Only 10 study participants completed the final 12 week knowledge test.

2) “Baseline demographics, perception and intention of LMCPR & LM, and adoption” questionnaire (see Appendix B): This questionnaire was provided in person to only the study participants after they had signed the informed consent at the end of the course. This provided the baseline pre-course self-reported LMCPR and LM behaviors, and immediate post-course perceptions of using LMCPR and LM. Note that technically, the self-reported “pre-course” behaviors were reported at the end of the course, however, the questionnaire wording asks them to report their current behavior. Since the only current behavior they had to report was behavior they were using just prior to the course, then I am considering this as pre-course baseline behavior. Also, because the study participants were not recruited until the end of the course, I could not collect this baseline data truly pre-course. This questionnaire was completed by 22 study participants.

3) “Follow-up perception, intention of LMCPR & LM, adoption, and process” questionnaire (see Appendix C): This questionnaire was sent, along with

questionnaire #5 below, via email at 6 and 12 weeks post-course to just the remaining study participants (22 were sent the six week questionnaire with 15 responses, and 15 were sent the 12 week questionnaire with 10 responses). This was a serial questionnaire that asked most of the same questions on self-reported behavior and perceptions as questionnaire #2 above.

4) “Baseline reaction and perception of program” questionnaire (see Appendix D): This questionnaire was provided in person to all the course attendees immediately after the last course lecture of the day. This questionnaire determined immediate post-course reactions (i.e. an “overall program rating”) and perceptions of the training program (see table 6).

5) “Follow-up reaction and perception of program” questionnaire (see Appendix E): This questionnaire was sent, along with questionnaire #3 above, via email at 6 and 12 weeks post-course to just the remaining study participants (22 were sent the six week questionnaire with 15 responses, and 15 were sent the 12 week questionnaire with 10 responses). This was a serial questionnaire that asked most of the same questions on post-course reactions and perceptions of the training program as questionnaire #4 above.

**Phone interviews.** (See Appendix G for phone interview guide) Upon receiving the completed study participant questionnaires at 6 and 12 weeks post-training, I would immediately arrange and then conduct the semi-structured 6 and 12 week follow-up phone interviews respectively (see Appendix U). I would use the questionnaire responses to refine the interview guide. This included developing probing questions when any

change was noted from an earlier questionnaire response (e.g. a change in a six week questionnaire response compared to a baseline response on the same item). I conducted a total of 15 “six week” interviews, and 10 “twelve week” interviews with a mean interview time of 35 minutes per interview. Technically, the six week interviews were conducted a mean of 52 days after the course, and the twelve week interviews were conducted a mean of 93 days after the course (see Appendix U). All interviews were transcribed, coded, and then the codes were further organized into themes.

**Observations.** Three different categories of observation opportunities included:

1) “LMCPR and LM competency checklist” (see Appendix F): At the end of the course lab, both instructors independently assessed all course attendees in key LMCPR and LM skills using a competency check list.

2) Course observational notes were collected in my field journal for each course. Insights captured at the moment of thought became valuable references while later analyzing data collected. Also, spontaneous conversations with course participants during the course breaks in some cases provided me valuable detailed data about past adoption efforts and experiences in using the rule and manipulation.

3) Observation and reading online blog/discussion board activity: Throughout the study period (17 September 2012, one week before the start of the first course, through my last 12 week phone interview on 3March 2013) I checked my blog and discussion board daily. I did not observe any blog/discussion board activity in real time. However, I did read all the blog/discussion board postings made by study participants (see Appendix Q and S).

**Memorandums.** Throughout the study period I took notes in my field journal and then used them to create a Word document memorandum for later analysis.

### **Data Analysis**

Data was analyzed using a mix of quantitative and qualitative methods. Quantitative analysis (mean, frequency, and percentage calculations of mean and frequency counts) was conducted on the questionnaire data, and competency checklist. Qualitative analysis (inductive theory generation, common themes, case and cross-case analysis) was conducted on the phone interviews, open-ended questionnaire responses, participant's online postings in the blog and discussion board, course observation notes, and memorandums.

**Questionnaires.** Given the small sample size of the study participants (i.e. 10 case study participants with full data sets covering 12 weeks), and their distribution across multiple courses, I did not calculate standard deviations or perform inferential statistical analysis on my quantitative data (Sauro & Dumas, 2009). While it is debatable if this would have been appropriate, I found it more helpful to analyze the data using simple descriptive techniques such as frequency counts, mean and percentage calculations (Norman, 2010). The purpose of the quantitative data was not to prove whether or not my intervention achieved statistically significant changes (e.g. changes in knowledge, and increased use of LMCPR and LM), but rather to describe what happened to the participants along their training journey. It is up to the readers to decide if the data presented seems credible and applicable to helping them better understand their own situations (Shenton, 2004).

Once again, data was consolidated across all eight cohort classes since their interventions were the same. I did calculate means for the ordinal Likert data (i.e. perception ratings 1-5 scale). While statistics text books do commonly state that mathematical calculations (i.e. calculating means) are not allowed with ordinal scale data, others argue this is allowed as long as thought is put into any conclusions drawn from the data (Dimitrov, 2009; Norman, 2010).

**Interviews.** Most of the qualitative data collected came from over 250 pages and 14 hours of transcribed study participant phone interviews. These interviews (and open ended questionnaire data) were open coded, and organized by theme (see Appendix R). I used a constant comparative analysis methodology, analyzing the data as it was collected for the seeds of inductively developed theories (Glaser, 1965). The interview data was analyzed for not only patterns, but also level of agreement between questionnaire and interview responses on the same topic (see table 25). This form of triangulation and clarification of the data, I feel strengthened the validity of my data and improved my understanding of what was really going on. Finally, the interview data was used along with the questionnaire data to develop rich case descriptions. These cases were then analyzed using cross-case analysis matrix tables (see tables 26-28) (Miles & Huberman, 1994).

**Observation of competency.** The observation checklists were analyzed by calculating percentage of “Go” (passed as competent) ratings per participant per instructor rater. I also looked at what skill items were not passed.

**Observation of online activity.** The blog/discussion board comments were read and analyzed. Based on the lack of participant postings (3 total for the blog, and only 1 for the discussion board) and the content of what was written, it did not make sense to code and categorize these data. Instead, the lack of postings became the important point, as well as the very limited use of the blog by 2 case participants (George and Todd), which I used to enhance their case descriptions.

**Course observations and memorandums.** The course observations and memorandums were used as reflection tools to help me generate and make sense of patterns I was beginning to see in the data at an early stage of constant comparative analysis. They also provided me data from detailed conversations I had during the course with some study participants.

### **Validity**

Threats to the validity of my study are described in the below validity threats table.

Table 1

#### *Validity Threats*

<b>Research Questions</b>	<b>Validity Threats to Possible Conclusions (how might I be wrong)</b>	<b>Strategies to Address Validity Threat</b>
Research Question (RQ)#1 Sub question (SQ)a: What are participants' knowledge of LMCPR and LM prior to the course, and how do these change over time after the course?	1) The knowledge test may not measure the knowledge needed to use the LMCPR and LM.	1) I had a physical therapy professor review this test, and then made recommended changes to insure content validity. I also looked at the study cases to see examples of

	<p>2) Changes to knowledge test may be related to testing on the same test twice (pre-test and post-test), rather than solely due to learning material in the training course.</p> <p>3) Knowledge of LM CPR and LM may change after the twelve week study period.</p>	<p>when knowledge scores and use of LM CPR and LM both increased or decreased over time, and for cases when knowledge scores and use of LM CPR and LM went in opposite directions (e.g. knowledge went up, but use of LM CPR/LM went down).</p> <p>2) The pre-test was done at the beginning of the training course and then not discussed (i.e., no answers were provided or discussed). The post-test was done at the end of a busy eight hour training course. The course covered so much material so quickly that I believe it was too hard for the participants to recall the exact questions on the test given eight hours earlier in the day.</p> <p>3) I acknowledge that continued knowledge changes (improvements or decrements) are possible beyond the 12 weeks study period.</p>
<p>RQ#1 SQb: What are participants' perception of LM CPR and LM, and how do these change over time?</p>	<p>1) Participant's main perceptions of LM CPR and LM may not be reflected in the constructs represented in the Likert type questions used in the perception questionnaires.</p>	<p>1) I asked open ended question on the phone interview about their "perception of LM CPR and LM". Rogers (2003), suggests that an adopter's "innovation-decisions are idiosyncratic [i.e., not necessarily logical]. They are based on an</p>

	<p>2) Perceptions of LMCPR and LM may change after the 12 week study period (this threat would be present for all RQ's that I am looking at change over the entire 12 week period such as RQ#2 SQb).</p> <p>3) Reactivity: declared perceptions on the questionnaire may not be true perceptions, and may be influenced by the participant's feelings towards me as the</p>	<p>individual's perceptions of an innovation" (p. 116) Therefore, it is important to ask this question directly without the restrictions of prefixed perception constructs which may limit the description of the participant's true perception of the innovations. While at the same time, certain constructs have been well studied and using these on questionnaires to gain specific perceptions on certain aspects of an innovation may still be helpful.</p> <p>2) I acknowledge that I could not adequately guard against this threat given the logistical constraints of the length of my study period. It is reported that adoption rates may decline over time up to 1 year after training (Saks &amp; Belcourt, 2006). It is certainly reasonable to assume perceptions (and behaviors) will continue to change beyond the 12 week period as well (either becoming more positive or negative).</p> <p>3) I modeled and promoted transparent/realistic self-assessment of skills and current behaviors. During the interviews and all course interactions I tried to avoid providing</p>
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	instructor/researcher.	indications of how I wanted them to respond. I made it clear to all participants that I was not looking at how many would end up adopting LMCPR and LM, but rather the process they go through in this training program (pre-course, course, and post-course), and their true perceptions and use of the LMCPR and LM at the beginning and end of the study period.
RQ#1 SQc: How competently can participants perform the LMCPR and LM by the end of the course?	<p>1) I may not be consistent in my assessment of competence.</p> <p>2) Being rated as competent in the lab may not translate into being competent in the clinic with a real patient.</p>	<p>1) My co-instructor and I independently determined competence (using the checklist – see Appendix F) of each study participant. The frequency of interrater agreement was analyzed.</p> <p>2) I matched up rating of competence in the lab of performing LM with any data that indicated the level of competence in the clinic using LM (e.g. self-reported confidence in performing LM, cavitations, reports of good outcomes on using LM with patients).</p>
RQ#2 SQa: What are the participants' intentions with respect to adopting LMCPR and LM into their practice, and how do these change over time?	1) Reactivity: declared self-reported intentions to adopt on the questionnaire may not be a true reflection of actual intentions to adopt, and may be influenced by participant's feelings towards me as the instructor and researcher.	1) The phone interview provided me the opportunity to follow-up on answers related to intention to adopt. When I noticed a change in intention to adopt (or any change in any earlier questionnaire on any topic)

	<p>2) Questionnaires with limited validity/reliability testing. This is true for all</p>	<p>I would ask why this changed. This discussion would open the door to more probing until I felt I had a good understanding of the reasoning behind their questionnaire responses.</p> <p>Throughout this process I remained conscious of the relationship I was having with each participant. I worked hard to create an open and friendly atmosphere in order to facilitate ongoing participation in the entire 12 week study. However, at the same time I recognized that I was seen as an expert (as the instructor) who was vested in their adoption of LMCPR and LM. So, I made overt statements when appropriate to suggest that I really just wanted to know what they were going through as they tried to adopt LMCPR and LM.</p> <p>2) Questionnaires were checked by a physical therapy professor and</p>
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	<p>my questionnaires.</p>	<p>determined to have good construct and face validity.</p> <p>Large portions of the questionnaires as they exist today have been pilot tested by 10 PTs over three pilot cycles prior to the dissertation and adjusted to maximize clarity.</p> <p>By comparing questionnaire and interview responses on the same questions this gave me a sense of the questionnaire items construct validity (did the participant understand what I was asking and did they respond in a way that reflected their beliefs as described in the interview). This check was performed for any changes in questionnaire responses over time. It was also checked for key constructs such as reports of past training and use of LMCPR and LM, even without the trigger of a change over serial questionnaires.</p>
<p>RQ#2 SQb: How do participants' self-reported use of the LMCPR and LM change after participation in the course?</p>	<p>1) Self report of behavior change may not reflect reality of behavior change.</p>	<p>1) This threat was addressed with triangulation of questionnaire, co-worker reports (when both were study participants working in the same clinic), phone interviews, online postings, and rich description of user experiences.</p>

	<p>2) Researcher bias. I believe that LMCPR and LM are effective ways of helping patients with LBP. I teach the course in a way that promotes adoption of these innovations. It is possible my conclusions may be swayed (particularly my coding and operational definitions) in favor of pro adoption behaviors and perceptions.</p> <p>3) Operational definition of what constitutes adoption or not adopting LMCPR and LM may be biased and was not determined apriori. Therefore my conclusions of how many were able to adopt LMCPR and LM after training may not be correct, or are subject to challenge.</p>	<p>My pilot findings suggested phone interview confirmation of reported questionnaire changes was helpful in improving the validity of reported questionnaire behavior changes. I found this to be true for my dissertation study as well.</p> <p>2) Being aware of my pro-adoption bias, made me more diligent in my efforts as a researcher to reflect reality, particularly coding in an objective fashion. I performed member checks of my conclusions and assumptions along the way in phone interviews, and also of the final cases via email.</p> <p>3) I used a multi-step process to determine how to categorize participants as having adopted or not having adopted LMCPR and LM. I first compared my general sense of adoption of LMCPR and LM from the interviews (i.e. getting an overall sense of the participant's practice behaviors) to their reported questionnaire and interview data. I then categorized the participant as having adopted or not adopted LMCPR and LM. I then came up with a</p>
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		<p>tentative operational definition that I felt had face validity and was supported by the data, and then tested it on every case study participant to insure that all were categorized accurately. When the definition did not work 100% of the time, I relooked if I made a mistake in categorizing the participant or in defining the operational definition. Once adjustments were made and the operational definition fully categorized all participants consistently, I then did a final member check to see if the case participant agreed with my overall assessment of their before and after study description of their use of LM CPR and LM.</p>
<p>RQ#2 SQc: What factors do participants report as facilitators in adopting LM CPR and LM as part of their practice?</p> <p>RQ#2 SQd: What difficulties/barriers do participants experience in adopting LM CPR and LM as part of their practice?</p> <p>RQ#2 SQe: How do participants overcome (or recommend overcoming) reported difficulties/barriers in adopting LM CPR and LM?</p>	<p>1) Reactivity: answers provided may be influenced by the participant's feelings towards me as the instructor/researcher. For example, they may shy away from highlighting non-course influences such as a supervisor, if they think I want to hear about how great the course was at helping them use the new skills.</p> <p>2) Participant may not recall all factors, and may simply report what is easiest to</p>	<p>1) The phone interview provided me the opportunity to probe answers from the questionnaires.</p> <p>2) I would frequently end the phone interview with asking the participant "is</p>

<p>RQ#2 SQf: What do participants report as reasons for failing to overcome reported difficulties/barriers in adopting LM CPR and LM?</p>	<p>remember. This would be the same threat for reported barriers.</p>	<p>there anything else that you wanted to tell me about that I didn't already ask you?"</p>
<p>RQ#3 SQa: What are the participants' perceptions and reactions to the training program?</p> <p>RQ#3 SQb: How were particular features of the training program perceived as helpful or not helpful in the adoption process?</p> <p>RQ#3 SQc: Why do participants use or not use particular features of the training program?</p>	<p>1) Reactivity: answers provided may be influenced by the participant's feelings towards me as the instructor/researcher.</p>	<p>1) The interview provided for detailed descriptions and examples of how features were helpful/not helpful, and why they were used or not used. This level of detail helped guard against superficial answers that may be perceived as "correct". In addition, I asked for specific details of their use of program components (e.g. metric tracker, blog use, discussion board). I feel this made the participant less likely to be affected by reactivity than general questions about use (Maxwell, 2013).</p>

## **Chapter Four: Quantitative Results**

This chapter summarizes the quantitative findings of this study on the adoption process of physical therapists following a multi-component training program on LMCPR and LM. The data presented was collected primarily through serial questionnaires, but triangulated using phone interviews, and observations of lab competency, classroom interactions, and online postings.

### **Tables**

Presented in this section are twenty four tables (i.e. table's #2-25). Each table will be preceded by an explanation of that specific table and a summary of relevant findings. Here is an overview of the tables: the first three (tables 2, 3, and 4) present the context of the study. The next table (5) provides a summary of the overall usage of LMCPR and LM. The next two tables (table 6 and 7) show the participant's rating of the training program. Then tables 8 and 9 report the participant's knowledge changes over time. Tables 10, 11, and 12 then cover the topic of participant competency in performing the LMCPR and LM. Then six tables (13, 14, 15, 16, 17, and 18) present the data regarding self-reported participant use of the LMCPR and LM. The next four tables (19, 20, 21, and 22) present the data regarding the participant's perceptions of the LMCPR and LM. Then two tables (23 and 24) present data related to the training program.

Finally, the last table (25) provides detailed information on the disagreement rate between the questionnaire and interview responses.

All table data numbers are reported as means, unless indicated otherwise. Also, the term “all study participants” used in many of the column headings is referring to the 22 participants that completed informed consent forms agreeing to participate in my study. Of these 22 participants, all completed the data collection instruments used at the time of the course (i.e. questionnaires on knowledge, reaction, demographics, and baseline behaviors and perceptions), and 15 of these 22 went on to complete the six week post-course data collection instruments (reaction, behavior, and perception questionnaires, and phone interviews). Finally, of these remaining 15, 10 went on to finish the entire twelve week study protocol by completing the twelve week post-course data collection instruments (knowledge, reaction, behavior and perception questionnaires, and phone interviews). This final sub-group of 10 study participants that completed the entire 12 week study protocol is presented as cases. This subgroup is also reflected in the tables with the column heading “case study participants”.

Also, I asked all course attendees (including non-study participants, also referred to as non-participants) to complete three questionnaires. This was done to mimic a normal course experience (e.g. taking a pre-course / post-course knowledge test, and post-course reaction questionnaire), prior to asking if anyone was interested in participating in the study. Therefore, some data was collected on non-participants, and is presented in aggregate form in tables 2, 6, 8, and 10 to allow a comparison of study

participants to non-participants in constructs such as knowledge change, course reaction, and initial competence of performing LM CPR and LM.

In addition, some of the tables have notes at the bottom indicating that the original data had been adjusted, or that I had validity concerns with some of the reported data. This was explained in detail in chapter 3, but briefly here, whenever a discrepancy existed between a questionnaire response and an interview response on the same question then this discrepancy was categorized as either factual (i.e. clear concrete error) or conceptual (see table 25 and Appendix P). I changed the original data for factual based discrepancies, and indicated this clearly in the tables. I did not change the data for conceptual based discrepancies, but indicated on the tables that a validity concern existed for that particular data item.

Finally, although six week questionnaire data was collected, it was not included in these tables. All the tables that look at change over the twelve week study period did so by comparing baseline measures to only twelve week measures (i.e. therefore only looking at the case study participants). However, the six week questionnaire data was still very helpful in guiding the six week interviews, and in piecing together the overall adoption process that occurred over the entire twelve week period.

**Context of study.** The following three tables (table 2, 3, and 4) provide the overall context of the study. Table 2 and 3 present demographic information and table 4 describes specifics about each of the eight courses.

**Table 2.** The first table presented below is table 2, which gives a side-by-side comparison of all study participants, case study participants, and the 26 non-participant

course attendees' demographics. Non-participants did not complete the demographic questionnaires (thus explaining the "no data" statement in most of the table cells), but through observation I was able to report their numbers and gender. This table is useful in confirming that both the study participants and sub-group of case study participants were experienced orthopedic physical therapists, mostly with no orthopedic specialization certifications, which saw LBP patients on a weekly basis. This is a good description of the target audience for who should use LMCPR and LM, and of a common outpatient physical therapist. The table also shows two demographics that paint the picture that many of the study participants were clinical instructors, a position of clinical influence with physical therapy students, and attended this course with a co-worker. This latter point is discussed as an important facilitator to adoption in Chapter 6 (and as reflected in Appendix R).

Table 2

*Demographics*

Descriptor	All study participants (n=22)	Only case study participants (n=10)	Non-participants, but course attendees (n=26)
Age	38	33	No data
% male	55	60	58
# years as a physical therapist	13	7	No data
# years working in an outpatient orthopedic setting	10	5	No data
% with doctorate of physical therapy degree	59	90	No data
% with ortho specialization (OCS or FAAOMPT)	18	10	No data
Pre-course # LBP visits** seen per week	19*	13	No data
% that were clinical instructors in the last year	59	60	No data
% attended this course with direct co-worker	73	50	No data

\*original data adjusted (see item C in Appendix P for detail description of change)

\*\*"visits" are defined as evaluations, treatments, or follow-ups with a LBP patient

**Table 3.** This next table presents just the 10 case study participants' information on many of the same demographic topics as in table 2 (i.e. the first five columns). In addition, it provides the name of the co-workers (which helps in reading the cases), what type of LBP patients they see, and their prior training on the topics of LMCPR and LM. These topics are discussed in detail in the cases and later in chapter 6, so having this information in one location is helpful for reference. It is important to note in this table

that only two of the case study participants saw a large portion of “acute” low back pain patients (i.e. patients with low back pain symptoms for less than 16 days). This will be discussed in chapter 6 as a barrier to adoption since “acute” LBP pain is one of the strongest indicators for use of LM. Also, it is interesting to note how many of the case study participants had already been trained in LMCPR and LM prior to this study training program (table 5 below will present which of these participants were actually using LMCPR and LM prior to this study training course. This reinforces the concept that training does not often translate fully to adoption).

Table 3

*Case Participant’s Demographics*

Case study name	Age	# years as physical therapist	# years working outpatient orthopedic setting	Attended this course with direct co-worker	Pre-course # LBP visits per week	% of LBP patients at evaluation with less than 16 days of symptoms (“acute”)	% with prior training on LMCPR	% with prior training on LM
Susan**	26	3	3	No	10	0	Yes	Yes
Mary**	33	8	8	John, Todd	22.5	12.5	No	Yes
John**	32	6	6	Mary, Todd	6.5	5	Yes	Yes
Todd**	37	13	6	John, Mary	10	5	No	No
Trisha**	30	5	5	Tim, Britt*	6	1	Yes	Yes
Tim**	26	.5	.5	Trisha, Britt*	10	0	No	Yes
George**	31	6	6	No	2	0	No	No
Jeff**	29	3	3	No	35	50	Yes	Yes
Leslie**	49	16	3	No	8	75	No	Yes
Keith**	37	12	12	No	20	16	No	No
Mean	33	7	5	50%	13	16%	40%	70%

\*Not a study participant

\*\* Actual self-reported data, not means

**Table 4.** This table presents the context of the course in terms of number, timing, and geographic location of courses, number of physical therapists course attendees, and how many actually signed up as a study participant. Note that the study participants (and case study participants) came from different courses, demonstrating a wide representation of different geographic locations. This table also provides an idea of how small some of the courses were, and the proportion of attendees that signed-up to be study participants in each course.

Table 4

*Course Context*

Course date	8 hour day long training course location	Number of physical therapy attendees	Initial number of study participants	Name of study participants completing 12 week study (making up the cases)
22-Sep-12	Mid-Atlantic US	2	1	Susan
13-Oct-12	Mid-West US	9	5	Mary, John, Todd
20-Oct-12	South East US	4	3	Trisha, Tim, George
3-Nov-12	South Central US	10	5	Jeff, Leslie
10-Nov-12	South Central US	5	4	0
1-Dec-12	South Central US	2	1	0
15-Dec-12	Mid-Atlantic US	4	2	Keith
19-Jan-13	South West US	12	1	0
Column frequency count	8	48	22	10

**Overall usage of LM CPR and LM.** This next table presents the overall usage of LM CPR and LM before and after the course. I present this table now, as opposed to later with the specific self-reported behavior tables (13-18), to provide an upfront big picture of the overall changes that occurred to the case study participants.

*Table 5.* This table provides a picture of the use of the lumbopelvic manipulation clinical prediction rule (LM CPR) and lumbopelvic manipulation (LM) before the course, and twelve weeks after the course. Comparing the pre-course use of LM CPR and LM to previous training received on these topics (as shown in table 3) provides some support for my claim of historically low adoption rates of LM CPR and LM after training on these topics. Also, seeing the 12 weeks post-course use of LM CPR and LM gives an idea of the level of adoption after this studies training program. Finally, in order to understand this table I must explain some key operational definitions and then what the table acronyms mean.

"Routine" is operationally defined as 75% of the time or greater. This rate was chosen as a cut point since it seemed to match with interview reports of consistent and persistent use of a particular behavior, while allowing for reasonable exceptions for not using the behavior 100% of the time. Note that this operational definition (including the below acronym descriptions) is discussed in chapter 6 as a possible validity threat to this study.

FR (full use of LM CPR): the physical therapist measures enough of the LM CPR criteria on a routine basis to see if patients are indicated for manipulation, and routinely uses this information to decide if manipulation should be used on a patient.

PR (partial use of LMCPR): the physical therapist collects and uses some of the LMCPR criteria on a less than routine basis to decide if manipulation should be used on a patient.

NR (no use of LMCPR): the physical therapist is not collecting any of the LMCPR criteria data, or collecting some of the criteria, but not using the criteria data to decide if manipulation should be used (i.e. not using LMCPR as a clinical decision tool).

FM (full use of LM): the physical therapist uses LM on low back pain patients on a routine basis when strongly indicated (e.g. when 4 of 5 of the criteria are present), and has used LM at least once in the last twelve weeks.

PM (partial use of LM): the physical therapist uses LM on at least one low back pain patient in the last 12 weeks, but uses LM on a less than routine basis when strongly indicated.

NM (no use of LM): has not used LM on a low back pain patient in the last 12 weeks.

Table 5

*Cases by Category*

Case study name	Pre-course LM CPR use	12 weeks post-course LM CPR use	Pre-course LM use	12 weeks post-course LM use
Susan	NR	<u>PR</u>	NM	NM
Mary	NR	<b>FR</b>	NM	<b>FM</b>
John	<b>FR</b>	<b>FR</b>	<b>FM</b>	<b>FM</b>
Todd	NR	<u>PR</u>	NM	<b>FM</b>
Trisha	NR	FR	NM	<b>FM</b>
Tim	NR	FR	NM	<b>FM</b>
George	NR	FR	NM	<b>FM</b>
Jeff	<b>FR</b>	FR	<b>FM</b>	<b>FM</b>
Leslie	NR	FR	NM	<b>FM</b>
Keith	NR	FR	NM	<b>FM</b>
% “Full” use	20	80	20	90

**Rating of training program.** The next two tables (6 and 7) show the overall rating, or participant reaction to the training program. The rating of the training program was on a scale of 0-10, with 0 being “poor”, and 10 being “outstanding”.

**Table 6.** This table presents the mean rating scores for the overall training program as reported by all course attendees (i.e. all study participants, only case study participants, and non-participants) immediately after the course. The only participants that completed the twelve week rating questionnaire were the case study participants, thus explaining why “no data” was available for the other two groupings. This demonstrated overall high course ratings by all groupings, and the ratings remained high over time.

Table 6

*Overall Training Program Rating*

Groupings	Immediate post-course score	Twelve weeks post-course score
All study participants (n=22)	9.5	No data
Only case study participants (n=10)	9.7	9.2
Non-participants, but course attendees (n=26)	9.0	No data

**Table 7.** This table focuses on only the overall training program ratings for the individual case study participants. This shows that program ratings over the twelve week post-course period were favorable and stayed fairly consistent.

Table 7

*Case Study Participant's Training Program Rating*

Case study name	Immediate post-course score	Twelve weeks post-course score
Susan*	9	9
Mary*	9	8
John*	10	10
Todd*	10	9
Trisha*	10	10
Tim*	10	9
George*	10	10
Jeff*	10	9
Leslie*	9	8
Keith*	10	10
Mean Score	9.7	9.2

\* Actual self-reported data, not means

**Knowledge change.** The next tables (8 and 9) report the knowledge changes over time. Having increase knowledge of an innovation is the first phase of Rogers (2003) innovation-decision process.

**Table 8.** This table presents the mean test scores (% of questions correct) for all course attendees (i.e. all study participants, only case study participants, and non-participants) immediately before and after the course. The only participants that completed the twelve week post-course test were the case study participants, thus explaining why “no data” was available for the other two groupings. Comparing the pre-course test scores to the immediate post-course test scores demonstrates changes suggestive of increased knowledge of LM CPR and LM for all groups. In addition, it appears the knowledge gains for the case study participants remained increased at twelve weeks post-course.

Table 8

*Knowledge of Rule and Manipulation*

Groupings	Pre-course test score (% correct)	Immediate post-course test score (% correct)	Twelve weeks post-course test score (% correct)
All study participants (n=22)	63	95	No data
Only case study participants (n=10)	65	95	94*
non-participants, but course attendees (n=26)	64	90	No data

\*Note that n=8 due to 2 participants inadvertently used the CPR algorithm as a reference while taking the 12 week test, so their 100% scores were not included in the twelve week mean calculation.

**Table 9.** This table focuses on only the individual test scores for the case study participants. Note that every case study participant increase their immediate post-course test score compared to their pre-course test score. Also, all twelve week post-course test scores remained increased over their baseline pre-course scores. Once again the pre-post test score changes are suggested of knowledge gains in LM CPR and LM, and that these knowledge gains were retained over the twelve week study period.

Table 9

*Case Study Participant's Knowledge of Rule and Manipulation*

Case study name	Pre-course score (% correct)	Immediate post- course score (% correct)	Twelve weeks post- course score (% correct)
Susan**	88%	100%	100%
Mary**	38%	88%	100%
John**	88%	100%	100%
Todd**	63%	88%	100%*
Trisha**	38%	88%	100%*
Tim**	75%	100%	88%
George**	63%	100%	100%
Jeff**	63%	100%	75%
Leslie**	75%	100%	88%
Keith**	63%	88%	100%
Mean	65%	95%	94%*

\*Test score not valid since inadvertently used the CPR algorithm as a reference aide while taking the test, so these scores are not included in the 12 week mean calculation

\*\* Actual test score, not means

**Overall competency performance.** The next three tables (10, 11, and 12) present the data related to the competency of all course attendees (i.e. all study participants, only case study participants, and non-participants) in performing various skills related to LMCPR and LM (see Appendix F). During the course based LM lab, each attendee was asked to demonstrate to each of the two independent raters (i.e. course

instructor) the required foundational skills required to perform LMCPR and LM on patients at an entry level. The rater used a check-list and determined the percentage of skills performed correctly. For example, a rating of 100% means the physical therapist was able to pass all of the eight skills as competent. This competency performance assessment was measured to insure that not only did attendees gain knowledge, but also gained the technical skills to perform the newly learned innovations.

**Table 10.** This table presents the percentage of course attendees in each group (i.e. all study participants, only case study participants, and non-participants) that passed all eight competency skills as independently tested by both raters. This table shows that 77% of the study participants, and 70% of case study participants, were rated 100% competent on all skills by both raters.

Table 10

*Competency Performing LMCPR/LM Skills*

Groupings	Percentage of participants that passed all skills by both raters
All study participants (n=22)	77
Only case study participants (n=10)	70
Non-participants, but course attendees (n=26)	46

**Table 11.** This table shows that all but one of the case study participants demonstrated 100% competence in using LMCPR and LM by at least one of the two raters. Note that 7 of the 10 were rated 100% competent by both independent raters, which is also reflected in table 10. Also, the case study participants that show an 88% all

missed passing only one of the eight skills (i.e. skill number six on the competency check list, see Appendix F). For example, Keith’s data below shows “88/88”. This means he was rated as competent by both raters on 7 of the 8 skills (or 88%). Finally, this table, as well as table 12, shows the high level of agreement between the two raters (i.e. they agreed on 8 of 10 overall rating scores, all but Mary and Leslie).

Table 11

*Case Study Participant’s Competency Performing LMCPR/LM Skills*

Case study name	% of skills passed at end of lab (each of the two rater’s ratings shown)
Susan	100/100
Mary	100/88
John	100/100
Todd	100/100
Trisha	100/100
Tim	100/100
George	100/100
Jeff	100/100
Leslie	88/100
Keith	88/88

**Table 12.** Where table 11 provided a general picture of the degree of agreement in overall rating scores between the two raters, it did not show the agreement level by

each rated item across all course attendees. This percentage agreement between raters for each of the skill items for all course attendees is shown in table 12. It clearly shows the high level of agreement between the two independent raters' competency ratings.

Table 12

*Percentage Agreement Between Raters*

Groupings	% of agreement between raters in Go/No-Go for all items on the competency skills checklist
All study participants (n=22)	99
Only case study participants (n=10)	98
Non-participants, but course attendees (n=26)	96

**Self-reported use of LMCPR and LM.** The next six tables (13, 14, 15, 16, 17, and 18) present the data regarding self-reported participant use and related behaviors of the LMCPR and LM. For example, LMCPR is made up of 5 main criteria, so the related behaviors to LMCPR use are the individual use of each of the five criteria measures. The first three tables (13-15) focus on LMCPR, and the last three (16-18) focuses on LM. As a reminder, only the case study participants completed the twelve week data collection measurements, and thus have data reported in the tables for twelve weeks. Whereas, the “all study participants” grouping as a whole did not complete the twelve week measurements, so has “no data” placed in that column cell. Also, as previously operationally defined, “routine basis” is considered doing something at least 75% of the time.

**Table 13.** This table presents the percentage of participants that adopted using LMCPR on a routine basis after training (both a look at adoption after prior training, and adoption after this study’s training program). The use of the term “routine basis” in this table means the participant is measuring enough of the LMCPR criteria on a routine (at least 75% of the time) basis to see if patients are indicated for manipulation, and routinely (at least 75% of the time) uses this information to decide if they should do manipulation on the patient. Looking at the first row, you can see what percentage of the group (i.e. all study participants) and subgroup (i.e. case study participants) had prior training in LMCPR before this study training course. This information is also presented for each case study participant in table 3. It is interesting to note the low percentage of participants that are using LMCPR prior to the study course (14% and 20%), despite the prior training. This supports my earlier claims of the low adoption of LMCPR after training. Finally, note the high (80%) routine use of LMCPR among the case study participants at twelve weeks post-course.

Table 13

*Self-reported LMCPR Use*

Descriptor	All study participants (n=22)	Only case study participants (n=10)
% of participants with prior training in LMCPR	55	40*
% of participants using LMCPR on routine basis before the study course	14	20*
% of participants using LMCPR on routine basis twelve weeks after the study course	No data	80

\* Original data adjusted (see item A and J in Appendix P for detail description of change)

**Table 14.** This table presents a comparison of all the study participants and the sub-group of case study participants on the main LMCPR related self-reported behaviors over time (baseline (0) pre-course behaviors versus twelve weeks (12) post-course behaviors). There are seven behaviors that are related to fully using LMCPR, and are being compared in this table (columns A-G). The first behavior, column A, is the use of a LMCPR associated LBP outcome measure (i.e. Modified Oswestry Disability Index, or MODI). While the MODI is not one of the official LMCPR criteria, it is used to determine if a patient has improved at a level that would suggest success (i.e. 50% reduction in MODI score). The next five columns (B-F) represent each of the five LMCPR criteria. The last column (G) represents the behavior of using all the criteria measurements together as a decision tool to use LM. When reading this table, use the key below the table to reference which behavior is being represented in each column. For example the column heading A12, represents the self-reported behavior at twelve weeks (12) post-course of the percent of the time the proper outcome measure (i.e. MODI) is being used during each evaluation and follow-up visit (A). Whereas, column C0 would represent the self-reported behavior at pre-course (0 weeks) for the percent of time hip internal rotation is measured during the initial LBP evaluation (C).

This table shows certain pre-course behaviors are more prevalent than others for both groupings. For example, the MODI (A0) and FABQ (B0) pre-course use are particularly low for all study participants and the subgroup of the case study participants. The cases and chapter 6 explore the reasons for this low use.

Looking at the bottom row of this table shows the changes in LM CPR related behaviors over time (0 vs. 12 weeks) for the case study participants. In aggregate, all behaviors have increased over time (with possibly the exception of column E (note the validity concerns for E0). This is consistent with the adoption summary shown in table 5.

Table 14

*Self-reported LM CPR Related Behavior*

Stubhead	Pre-course (0) use of LM CPR criteria vs. twelve weeks (12) post-course use of the LM CPR criteria (numbers are mean % use)													
Groupings	A0	A12	B0	B12	C0	C12	D0	D12	E0	E12	F0	F12	G0	G12
All study participants (n=22) ND=no data	13	ND	0	ND	36	ND	69*	ND	99	ND	92	ND	20	ND
Only case study participants (n=10)	23*	63	0	53	36	94	59	94	100^	99	85	99	23*	81

A: % of the time MODI used during initial LBP evaluation and follow-up visits

B: % of the time FABQ used during initial LBP evaluation

C: % of the time hip internal rotation is measured during initial LBP evaluation

D: % of the time lumbar spinal segments are classified as hyper or hypomobile during initial LBP evaluation

E: % of the time pain is determined as above or below the knee during initial LBP evaluation

F: % of the time the number of days of current LBP episode is determined during initial LBP evaluation

G: % of the time the number of rule criteria present is determined during the initial LBP evaluation

\*original data adjusted (see items E, H, and J in Appendix P for detail description of change)

^validity concern with reported data (see item I in Appendix P for detail description of concern)

**Table 15.** This last table covering the behaviors related to LMCPR presents a comparison of all the case study participants over time (baseline (0) pre-course behaviors versus twelve weeks (12) post-course behaviors). Once again, as in table 14, there are seven behaviors that are related to fully using LMCPR, and are being compared in this table (columns A-G). Also, like in table 14, the number in the column heading refers to the time (pre-course = 0 and twelve weeks = 12).

This table shows the individual case study participant's low pre-course use of certain LMCPR related measures such as the MODI, FABQ, and hip internal rotation (columns A0, B0, and C0 respectively). It also shows certain measures were commonly used before the course, such as determining the location of the patients symptoms (i.e. below the knee or not) and how long they have had symptoms (columns E0 and F0 respectively). This is important since several participants suggested that they felt it was easier to adopt a new behavior (e.g. LMCPR) if it was something they were already doing, and just had to make minor adjustments to their decision making.

This table is also important in showing how I determined that 80% of the case study participants had fully adopted using LMCPR (see table 5 and 13) by 12 weeks post-course. The first part of this two part (as previously described) operational definition of full adoption of LMCPR is "measuring enough of the LMCPR criteria on a routine basis to see if patients are indicated for LM." Since the LM is indicated when 3 or more of the LMCPR criteria are present (i.e. 68% chance of success with LM), at a minimum the participant should have adopted at least 3 of the LMCPR criteria using these measures at

least 75% of the time. Note (by looking at B12, C12, D12, E12, and F12) that this is the case for every case study participant.

Theoretically, if a physical therapists is seeing most of their patients with less than 16 days of symptoms (i.e. acute), then they could just adopt 2 of the criteria (measuring symptoms location, column E, and number of days of symptoms, column F), and still have enough information to apply the rule to see if LM is indicated (85% chance of success when no symptoms are below the knee, and the patient had symptoms for less than 16 days). The problem with this situation is, at least for my case study participants, only 2 of the 10 (see table 3) worked in environments with plenty of acute low back pain patients. So, if the therapist is not having many patients with less than 16 days of symptoms, then they must depend on the behaviors reflected in columns B, C, D, and E (measuring at least 3 of these 4 on a routine basis) in order to come up with at least 3 positive criteria to qualify patients for LM.

If the participant was measuring enough of the criteria on a routine basis, then the second qualifier for fully adopting LMCPR as a behavior is represented by behavior in column G being at least 75%. Column G suggests how often the collected criteria are counted up and used as a decision tool. It is possible that criteria can be measured, but then not used as a decision tool (as was the case for many of the participants before this training program, as reflected in column G0). Also, it is important to note that an increase in the use of each of the five LMCPR criteria individually would not guarantee an increase in the use of the LMCPR as a decision tool to determine when to use LM. If the criteria are counted and then a decision to perform LM or not is made based on this

criteria count then LMCPD is being used as a decision making tool. So, if column G is at least 75%, then the criteria count are being used in the decision making process at least 75% of the time. Note that only two of the participants did not meet this second operational definition requirement (Susan and Todd, both of which were counted as partial adopter of LMCPD at twelve weeks).

Table 15

*Case Study Participant's Self-reported LMCPD Related Behavior*

Case study name	Pre-course (0) use of LMCPD criteria vs. twelve week (12) post-course use of the LMCPD criteria (numbers are individual's reported use rates)													
	A0	A12	B0	B12	C0	C12	D0	D12	E0	E12	F0	F12	G0	G12
Susan	5	100	0	0	50	90	75	80	100	100	100	100	0	30
Mary	0	50	0	50	100	100	100	100	100	100	100	100	0	75
John	0	0	0	0	100	100	100	100	100	100	100	100	100	100
Todd	10	5	0	5	5	70	75	80	100 <sup>^</sup>	90	100	90	0	30
Trisha	60	100	0	100	0	100	0	100	100	100	100	100	0	100
Tim	60	100*	0	100	0	100	90	100	100	100	100	100	0	100
George	0	100	0	100	0	100	0	100	100	100	0	100	0	100
Jeff	0	80	0	100	0	100	100	100	100	100	100	100	100	100
Leslie	0	0	0	0	0	75	50	75	100	100	50	100	0*	75
Keith	90	95	0	75	100	100	0*	100	100	100	100	100	25	100
Mean %	23	63	0	53	36	94	59	94	100	99	85	99	23	81

A: % of the time MODI used during initial LBP evaluation and follow-up visits  
 B: % of the time FABQ used during initial LBP evaluation  
 C: % of the time hip internal rotation is measured during initial LBP evaluation

D: % of the time lumbar spinal segments are classified as hyper or hypomobile during initial LBP evaluation  
E: % of the time pain is determined as above or below the knee during initial LBP evaluation  
F: % of the time the number of days of current LBP episode is determined during initial LBP evaluation  
G: % of the time the number of rule criteria present are determined during the initial LBP evaluation  
\*original data adjusted (see items E, H, and J in Appendix P for detail description of change)  
^validity concern with reported data (see item I in Appendix P for detail description of concern)

*Table 16.* This table presents the percentage of participants that adopted using LM on a routine basis after training (both a look at adoption after prior training, and adoption after this study’s training program). The use of the term “routine basis” in this table means the participant is using LM on MLBP patients at least 75% of the time when LM is strongly indicated (e.g. 4 or more of the LMCPR criteria present). Looking at the first row, you can see what percentage of the group (i.e. all study participants) and subgroup (i.e. case study participants) had prior training in LM before this study training course. This information is also presented for each case study participant in table 3. It is interesting to note the low percentage of participants that are using LM prior to the study course (36% and 20%), despite the prior training. This supports my earlier claims of the low adoption of LM after training. Finally, note the high (90%) routine use of LM among the case study participants at twelve weeks post-course.

Table 16

*Self-reported LM Use*

Descriptor	All study participants (n=22)	Only case study participants (n=10)
% of participants with prior training in LM	68	70
% of participants using LM on routine basis before the study course	36	20
% of participants using LM on routine basis twelve weeks after the study course	No data	90

**Table 17.** This table presents a comparison of all the study participants and the sub-group of case study participants on the main LM related self-reported behaviors over time (baseline (0) pre-course behaviors versus twelve weeks (12) post-course behaviors). This data was collected via the behavior related questionnaire items (see Appendix B and C). There are 2 behaviors that are related to using LM, and are being compared in this table (columns A and B). The first behavior, column A (described by a note below the table), is the use of LM when 3 or more of the LMCPR criteria are present at initial evaluation. The second behavior, column B (also described by a note below the table), is the use of LM when 4 or more of the LMCPR criteria are present at initial evaluation. Note that this data shows higher use of LM when 4 or more of the LMCPR criteria are present, compared to 3 or more criteria present. Many participants explained that they

felt safer using LM when more criteria were present (i.e. more evidence to support their decision). Also, note the increase in use of LM at 12 weeks for both column A12 and B12, once again with the rate of using LM if 4 or more criteria present being higher than when 3 or more criteria are present.

Table 17

*Self-reported LM Related Behavior*

Stub head	Pre-course (0) use of LM vs. twelve weeks (12) post-course use of the LM (numbers are mean % use)			
Groupings	A0	A12	B0	B12
All study participants (n=22) ND = No Data	21	ND	25	ND
Only case study participants (n=10)	15	65	20*	83

A: % of the time LM is performed if 3 or more of the LMCPR criteria are present at initial evaluation

B: % of the time LM is performed if 4 or more of the LMCPR criteria are present at initial evaluation

\* Original data adjusted (see item M in Appendix P for detail description of change)

**Table 18.** This last behavior related table is presenting data on the prevalence of LM use by the case study participants under different conditions before the course (0), and twelve weeks after the course (12). Once again, this table describes what behavior column A, B, and C represent by a note under the table. Basically, Column A is the operational definition of FM (i.e. full use of manipulation when strongly indicated) as presented earlier in this chapter (see table 5). A “yes” in column A indicates that the case

study participant is fully using LM in their practice at the most basic level (i.e. when LM is most strongly indicated). Note that the 20% baseline full use of LM (i.e. 20% of the case study participants fully use LM), and then 90% full use of LM at 12 weeks, also reflected in table 5, suggests a high adoption of LM following this study's training program.

The other two columns (B and C) represent two different conditions of using LM as previously described in the table 17 introduction paragraph. In table 18, these behaviors are now being shown at an individual level, rather than at an aggregate level as was shown in table 17. Here it is easy to see that Susan had not adopted LM under any of the use conditions twelve weeks after training course (compare B0 to B12, and C0 to C12). Also, note that this table does not indicate how frequently LM was performed. Rather, the focus is on using LM when it is strongly indicated (e.g. when at least 4 of 5 LM CPR criteria are present), as reflected in column A.

Table 18

*Case Study Participant's Self-reported LM Behavior*

Case study name	Pre-course (0) use of LM vs. twelve week (12) post-course use of LM (numbers are individual's reported use rates)					
	A0	A12	B0	B12	C0	C12
Susan	No	No	0	0	0	0
Mary	No	Yes	0	50	0	75
John	Yes	Yes	100	100	100	100
Todd	No	Yes*	0	50	0	80
Trisha	No	Yes*	0	100	0	100
Tim	No	Yes	0	100	0	100
George	No	Yes	0	0	0	100
Jeff	Yes	Yes	50	100	100	100
Leslie	No*	Yes	0	75	0*	75
Keith	No	Yes	0	75	0	100
%	20	90	15**	65**	20**	83**

A: In the last twelve weeks has the physical therapist used manipulation on a routine basis when strongly indicated (e.g. when 4 of 5 of the criteria are present)? “%” equals percent of case study participants where the answer is Yes.

B: % of the time lumbopelvic manipulation (LM) is performed if 3 or more of the lumbopelvic manipulation clinical prediction rule (LMCPR) criteria are present at initial evaluation

C: % of the time LM is performed if 4 or more of the LMCPR criteria are present at initial evaluation

\* Original data adjusted (see item D and M in Appendix P for detail description of change)

\*\* Mean calculations

**Perception of the LMCPR and LM.** The next four tables (19, 20, 21, and 22) present the data collected on the participant's perceptions of using LMCPR and LM in their practice. The first two tables (19 and 20) focus on the perceptions of using LMCPR, first from an aggregate level (table 19), and then from an individual case study participant level (table 20). The last two tables (21 and 22) focus on the perception of using LM,

first from an aggregate level (table 21), and then from an individual case study participant level (table 22).

The LMCPR perceptions measured were focused on constructs selected from most of Rogers (2003) characteristics of innovations (relative advantage, compatibility, complexity, and trialability), as well as those that were supported in other literature, theories, and my earlier DBR cycles as important to the adoption process (i.e. perceived intention, confidence, and opportunities to use the innovation) (Moore & Benbasat, 1991; Sharma & Sabus, 2012; Struessel et al., 2012; Wergin et al., 1988). These same perceptions were measured for LM, with two additions that focused on the perceived risk of using LM (i.e. risk of injuring the patient, and risk of being sued). These additional constructs were also supported in the literature as important barriers to adopting LM by physical therapy students (Sharma & Sabus, 2012; Struessel et al., 2012).

These perceptions were made clear by having the participants rate their level of agreement to statements related to the above constructs (e.g. intention) of using LMCPR and LM (see Appendix B). They were given the choice to rate their level of agreement to the statement based on a five point Likert scale: strongly agree (5), agree (4), unsure (3), disagree (2), and strongly disagree (1). Overall, perceptions of using both innovations were favorable (i.e. either strongly agree or agree for most items such as confidence and intention to adopt, or disagree or strongly disagree for some items such as complexity and perceived risks) for all the constructs for nearly all the case study participants. This is consistent with the high rate of adoption of both LMCPR and LM seen among case study participants following the study training program. It should be noted that having

favorable perceptions alone was not enough to lead to full adoption of LMCPR and LM (as was the case with Susan and Todd).

*Table 19.* This table presents the perceptions of using LMCPR, as assessed by level of agreement to certain statements, from an aggregate level for all study participants and the subgroup of case study participants. Once again, only the case study participants were followed for the entire twelve week period, so no data (ND) is available for the “all study participants” grouping for the twelve week post-course table cells.

The seven constructs that are represented in this table are intention (column A), confidence (column B), opportunities (column C), advantage (column D), compatibility (column E), complexity (column F), and trialability (column G). The full questionnaire statements related to these constructs are listed as a series of notes at the bottom of this table. Note that for this table, responses that reflect favorable perceptions of LMCPR would be agree or strongly agree for columns A, B, C, D, E, and G. Whereas a response that reflects a favorable perception of LMCPR for column F would be disagree or strongly disagree.

Just like many of the other tables, each column header has a letter and a number. The number refers to either an immediate post-course baseline measurement (0), or a twelve week post-course measurement (12). So, A0 for the row under all study participants is 91. This means that 91% of all study participants agreed or strongly agreed to the statement that “I intend to use LMCPR in my practice” immediately after the course. This is a favorable perception of LMCPR that can facilitate adoption.

For the case study participants (2<sup>nd</sup> row) two numbers are provided. The bigger number in each cell is the combined level of agreement (e.g. A0 states 100% of case study participants agree or strongly agree to the statement on “I intend to use LMCPR in my practice”). The second, smaller number, in each cell (as designated by a \*) is the percent of case study participants that strongly agreed (or if ^ is shown, as in column F, the percent reflects those that strongly disagreed). This was included because if the larger number does not show a change at baseline and twelve weeks (e.g. A0 to A12, which shows 100% and 100%), then the smaller number (i.e. % of those that feel strongly) may still reflect a change (e.g. A0 to A12, which showed a change from 60% to 80%). In this example, the case study participants as an aggregate did have a more favorable perception of the intention to use LMCPR at 12 weeks compared to baseline, as reflected by the increase in the percentage of case study participants that strongly agreed to the statement by twelve weeks post-course.

Looking at the data in the table the immediate post-course measurements for the study participants and the case study participants were similar for each construct (e.g. A0, B0, C0, D0, E0, F0, and G0). This reflects the overall favorable perception of using LMCPR by the participants immediately after the course for all table constructs. Also, note that all, but 2 columns (E and F), show favorable changes for the case study participants over the twelve weeks. This is consistent with the high level of adoption of LMCPR by the case study participants. Note that the only column that appeared to have a lower level of strongly agreeing at twelve weeks was column E (compatibility), which also was flagged for having a validity concern for a data point (see item Q in Appendix

P). In other words, it is possible that this lower level of strongly agreeing at 12 weeks, was actually not true, and could be no change.

Table 19

*Perceptions Related to LM CPR*

Stub head	Level of agreement to LM CPR related statements at immediate (0) post-course vs. twelve weeks (12) post-course													
	Groupings	A0	A12	B0	B12	C0	C12	D0	D12	E0	E12	F0	F12	G0
All study participants (n=22) ND = No Data	91	ND	73	ND	96	ND	96	ND	91	ND	96	ND	96	ND
Only case study participants (n=10)	100 60*	100 80*	80 20*	100 80*	90 30*	90 50* @	100 40*	100 60* \$	100 70*	100 60* \$	100 60^	100 60^ \$	100 50*	100 60* \$

A: % of participants that “agree” or “strongly agree” with statement that “I intend to use LM CPR in my practice”  
 B: % of participants that “agree” or “strongly agree” with statement that “I am confident in my ability to use the LM CPR”  
 C: % of participants that “agree” or “strongly agree” with statement that “I have opportunities to use the LM CPR on my patients”  
 D: % of participants that “agree” or “strongly agree” with statement that “I feel using the LM CPR provides advantages over my current clinical decision making”  
 E: % of participants that “agree” or “strongly agree” with statement that “I feel using the LM CPR is compatible with my current clinical decision making methods and beliefs”  
 F: % of participants that “disagree” or “strongly disagree” with statement that “I feel the LM CPR is complex and difficult to use”  
 G: % of participants that “agree” or “strongly agree” with statement that “I feel I can easily try out using the LM CPR with my MLBP patients”  
 \* this number is the % of participants that answered “strongly agree”  
 ^ this number is the % of participants that answered “strongly disagree”  
 @ original data adjusted (see items O in Appendix P for detail description of change)  
 \$ validity concern with reported data (see items P, Q, R, and S in Appendix P for detail description of concern)

**Table 20.** This table presents the perceptions of using LM CPR from a case study participant level, showing each individual's Likert scale rating for each perception construct. Note that the perception constructs used are the same as in table 19.

The one clear pattern that emerged in this data is the prevalence of increased favorable perceptions for LM CPR over time on most of the constructs. This pattern can be easily seen by looking at the mean Likert rating changes for each perception construct from baseline to twelve weeks at the bottom of the table (e.g. A0 = 4.6 and A12 = 4.8). However, these favorable changes are even more clearly seen when looking at an individual's ratings over time. For example, Mary reflected her increased favorable perception of LM CPR with her change in level of agreement to the "intention to use the LM CPR" statement (column A), changing from 4 (agree) immediately after the course (as seen in column A0) to 5 (strongly agree) at 12 weeks post-course (as seen in column A12). She also demonstrated an increased favorable perception of LM CPR when she dropped her level of disagreement to the statement "I feel the LM CPR is complex and difficult to use" (column F) by twelve weeks post-course. At baseline (F0) she disagreed with this statement, but by twelve weeks post-course (F12) she now strongly disagreed with this statement; suggesting that she now perceived that LM CPR was less difficult to use than it was immediately after the course. I believe this is a reflection of a more favorable perception of LM CPR.

Each change in rating was analyzed and fully described in the individual cases. However, note that four ratings raised validity concerns based on statements made in

follow-up phone interviews that were not consistent with their questionnaire ratings.

These interview statements are available in Appendix P for review.

Table 20

*Perceptions of LMCPR*

Case study name	Level of agreement to the LMCPR related statements at immediate (0) post-course vs. twelve weeks (12) post-course													
	A0	A12	B0	B12	C0	C12	D0	D12	E0	E12	F0	F12	G0	G12
Susan	4	4	3	4	4	4	4	4	4	4	1	2	4	4
Mary	4	5	3	5	4	4	4	4	4	4	2	1	4	5
John	5	5	5	5	5	5*	4	5	5	4@	2	1	5	5
Todd	4	4	4	5	4	4	4	4	4	4	2	2	4	4
Trisha	5	5	4	5	2	1	4	5	5	5	1	1	4	5
Tim	5	5	4	5	4	4	5	5	5	5	1	1	5	5
George	5	5	4	5	4	5	5	5	5	5	1	1	5	5
Jeff	5	5	4	5	5	5	5	4@	5	5	1	2@	5	4@
Leslie	5	5	5	4	5	5	5	5	5	5	2	2	4	4
Keith	4	5	4	5	4	5	4	5	5	5	1	1	5	5
Mean	4.6	4.8	4	4.8	4.1	4.2	4.4	4.6	4.7	4.6	1.4	1.4	4.5	4.6

1=strongly disagree 2=disagree 3=unsure 4=agree 5=strongly disagree

A: "I intend to use the LMCPR in my practice"

B: "I am confident in my ability to use the LMCPR"

C: "I have opportunities to use the LMCPR on my patients"

D: "I feel using the LMCPR provides advantages over my current clinical decision making"

E: "I feel using the LMCPR is compatible with my current clinical decision making methods and beliefs"

F: "I feel the LMCPR is complex and difficult to use"

G: "I feel I can easily try out using the LMCPR with my MLBP patients"

\* original data adjusted (see items O in Appendix P for detail description of change)

@ validity concern with reported data (see items P, Q, R, and S in Appendix P for detail description of concern)

**Table 21.** This table presents the perceptions of using LM, as assessed by level of agreement to certain statements, from an aggregate level for all study participants and the subgroup of case study participants. Note that only the case study participants were followed for the entire twelve week period, so no data (ND) is available for the “all study participants” grouping for the twelve week post-course table cells.

The nine constructs that are represented in this table are intention (column A), confidence (column B), opportunities (column C), advantage (column D), compatibility (column E), complexity (column F), trialability (column G), risk of injuring patient (column H), and risk of being sued (column I). The full questionnaire statements related to these constructs are listed as a series of notes at the bottom of this table. Note that for this table, responses that reflect favorable perceptions of LM would be agree or strongly agree for columns A, B, C, D, E, G, and H. Whereas a response that reflects a favorable perception of LM for column F and I would be disagree or strongly disagree.

Just like many of the other tables, each column header has a letter and a number. The number refers to either an immediate post-course baseline measurement (0), or a twelve week post-course measurement (12). So, A0 for the row under all study participants is 96. This means that 96% of all study participants agreed or strongly agreed to the statement that “I intend to use LM in my practice” immediately after the course. This is a favorable perception of LM that can facilitate adoption.

For the case study participants (2nd row) two numbers are provided. The bigger number in each cell is the combined level of agreement (e.g. A0 states 100% of case study participants agree or strongly agree to the statement on “I intend to use LM in my

practice”). The second, smaller number, in each cell (as designated by a \*) is the percent of case study participants that strongly agreed (or if ^ is shown, as in column F and I, the percent reflects those that strongly disagreed). This was included because if the larger number does not show a change at baseline and twelve weeks (e.g. F0 to F12, which shows 100% and 100%), then the smaller number (i.e. % of those that feel strongly) may still reflect a change (e.g. F0 to F12, which showed a change from 40% to 50%). In this example, the case study participants as an aggregate did have a more favorable perception change of the complexity and difficulty using LM at 12 weeks compared to baseline, as reflected by the increase in the percentage of case study participants that strongly disagreed to the statement by twelve weeks post-course.

Looking at the data in the table the immediate post-course measurements for the study participants and the case study participants were similar for each construct (e.g. A0, B0, C0, D0, E0, F0, G0, H0, and I0). This reflects the overall favorable perception of using LM by the participants immediately after the course for all table constructs.

When looking at changes in case study participant’s perception of LM over time, mixed results are reflected. The biggest change is a decline in the level of agreement to the statement on having opportunities to use LM in practice (column C0 compared to C12). At baseline 90% of the case study participants either agreed or strongly agreed to the statement that they have opportunities to use LM. However, by twelve weeks post-course, only 50% agreed or strongly agreed to this same statement. This reflects the perception that it can be challenging to find opportunities to use LM for some therapists

based on their typical patient case load (this is described in more detail in the individual cases and chapter 6 research questions discussions).

Some of the other changes reflected in this table that are easy to see are the increase in favorable ratings related to the constructs of confidence (A0 to A12), the risk of injuring a patient (H0 to H12), and the risk of being sued (I0 to I12). In particular note the large shift in the percent of case study participants who changed their level of agreement to the statement on confidence in using LM from agree to strongly agree (B0 20% to B12 60%). This change is consistent with increased use of LM over the twelve week study period, and as discussed in chapter 6, confidence is a facilitating factor to adoption of LM. So, this data is consistent with the high adoption level of LM among case study participants.

Finally, the case study participants' perceptions of three of the constructs (intention (column A), advantage (column D), and compatible (column E)) appear to have become less favorable over the twelve week period. However, in each of these cases, note the increase in the percentage of participants that more strongly agreed to the construct statement (e.g. A0 =60% strongly agree, A12=70% strongly agree). This suggests while some participants may have become less sure about their initial favorable rating of the construct, others become more certain. In other words, participants came out of the class with an initial perception, but this perception was tested during the trial period, and resulted in some of them becoming more convinced of the advantages and compatibility of LM, and of their intention to adopt LM. Rogers (2003) suggests that this occurrence takes place in the persuasion stage of the innovation-decision process.

Table 21

*Perceptions Related to LM*

Stub-head	Level of agreement to LM related statements at immediate (0) post-course vs. twelve weeks (12) post-course																	
	A 0	A 12	B 0	B 12	C 0	C 12	D 0	D 12	E 0	E 12	F 0	F 12	G 0	G 12	H 0	H 12	I 0	I 12
All study group members (n=22) ND = no data	96	ND	73	ND	96	ND	96	ND	96	ND	96	ND	91	ND	91	ND	82	ND
Only case study group members (n=10)	100 60*	90 70*	80 20*	90 60*	90 50*	50 30*	100 40*	80 60*	100 50* @	90 60*	100 40^	100 50^	90 50*	80 50*	90 50*	100 60*	70 20^	80 30^ @

A: % of participants that “agree” or “strongly agree” with statement that “I intend to use LM in my practice”

B: % of participants that “agree” or “strongly agree” with statement that “I am confident in my ability to use the LMs”

C: % of participants that “agree” or “strongly agree” with statement that “I have opportunities to use the LMs on my patients”

D: % of participants that “agree” or “strongly agree” with statement that “I feel using LMs provide advantages over my current treatment methods and beliefs”

E: % of participants that “agree” or “strongly agree” with statement that “I feel using LMs are compatible with my current treatment methods and beliefs”

F: % of participants that “disagree” or “strongly disagree” with statement that “I feel LMs are complex and difficult to use”

G: % of participants that “agree” or “strongly agree” with statement that “I feel I can easily try out using LMs on my MLBP patients”

H: % of participants that “agree” or “strongly agree” with statement that “The risk of me injuring a patient while using a LM is low”

I: % of participants that “disagree” or “strongly disagree” with statement that “The risk of me being sued for using LM is higher than other treatments I typically use”

\* the smaller number is the % of participants that answered “strongly agree”

^ this number is the % of participants that answered “strongly disagree”

@ validity concern with reported data (see items U and W in Appendix P for detail description of concern)

**Table 22.** This table presents the perceptions of using LM from a case study participant level, showing each individual's Likert scale rating for each perception construct. Note that the perception constructs used are the same as in table 21.

As discussed in the table 21 introductory paragraph, the mean case study participant ratings of the level of agreement to the LM construct statements are mixed, some went up, some went down, and some stayed about the same. The most notable change was the increase in perception of confidence in using LM (B0 to B12), and the decrease in perceived opportunities to use LM (C0 to C12). For the latter change, nearly all of the participants immediately after the course thought they would have opportunities to use LM on their patients (see column C0), but once they started trying out the LM CPR, some felt that they were not able to qualify very many patients for LM. This led them to lower their level of agreement to the statement that they have opportunities to use LM on patients.

Susan is one example, where she started out with the perception that she would have opportunities to use LM in her practice, as reflected by her initial agreement to that statement (see column C0). However, by 12 weeks she was now unsure about having opportunities to use LM (see column C12), still had not performed LM on any patient, and was ultimately the only case study participant classified as not having adopted LM (see table 5). In Susan's case, during the twelve week study period she did not feel she had found any patients who qualified for LM. Her "unsure" level of agreement was due to her recently changing jobs so she was still figuring out if her new work setting would provide her opportunities to qualify any patient for LM, and if the social norms at her

new work would support this treatment. It is important to note that the perception of opportunities to use LM on patients are perceptions, and may or may not accurately reflect the reality of how many of her patients would be appropriate for LM. This is discussed in chapter 6, but part of this perception is based on personal biases, or screening criteria, and not strict objective use of the LM CPR to identify appropriate patients for LM use.

Despite the mix of changes in the case study participants' perceptions of LM over time, most individuals' perceptions on most of the constructs in this table remained favorable over the twelve week period. For example, even though John's level of agreement changed from strongly agree to disagree that he would have opportunities to use LM on his patients (i.e. an unfavorable change in perception), he had a favorable perception on the other 8 of the 9 constructs (including a favorable change in the perceived risk of being sued changing from agree to disagree).

Clearly the adoption of LM is not solely dependent on the perception constructs as contained in this table, but they still explained and/or reflected some adoption behaviors. For example, Susan was the only case study participant to lower her intention to use LM in her practice at 12 weeks (see column A12). She was also the only case study participant to not adopt LM into her practice. It seems logical that a therapist who is unsure about their intention to use LM is less likely to do so compared to a therapist who agrees that they intend to use LM. Each of these rating changes is analyzed and fully described in the individual cases.

Table 22

*Perception of LM*

Case study name	Level of agreement to LM related statements at immediate (0) post-course vs. twelve weeks (12) post-course																	
	A 0	A 12	B 0	B 12	C 0	C 12	D 0	D 12	E 0	E 12	F 0	F 12	G 0	G 12	H 0	H 12	I 0	I 12
Susan	4	3	3	2	4	3	4	3	4	2	2	2	2	3	3	4	4	4
Mary	4	4	3	4	4	4	4	3	4	4	2	2	4	4	4	4	2	2
John	5	5	5	5	5	2	4	5	4	5	2	1	5	5	5	5	4	2
Todd	4	4	4	4	4	3	4	4	4	4	2	2	4	4	5	4	1	2
Trisha	5	5	4	5	1	1	5	5	4	5	1	1	4	5	4	5	2	1
Tim	4	5	4	5	4	2	4	4	5 <sup>^</sup>	4	2	2	4	2	5	5	4	2
George	5	5	4	5	5	4	5	5	5	5	1	1	5	5	4	5	2	1
Jeff	5	5	4	5	5	5	4	5	5	5	1	1	5	5	5	5	2	2
Leslie	5	5	4	4	5	5	5	5	5	5	2	2	5	4	4	4	2	4 <sup>^</sup>
Keith	5	5	5	5	5	5	5	5	5	5	1	1	5	5	5	5	1	1
Mean	4.6	4.6	4	4.4	4.2	3.4	4.4	4.4	4.5	4.4	1.6	1.5	4.3	4.2	4.4	4.6	2.4	2.1

1=strongly disagree 2=disagree 3=unsure 4=agree 5=strongly disagree

A: "I intend to use LM in my practice"

B: "I am confident in my ability to use LMs"

C: "I have opportunities to use the LMs on my patients"

D: "I feel using LMs provide advantages over my current treatment methods"

E: "I feel using LMs are compatible with my current treatment methods and beliefs"

F: "I feel LMs are complex and difficult to use"

G: "I feel I can easily try out using LMs on my MLBP patients"

H: "The risk of me injuring a patient while using a LM is low"

I: "The risk of me being sued for using LM is higher than other treatments I typically use"

<sup>^</sup> validity concern with reported data (see items U and W in Appendix P for detail description of concern)

**Training program.** These next two tables (23 and 24) present data that indicates which components of the training program were used by the case study participants (table 23), and then which components of the training program were perceived as helpful in the adoption process (table 24). The components of the training program are categorized as

pre-course (i.e. performed before the 8 hour day long face-to-face course), course, and post-course (i.e. immediately after the course up to the 12 weeks after the course). These categorizations and components were all described in the last part of chapter 2.

In addition, table 23 and 24 are similar in structure to the prior tables with the lettered column headings referring to the key below the table. These should be used like a key to a map. For example, in Table 23, column B refers to the pre-course activity of reading the APTA white paper.

**Table 23.** This table describes the case study participant's use of the various training program components. Each number provided under the column heading reflects the percentage of case study participants that completed or used that component of the training program.

The pre-course activities included reviewing the online support website (column A), reading the APTA white paper on manipulation (column B), reviewing the blog and discussion board (column C), and making a pre-course introductory blog post (column D). The data shows that most of these activities were performed by most of the case study participants. However, column D shows that none (0%) of the 10 case study participants posted a response to the introductory blog posting as directed in the course introduction email. This behavior is consistent with the very low postings (4 total, see Appendix Q and S) by all course attendees in the blog and discussion board throughout the dissertation study period (September 2012 – March 2013).

The course activities included several hands-on labs (column E), course lectures and case activities (column F), and participating in a training transfer lecture and group

discussion/interaction (column G) at the end of the course day. Note that since all of the case study participants were in attendance for the full course session, all participants (100%) used these components of the training program.

Finally, the post-course activities included serial questionnaires/interviews (column H), using the CPR algorithm (column I), using measurement tools (column J), using the evaluation form (column K), receiving at least one of the weekly blog emails (column L), reading the blog at least once (column M), reading the discussion board at least once (column N), posting to the blog at least once (column O), posting to the discussion board at least once (column P), and using the metric tracker at least once (column Q). Note that no case study participant used the discussion board or metric tracker as reflected in columns P and Q. Also, notice the low use of reading the discussion board (30%), and posting to the blog during the post-course period (20%). Finally, there were only 20% (column K) that used the evaluation form provided. This type of job aide was designed to allow for quick integration of LMCPR into one's formal patient evaluation process.

Note that much of this information is also presented in a narrative form in answering the research questions pertaining to the training program in chapter 6.

Table 23

*PraTTv5 Based Training Program Components Used*

Stub head	“Training program” features/components used (% of case study participants that used)																		
	Grouping	A	B	C	D	E	F	G	H	I	I	J	K	L	M	N	O	P	Q
Only case study participants (n=10)	70	80	60	0	100	100	100	100	100	100	100	80	20	100	100	30	20	0	0

Pre-Course:

- A. Completed pre-course assignment: reviewed online support website
- B. Completed pre-course assignment: read APTA white paper
- C. Completed pre-course assignment: reviewed blog/discussion board
- D. Completed pre-course assignment: made pre-course blog posting

Course:

- E. Completed hands-on lab (3 hours)
- F. Completed course lecture and case activities (5 hours)
- G. Participated in training transfer lecture and group discussion/interaction

Post-Course:

- H. Completed serial questionnaires/interviews (baseline, six weeks, and twelve weeks post-course)
- I. Used post-training job aides (CPR algorithm)
- J. Used post-training job aides (measurement tools (MODI and/or FABQ))
- K. Used post-training job aides (evaluation/criteria form)
- L. Received weekly blog email (at least one)
- M. Read blog (at least once)
- N. Read discussion board (at least once)
- O. Posted to blog (at least once)
- P. Posted to discussion board (at least once)
- Q. Used metric tracker (at least once)

**Table 24.** This table presents the percentage of case study participants that felt particular training program components were helpful in their adoption process of

LMCPR and LM. Each number provided under the column heading reflects the percentage of case study participants that reported, either in their questionnaire responses or interviews, that a particular training program component was helpful in their adoption process.

The pre-course components included reviewing the online support website, blog, and/or discussion board (column A). Only 10% of the case study participant indicated that reviewing these sites was helpful in their adoption process. It is important to note that not all the case study participant performed this pre-course activity, as reflected in table 23, columns A and C.

The other pre-course component was reading the APTA white paper on manipulation. Column B shows that this was seen as helpful by 60% of the case study participants. Note that table 23 indicates that 80% of the case study participants had performed this activity (column B). So, of the 8 that read the paper as a pre-course assignment, 6 felt it was helpful in their adoption process.

All of the course activities (columns C-G) were seen as helpful by at least some of the case study participants. In particular, 90% of these participants reported that the hands-on lab play an important role (i.e. was seen as helpful) in their adoption of LMCPR and LM. Once again, a detailed narrative of how these components actually helped is presented in chapter 6 of this paper in the research question section.

Finally, of the post-course components (columns H-P) the discussion board and metric tracker were not seen as helpful, but again nor were they used (see table 23). For some participants they were not used since they were perceived as not helpful, but for

others they were not used for other reasons (e.g. a lack of time), and they were not sure if either component could play a role in helping adoption at some point in the future or for some other adoption situation (e.g. another course topic). Three post-course components that were used by all participants (see table 23 columns H, I, and M), and were seen as helpful to adoption by 90% of the participants were completing the questionnaires/interviews (i.e. follow-up component), using the CPR algorithm as a job aide, and reading the weekly blog.

While the lack of posts (see table 23) and interaction among course attendees in the online environment (i.e. eCoP: blog and discussion board) reflects the reality that an eCoP was not achieved in this online environment, table 24 still indicates that there was some perceived value to the adoption process of this online post-training support system. For example, despite the very low postings of the blog by participants, they still perceived that receiving the blog email (column M = 80%), and reading the weekly blog (column N = 90%) was helpful in the adoption process. Once again, a detailed narrative on this topic is provided in chapter 6.

Table 24

*PraTTv5 Based Training Program Helpful Components*

Stub head	“Training program” features/components perceived as helpful in the adoption process (% of case study participants)															
	Grouping	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Only case study participants (n=10)	10	60	90	70	60	70	80	90	90	20	20	50	80	90	0	0

Pre-Course:

- A. Reviewing online support website/blog/discussion board
- B. Reading APTA white paper on manipulation

Course:

- C. Hands-on lab
- D. Course lecture
- E. Case activities
- F. Reviewing job aides/reference material in class
- G. Training transfer lecture and group discussion/interaction

Post-Course:

- H. “Following up”: Questionnaires/interviews/participating in study
- I. Job aides (CPR algorithm)
- J. Job aides (outcome measurement tools (MODI and/or FABQ))
- K. Job aides (evaluation/criteria form)
- L. Access to online resources
- M. Weekly blog email
- N. Weekly blog
- O. Discussion board
- P. Metric tracker

**Disagreement rate.** This last section provides a table that demonstrates the degree of intra-participant disagreement between their own questionnaire and interview

responses. Note that this includes only 15 participants (including all 10 of the case study participants) since these were the only ones interviewed and thus provided me an opportunity to detect a discrepancy in questionnaire data.

*Table 25.* As indicated in other tables (e.g. 20-22), at times the participant's interview comments seemed to disagree with their questionnaire responses on the same topic. When this happened, I followed up and clarified this discrepancy as either a factual discrepancy or a conceptual discrepancy. These interview clarification discussions are presented in Appendix P, and discussed in the validity threats section of chapter 6.

In this table, the disagreement rate is calculated at six weeks, twelve weeks, and then combined. The numerator in each calculation is the number of disagreements between the participant's questionnaire and interview data on the same topic. The denominator is the total number of interview discussion topics that allowed for a comparison between the questionnaire and interview data on the same topic. Also note that only the 10 case study participants were interviewed at the 12 week point. Disagreement rates for the other 5 study participants that were interviewed at 6 weeks, but not 12 weeks, are reported below, but only for six weeks disagreements. Mean disagreement rates were only calculated for the 10 case study participants.

As this table shows the mean intra-case study participant questionnaire/interview disagreement rates were generally higher at six weeks (24.8%) compared to twelve weeks (10%) (see table foot notes). This likely reflects the participant learning that occurred during the six week interviews in terms of clarifying questionnaires items, and facilitating

deeper reflection on topics through the interview probing process and making them aware of apparent discrepancies in their responses. By their twelve week questionnaires and interviews all, but three (Susan, Trisha, and Leslie), of the case study participants had lowered their disagreement rates.

Table 25

*Disagreement Rate Questionnaire vs. Interview on Same Question*

Name	6 weeks % disagreement	12 weeks % disagreement	Overall % disagreement
Susan*	1 out of 19 = 5.3%	1 out of 16 = 6.3%	2 out of 35 = 5.7%
Mary*	2 out of 15 = 13.3%	0 out of 17 = 0%	2 out of 32 = 6.3%
John*	2 out of 9 = 22.2%	1 out of 8 = 12.5%	3 out of 17 = 17.6%
Todd*	3 out of 11 = 27.3%	1 out of 11 = 9%	4 out of 22 = 18.1%
Trisha*	1 out of 9 = 11.1%	2 out of 7 = 28.6%	3 out of 16 = 18.8%
Tim*	3 out of 17 = 17.6%	1 out of 9 = 11.1%	4 out of 26 = 15.4%
George*	4 out of 10 = 40%	0 out of 5 = 0%	4 out of 15 = 26.7%
Jeff*	9 out of 18 = 50%	1 out of 9 = 11.1%	10 out of 27 = 37%
Leslie*	3 out of 9 = 33.3%	4 out of 12 = 33.3%	7 out of 21 = 33.3%
Lilly	2 out of 8 = 25%	Did not complete	NA
Rebecca	0 out of 10 = 0%	Did not complete	NA
Kelly	3 out of 17 = 17.6%	Did not complete	NA
Jen	9 out of 13 = 69%	Did not complete	NA
Clay	0 out of 5 = 0%	Did not complete	NA
Keith*	6 out of 20 = 30%	0 out of 14 = 0%	6 out of 34 = 17.6%

\*Mean 6 weeks: 24.8% for 10 case study participants

\*Mean 12 weeks: 10% for 10 case study participants

\*Mean (6 week and 12 week combined): 18.4% for 10 case participants

## **Chapter Five: Case Studies**

This chapter summarizes the qualitative findings on the adoption process of physical therapists following a multi-component training program on LMCPR and LM. This data is first put into context in ten individual cases. Then cross case analysis is presented in the form of matrix tables. Finally, an outline of my interview codes and themes (organized within the framework of Baldwin and Ford's (1988) training transfer inputs described in chapter 2 of this work) is available in Appendix R.

### **Cases Overview**

In this section I present the 10 case study participants who completed the entire 12 week study period out of the 22 initial study participants across 8 duplicate training courses (see table 4). These participants were selected based on completing the entire 12 week study. Tables 2, 6, 8, 10, 13, 14, 16, 17, 19, and 21 demonstrate how the case study participants compare to all the study participants (i.e. those that started the study, but did not complete the entire 12 week study protocol), and in some cases, when data is available, how they compare to the non-study participants.

Each case study participant is categorized based on their pre-study lumbopelvic manipulation clinical prediction rule (i.e. rule) and lumbopelvic manipulation (i.e. manipulation) behavior and their post-study rule and manipulation behavior (see table 5's introduction paragraph for the operational definition and description of the acronyms

used in categorizing these cases: NR, PR, FR, NM, PM, FM). Any reference to a change over time for a case study participant is referring to comparing their baseline measures (i.e. immediately after the course, or “0”) to their twelve weeks post-course (“12”) measures, unless otherwise specified. Also, any reference to “routine” in any of these cases is operationally defined as at least 75% of the time.

Finally, it is important to point out that in these cases I did not present the information about the impact of the training program components on their adoption process. This information and analysis is presented in tables 23 and 24, with more detailed discussed in the answers to the research questions in chapter 6.

### **Case #1 Susan**

**Summary.** Before the course Susan did not use the rule or manipulation (NR and NM). By 12 weeks post-course Susan had partially adopted the rule (PR) and still had not adopted manipulation (NM) into her practice.

### **Pre-Course**

Susan, a staff physical therapist, had been working full time at a hospital-based outpatient physical therapy clinic located in a large sized (greater than 500,000 people) Mid Atlantic U.S. city just prior to attending the 22 September 2012 study training course (see table 3 and 4 for more demographics). Susan did not have an orthopedic specialty certification, nor any residency or fellowship training, but she did see low back pain patients on a weekly basis (see table 3). She described her typical low back pain patient

as older with chronic low back symptoms, and no acute low back pain patients (see table 3).

Susan indicated that while she was in Physical Therapy school she was trained on the rule and manipulation (see table 3), which included 4 hours of lab time. However, after school she did not adopt the rule and manipulation, and prior to the 22 September 2012 course she reported she did not “currently” use either of these innovations in her practice (see table 5), nor did any of her current co-workers. She noted that her clinic did not “share” patients between various physical therapists.

During a phone interview conducted six weeks after the course, Susan indicated that she felt she did not adopt the rule and manipulation into her practice after physical therapy school since during her only orthopedic clinical affiliation while in school none of her co-workers or clinical instructors used these techniques. She stated,

“... I really only had one outpatient clinical and they were, they only did McKenzie, so they were so far out of the box...and when you do the actual internships [clinical] the hands-on training with patients, I think that is where you really develop your evaluation skills, theory, and diagnostic skills, so I think for me that’s probably why I did not carry it over so much from school.”

This lack of using the rule and manipulation by clinical instructors has been shown to be correlated to low use of the rule and manipulation by physical therapy students (Sharma & Sabus, 2012; Struessel et al., 2012).

Although Susan reported on the baseline questionnaire that she did not use the rule as a decision tool prior to the course, she did report pre-course practice patterns of

routinely measuring three of the five rule criteria (see table 15, column D0, E0, and F0). When asked why her pre-course baseline hip internal rotation was so high (compared to other case study participants), she indicated that she had previously partially adopted this hip measurement after taking an online course and currently used it to clear the hip joint.

Even though Susan reported routinely measuring 3 of the 5 rule criteria before the course, she indicated that she never used them together (as a cluster, or treatment based classification system) to match the appropriate patient to manipulation treatment (see table 15, column G0). Rather she gathered this information along with many other data pieces during the evaluation to determine a more traditional medical model pathoanatomical diagnosis.

### **Course**

One week prior to the course, Susan visited the course website, and reviewed the online material; including reading the American Physical Therapy Association white paper on manipulation as a pre-reading assignment for the course. She also became familiar with the blog and discussion board, but did not make any pre-course postings in either forum.

During the 22 September 2012 course Susan, who attended this course without co-workers (see table 3), was highly engaged and seemed interested in the course material (lectures and cases) and labs. At the end of the lab portion of the course she demonstrated competence in using the rule and manipulation (see table 11).

### **Post-course**

Overall Susan had a good course experience. She demonstrated pre-course knowledge gains as reflected by her 12% increase in immediate and twelve week post-course test scores (see table 9), and rated the training program favorably both immediately after the course and at twelve weeks post-course (see table 7).

Susan's intention to adopt the rule and manipulation over the twelve week study is shown in table 20 and 22, column A. While it seemed her intention to adopt the rule remained steady and high throughout the post-course study period, her intention to adopt manipulation declined by the twelfth week after the course. It seems relevant to point out that she was the only case study participant to have a drop (from agree to unsure) in intention (on either the rule or manipulation) over the entire twelve week study, and she was also the only case study participant to not adopt manipulation. She seemed to predict this outcome on her baseline post-course questionnaire by writing, "I do not know how often I will use the manipulation due to the lack of confidence and my current patient population".

Susan's confidence in using the rule and manipulation is reflected in table 20 and 22, column B. Note that her confidence in using the rule increased over time (from unsure to agree), whereas her confidence in using manipulation decreased over time (from unsure to disagree). Just like her decline in intent to adopt manipulation at twelve weeks, Susan was the only study participant to have a decrease in confidence in using manipulation over time. Once again, she eventually partially adopted the rule, but did not adopt manipulation. Susan stated in her six week phone interview that this gain in confidence in using the rule was due to "actually being able to use it [the rule] on patients

or using components of it on patients makes it routine. So, that makes me more confident”.

**Perceptions.** Susan’s perceptions of the rule and manipulation at baseline (immediately after the course) and at twelve weeks post-course are reflected in table 20 and 22, and can be compared to all study participants and all case study participants (see table 19 and 21). Susan’s perception of her opportunities to use the rule remained high and unchanged throughout the 12 week study period.

Susan’s perceptions of the rule were initially favorable and remained mostly unchanged by the end of the twelve week study period. One less favorable change that did occur was her perception of the complexity of the rule from initially strongly disagrees to disagree. She stated this was related to, “...being 12 weeks out it is not as fresh in my mind, and since the last few weeks I haven’t really been using it as much just because I haven’t seen as many low back pain patients.” At the end of the study period, Susan’s overall perception of the rule was, “I think it is definitely beneficial including those [rule criteria measurements] in my evaluation whether or not I am considering following the manipulation category. It makes everything very thorough.”

Initially, Susan’s perceptions of manipulation were generally favorable, with the exception of her agreement to the statement on using manipulation put her at higher risk for being sued (see table 22, column I). However, unlike her perceptions of the rule, Susan’s perceptions of manipulation generally became less favorable by the end of the twelve week study period. Susan’s perception of the opportunities to use manipulation changed from agree to unsure. She explained in her twelve week interview that this was

due to being in a relatively new job setting (i.e. at 8 weeks after the course she started working at a new job in a different outpatient orthopedic clinic) and still being uncertain of the type of patients she would be typically seeing. Overall she felt having access to younger patients with more acute symptoms would make using manipulation more feasible, but she was not sure if she would have more of these types of patients at her new job site.

In addition, her perception of opportunities to use manipulation was not just linked to the type of patients she evaluated, but also whether or not using manipulation would be accepted by her co-workers and referring physicians. Susan stated,

“I think I would like to have a discussion with my new colleagues and see if it [manipulation] is something that anyone else does, or is it something that if I tried it would go against what the physicians want?...”

This suggests that perceived opportunities to use manipulation are also influenced by the social norms of a work setting. In other words, if the physicians or her co-workers do not support the use of manipulation by physical therapists, then this would limit her perceived opportunities to use manipulation. At this point, just the uncertainty seemed to be a barrier to her adoption of manipulation.

By twelve weeks post-course she also had a decline in her level of agreement (from agree to unsure) to the statement about the relative advantage of manipulation. Considering she still had not been able to perform manipulation on a patient, it is not surprising that she was unsure if this treatment would be better than what she currently used...she simply had not tried it out yet.

**Behaviors.** Susan’s self-reported change in the rule and manipulation behaviors is shown in table 15 and 18, and can be compared to all study participants and all case study participants (see table 14 and 17). Over the twelve weeks of the study she generally increased adoption of the rule criteria, and by the end of the study period routinely measured 4 of the 5 rule criteria (see table 15, columns C12, D12, E12, and F12). One rule behavior that changed was a 5% increase in the use of lumbar segmental assessment for hypomobility at the initial evaluation. Susan stated this small, but real change, was related to having younger patients at her new work site. She felt it was safer performing this test maneuver on these younger patients, whereas at her prior work setting she may have held off on testing for lumbar spinal mobility in some of her older patients.

She further described why she did not do this measurement at all times by suggesting that,

“Sometimes I will leave out the joint play assessment, because just based on range of motion you can kind of tell if they are limited or what not, and that is something that can be looked at the follow-up treatment, so yeah sometimes I leave that one out.”

This demonstrates how therapists weave biases into their decisions, whether or not these biases are true or just personal beliefs. For example, there is no research that supports her belief that limits on general range of motion correlate to lumbar segmental hypomobility, and thus may be substituted as a measurement for lumbar segmental assessment.

The biggest change was in her full adoption of MODI (see table 15, column A12). At baseline Susan only measured MODI 5% of the time, and at six weeks 20% of the

time. Once again, MODI was not required at her old job site, and she had not integrated this form into the patient check-in process, but was instead trying it out on certain patients when time allowed and if she remembered. By twelve weeks post course she was measuring MODI 100% of the time. Susan indicated that this was due to MODI being used as a standard form during the patient check-in process at her new job. It was expected that all physical therapists would collect this data. This rapid (in less than 4 weeks) full adoption of MODI suggests the importance of clinic wide mandatory standardized practices in leading to new behaviors.

One rule behavior that Susan still had not adopted was the FABQ (see table 15, column B12). She indicated collecting data using two check-in forms (i.e. MODI and FABQ) was “a little bit much” for her patients to complete while checking-in, in addition to the medical screening forms they already complete. Initially, she did indicate that she had not yet integrated either form into the formal check-in process (as mentioned above later the MODI was part of this formal check-in process at her new job site, but not the FABQ), and did not even have the FABQ forms available for use (despite them being handed out in the course, and made available on the post-training support website for easy free download).

Another barrier to adopting this measurement tool was that she was uncertain if her new co-workers and new employer would want her using that form. In other words, no one else at her new work setting was using it, so being a new employee she was uncertain how it would be looked on to request using a new form. Also, she admitted that she did not see value in using the FABQ. She stated, “in the subjective you can kind

of get an idea of how much they are limiting themselves.” So, she rationalized if the rule FABQ criterion is used to identify those that are not fearful of movement, then you can identify these patients just by talking to them and getting a sense of their fear avoidance behavior, thus eliminating the need for the FABQ.

Susan reported she had increased her frequency of determining the number of positive rule criteria present in her LBP patients at initial evaluation from 0% to 30%. She stated the reason why this was not higher was due to, “time constraints, that’s probably what I would say the biggest thing is...not having time to complete all the exam findings...just trying to get the basics like range of motion.” This less than routine use of rule demonstrates partial adoption of the rule as a decision tool.

In Susan’s process of adoption of the rule and manipulation, she paints the picture of a trial period, where she worked in isolation (i.e. no apparent direct influence or support to adopt or not adopt by co-workers, supervisors, and fellow course attendees) as she used the rule and manipulation (only practicing on a co-worker three times in twelve weeks) to see if it would work for her patients. She stated she did not feel accountable to anyone to change her practice after the course. While Susan made it clear she had not used manipulation on patients, she did provide additional insights into factors related to her lack of use of manipulation. For one thing, she mentioned “I have not performed any lumbopelvic manipulations, which is largely due to non-appropriate patients classified by the CPR [rule]”. She felt she did not have the correct patients (e.g. acute) to perform manipulation on.

She also indicated that having co-workers that use manipulation would have “definitely” improved her adoption of manipulation, since “you could get their feedback on your technique and you could have a patient right after, use the technique, and have good carryover.” Additionally, she suggested not having co-workers that use manipulation served as a barrier for her to adopt this new treatment given her low confidence in using manipulation, since doing something different than the norm could be questioned. Note that her low confidence in using manipulation is an important moderating variable of this barrier, and if she were confident in her ability to use manipulation, her co-workers lack of use of manipulation would likely be less of a barrier.

By the end of the study period Susan had not found a single LBP patient that she felt qualified for manipulation, and thus had not used manipulation in her practice. She suggested another major factor in her lack of use of manipulation was her not being sure about co-workers and referring physician’s impressions about manipulation. She explained her concern as:

“now I am coming in new, and they don’t know what my training is, and that I have done this course. I don’t want to raise any flags at this point, I just want to kind of observe what everyone else does, and then present that information at a later point.”

One final, more insidious, barrier to using manipulation is her application of screening criteria in addition to the official rule criteria. This is the application of biases during her patient evaluation process that leads her to a quick conclusion that regardless

of the rule criteria, she will not try out manipulation on that patient. This is likely a form of heuristic thinking. She explains one such screening criterion as,

“If someone is in that acute stage, I will pick and choose what is appropriate and what will send them out of the room pain wise. I think age, whether or not they have been diagnosed with osteoporosis or they are at that stage, or based on their past medical history, that will play a part as well. Sometimes if they have, especially women who you can see if they are developing that increased thoracic kyphosis, posturally if they look like they are heading towards osteoporosis I will modify my exam, and not put them in prone if I think they can’t even tolerate.”

Such screening criteria lead to fewer opportunities to perform manipulation since patients that may qualify using only the rule criteria (i.e. strict objective use of the rule), may be ruled out prematurely for use of manipulation using biases or screening criteria.

In summary, before this study course, Susan had previous training in the rule and manipulation. However, she did not adopt either into her practice at that time. This time despite having a positive reaction to the training program, knowledge gains, and demonstrated competency in performing the skills, after twelve weeks she only partially adopted the rule, and did not adopt manipulation into her practice behaviors.

### **Case #2 Mary**

**Summary.** Before the course Mary did not use the rule or manipulation (NR and NM). By 12 weeks post-course Mary had fully adopted the rule and manipulation (FR and FM) into her practice.

## **Pre-Course**

Mary, a staff physical therapist, had been working full time at an outpatient physical therapy clinic in a medium sized (between 100,000-500,000) Mid-Western U.S. city just prior to attending the 13 October 2012 study training course. Mary did not have an orthopedic specialty certification, nor any residency or fellowship training, but she did see low back pain patients on a weekly basis. Her low back pain patients were described as typically older with chronic low back symptoms, and very few acute low back pain patients (see table 3).

Mary indicated that while she was in Physical Therapy school she was first introduced to manipulation. However, on her six week interview she stated, “we did not practice it very much, and I can’t think of any clinical instructors that I practiced it with after the fact...” At that time she did not adopt manipulation. Years later she took a training course on manipulation, but again did not adopt this skill into her practice. This time she indicated the barriers to adoption were learning too much material in the course at one time (i.e. feeling overwhelmed), and not having a co-worker that was already using manipulation and who she could practice with. She also indicated that she had never been trained in the rule. So, prior to the 13 October 2012 course Mary reported she did not currently use either of these innovations in her practice. However, she did indicate that one of her two current co-workers (John) did use the rule and manipulation on a routine basis. She also reported that her clinic would “share patients” between various physical therapists.

Although Mary reported on the baseline questionnaire that she did not use the rule as a decision tool prior to the course, she did report pre-course practice patterns of measuring on a routine basis four of the five rule criteria (see table 15, columns C0, D0, E0, and F0). When asked why her pre-course baseline hip internal rotation was so high (100% compared to case study participant's reported baseline mean of 36%), she indicated that she had previously fully adopted this hip measurement after taking a previous training program on postural restoration.

Even though Mary reported frequently measuring 4 of the 5 rule criteria before the course, she indicated that she never used them together (as a cluster, or treatment based classification system) to match the appropriate patient to manipulation treatment (see table 15, column G0).

### **Course**

One week prior to the course, Mary visited the course website, reviewed the online material, including reading the American Physical Therapy Association white paper on manipulation as a pre-reading assignment for the course. She also reported becoming familiar with the blog and discussion board, but did not make any pre-course postings in either forum.

During the 13 October 2012 course Mary, who attended the course with her two direct co-workers (see table 3), was highly engaged, asked questions, and seemed interested in the course material (lectures and cases) and labs. At the end of the lab portion of the course she was rated competent in performing all of the rule and

manipulation skills, except for one (one rater felt she did not pass 1 of the 8 skills), based on an independent skills assessment by both instructors (see table 11).

### **Post-course**

Overall Mary had a good course experience. She demonstrated pre-course knowledge gains as reflected by her 50% increase in immediate and 62% increase in twelve week post-course test scores (see table 9), and rated the training program favorably both immediately after the course and at twelve weeks post-course (see table 7).

Mary's intention to adopt the rule and manipulation remained high over the twelve week study, and is shown in table 20 and 22 (column A). While it seemed her intention to adopt manipulation remained steady throughout the post-course study period, her intention to adopt the rule increased from agree to strongly agree by the twelfth week after the course. During her twelve week interview she indicated this was due to her becoming more comfortable with the rule and seeing the benefit of it by qualifying more people for manipulation.

Mary's confidence in using the rule and manipulation is reflected in Table 20 and 22 (column B) respectively. Her confidence in her ability to use the rule and manipulation initially after the course was unsure, but grew for both over the twelve week study period. She indicated that her gains in confidence were based on practice, and successful outcomes when used on patients.

**Perceptions.** Mary's perceptions of the rule and manipulation are reflected in table 20 and 22. Mary's perception of her opportunities to use the rule remained high and unchanged throughout the 12 week study period.

Mary's perceptions of the rule initially were favorable and remained mostly unchanged by the end of the twelve week study period. However, she did have two favorable changes in perception of the rule over the twelve week period. The first was she more strongly disagreed by twelve weeks post-course to the statement that the rule was complex and difficult to use. She explained this change was due to her ability to memorize the rule just from using it so frequently. The second favorable change in her perception of the rule was in her change from agreeing to strongly agreeing to the statement that she could easily try out the rule on her patients. On her twelve week phone interview when asked why she felt that way, she simply stated "I do it all the time."

Overall Mary's perception of the rule, as stated in her twelve week interview, "...they [rule criteria] are easy to follow, they make sense, and again I was already doing at least half of them to begin with. So it is not like I have had to put any extra effort into the evaluation, I have just had to think about it a little differently, so it has worked for me."

Note that this reference to thinking about things differently is a matter of simply adding up the number of positive criteria at the end of the exam to see if manipulation is indicated (with 3 or more of the criteria present or strongly indicated with 4 or more of the criteria).

Initially, Mary's perceptions of manipulation, including her perceived opportunities to use, were favorable and generally remained unchanged over the twelve week study period. The one area that did change was her perception of the relative advantage of manipulation. She explained this change, from her initial agreement to now being unsure of the statement that using manipulation provides advantages over her current treatment methods, was based on her perspective that manipulation was now (at 12 weeks post-course) just another effective tool in her repertoire. She did not see manipulation as something superior to her existing treatment techniques, but rather as something that could be used effectively in combination. At the end of the 12 weeks study period, Mary's overall impression of manipulation was stated as "...I think that it is definitely within our scope of practice. I think they are safe to do..."

**Behaviors.** Mary's self-reported changes in the rule and manipulation behaviors are shown in table 15 and 18. By twelve weeks post-course Mary was still routinely measuring 4 of the 5 rule criteria. However, over the twelve weeks of the study she did increase her adoption of the rule criteria for measuring the MODI and FABQ from 0% to 50% for both. She indicated that her new partial use of these rule related measurement tools was due to her clinic agreeing to implement these forms into their patient check-in process. However, she stated the administrative staff was still not consistent with providing these forms to the patients at check-in, in which case she was not able to then get these forms done during her evaluation because of limited time.

In addition, Mary did not see much value in doing the FABQ, as stated in her 12 week interview:

“...the ones [criteria] that have qualified the most are no symptoms distal to the knee is a big one, hip internal rotation is a big one, so is hypomobility ... like I said I can usually qualify patients with 3 or 4 of those criteria anyway without the FABQ, so I guess that’s why I have not been more diligent about getting the paperwork part of it done.”

She did note this ability to qualify patients with 4 criteria, without the FABQ, was based on her modifying the criteria of number of days of low back pain to be 1 month rather than 16 days. While only 12-13% of her LBP patients presented with symptoms less than 16 days (see table 3), she was finding that using less than 1 month of symptoms as a modified criteria allowed her to qualify more relatively acute low back pain patients for manipulation, and they still seemed to respond well to this treatment.

As described earlier in this case, despite Mary’s pre-course practice behavior of measuring four of the five criteria routinely in her back exam, she never put them together as a decision rule to determine if manipulation was indicated. However, by twelve weeks post-course she indicated that she was now determining the number of rule criteria present during her LBP evaluations 75% of the time (see table 15, column G). This demonstrated a shift in her clinical decision making, and provided evidence of her full adoption (by operational definition) of the rule into her practice behavior.

Mary’s behavior related to manipulation also changed over the twelve week study period (see table 18, columns A12, B12, and C12). Where before the course she was not using manipulation at all on her low back pain patients, by twelve weeks post-course she was now using manipulation about 5 times per week out of her 15 weekly low back pain

visits. She was also choosing to perform manipulation on a routine basis (i.e. 75% of the time) when it was strongly indicated by 4 or more of the rule criteria, but only 50% of the time when 3 of the criteria were present. This met the previously described operational definition of fully adopting manipulation into her practice (see introduction to table 5).

Mary's describes her process of adoption of manipulation as being initially dependent on her interaction with others and the use of additional screening criteria, other than just the rule criteria, to determine who to perform manipulation on. Mary reported that she felt she was successful after this course in adopting manipulation due to her interaction with others, such as having co-workers attend the course with her, being able to practice with these co-workers frequently in the first few weeks after the course as a clinic wide effort at trying out using the rule and manipulation, and having a physical therapy student who was interested in learning and practicing these newly learned techniques with her. She stated in her six week interview, "...for me it was extremely helpful to have someone [John] right after the course, who was already doing it, who took the course too, and we could practice it a little bit." She indicated that they (co-workers and physical therapy student) would practice during lunch, and if they had a patient cancellation. This and having success with her patients when using manipulation, contributed to her increase in confidence in using manipulation over this study period.

It is important to note that Mary moved to a new clinic within the same company and in the same city approximately three weeks after her course. This move did not seem to have any long-term impact on her adoption of the rule and manipulation. She did indicate that her new location also had two co-workers that had attended this course on

13 October, one of whom was also using the rule and manipulation. So, she continued to have supportive interaction with co-workers despite her job site change.

The second notable element of her adoption process was her use of screening criteria as a means of making trying out manipulation less risky and more successful. In her six week interview she described this process as, "...I definitely, probably, whether it is subconsciously or not, am picking people I think this [manipulation] is probably going to work for them..." She later explained that these screening criteria, based on her own pre-course biases, led her to decide, independently of the rule criteria, whether or not she would want to try out using manipulation on any particular low back pain patient. She described screening out patients that were older, in more pain, or were larger. Note that all of these screening factors were based on her perception that the patient might get hurt with manipulation or that she may not succeed in performing the manipulation correctly and thus may not have the desired effect. She further explained that over time as she was becoming more confident and skilled in her ability to perform manipulation she was noticing a decline in her use of these screening criteria, and was relying more on just the rule criteria to qualify patients for manipulation.

Finally, during Mary's adoption process she stated she felt accountable to adopt the rule and manipulation to her patients. She felt these innovations would be helpful at getting some patients better, and she felt it was her responsibility to learn and use these techniques when indicated. She also indicated that having her supervisor, Todd, attend the course, and support everyone's (John and Mary's) efforts at using the rule and manipulation, was also helpful.

In summary, before this study course, Mary had no prior training in the rule, but did have previous training in manipulation. However, she was not using either innovation in her practice prior to the study training program. This time Mary did fully adopt both the rule and manipulation into her practice by the end of the twelve week study period.

### **Case #3 John**

**Summary.** Before the course John fully used the rule and manipulation (FR and FM) in his practice. By 12 weeks post-course John continued to fully use the rule and manipulation (FR and FM) in his practice.

### **Pre-Course**

John, a staff physical therapist, had been working full time at an outpatient physical therapy clinic in a medium sized (between 100,000-500,000) Mid-Western U.S. city just prior to attending the 13 October 2012 study training course. John did not have an orthopedic specialty certification, nor any residency or fellowship training, but he did see low back pain patients on a weekly basis and had completed advanced training in orthopaedic manual therapy through NAIOMT (which included advanced spinal manipulation training). His pre-course low back pain patients were described as typically older with chronic low back symptoms, and very few acute low back pain patients (see table 3).

John indicated that while he was in Physical Therapy school he was first introduced to the rule (short version) and manipulation. The short version rule he learned

included 3 criteria (pain less than 16 days (acute), hip internal rotation greater than 35 degrees, and no symptoms below the knee), rather than 5 (which adds in the FABQW less than 19, and the patient having at least one hypomobile lumbar spinal segment) for the standard rule. He indicated that during his outpatient clinical affiliation as a physical therapy student his clinical instructor used manipulation heavily, and he was encouraged to practice and use manipulation on patients as well. After physical therapy school he considered the rule and manipulation as part of his standard practice behaviors. He directly attributed this adoption to his clinical affiliation training.

Over the years, he modified one of the short rule criteria based on his experience and lack of acute low back patients. He found that changing the definition of acute pain from less than 16 days of pain to less than 3 months of pain, allowed him to qualify many more patients for manipulation, and he felt they still responded well with this treatment. He had also been taught to not perform manipulation on any patient with symptoms below the knee. In addition, although John used the modified short rule, his pre-course practice patterns still included routinely measuring for lumbar hypomobility. He just did not know to use this information as rule criteria.

So, prior to the 13 October 2012 course John reported he routinely used the rule (a shortened modified version) and manipulation in his practice (see table 15, column G0, and 18, column A0). He indicated that his other two co-workers, pre-course, did not use the rule and manipulation at all (see table 3 and 5). He also reported that his clinic would “share patients” between various physical therapists.

## **Course**

One week prior to the course, John reviewed the American Physical Therapy Association white paper on manipulation as a pre-reading assignment for the course. However, he did not review the post-course training website, blog, or discussion board.

During the 13 October 2012 course John, who attended the course with his two direct co-workers, was highly engaged, helped his co-workers during the labs on manipulation, and seemed interested in the course material (lectures and cases). At the end of the lab portion of the course he was rated competent in performing all of the rule and manipulation skills (see table 11).

## **Post-course**

Overall John had a good course experience. He demonstrated pre-course knowledge gains as reflected by his 12% increase in immediate and twelve week post-course test scores (see table 9), and rated the training program favorably both immediately after the course and at twelve weeks post-course (see table 7).

John's intention to adopt and confidence in using the rule and manipulation remained very high over the twelve week study as shown in table 20 and 22, columns A and B. After the course he indicated that his intent was to adopt the long version of the rule in lieu of his shortened modified version of the rule. He felt having more criteria would result in him qualifying more patients for manipulation.

**Perceptions.** John's perceptions of the rule and manipulation are reflected in table 20 and 22. John's perceptions of the rule, including perceived opportunities to use,

initially were favorable and remained so by the end of the twelve week study period. It is important to note that the original data on John's twelve week rating for opportunities to use the rule was changed from disagree to strongly agree based on his reported error in recording his own questionnaire score (see item O in Appendix P for a more detailed explanation of this change).

John had three changes in perception of the rule over the twelve week period. The first was by the end of the 12 week post-course period he more strongly agreed with the statement that using the [long] rule provided advantages over his current clinical decision making [short rule]. He stated that just through the process of using the long rule he had gained confidence in applying it to patients.

Another favorable change in his perception of the rule was in his stronger disagreement with the statement that the rule was complex and difficult to use. In the six week interview, he explained this change was due to his observation on how quickly others around him learned this rule (i.e. other co-workers and students).

Finally, the third change was actually a conceptual error in the questionnaire data (see item Q in Appendix P). Although the data shows that his level of agreement on the statement of compatibility declined from strongly agree to agree over 12 weeks, on the twelve week interview he clarified that he did not really feel like this changed, and he still strongly agreed with that statement.

Initially, John's perceptions of using manipulation were favorable and generally became even more favorable over the twelve week study period. This was true with one exception. His overall perception of the opportunities to use manipulation declined over

the study period as reflected in his level of agreement to the opportunities statement changing from strongly agree to disagree. In the twelve week interview he stated, "...They are just not fitting the criteria, at least lately." He indicated that over the last six weeks of the study he had been receiving more chronic low back pain patients than normal, which made it more difficult to qualify patients for manipulation using the rule. This resulted in a decline in his perceived opportunities to perform manipulation.

**Behaviors.** John's self-reported changes in the rule and manipulation behaviors are shown in table 15 and 18. Looking at the data it appears his self-reported behaviors in using the rule (e.g. routinely measuring 4 of 5 rule criteria) and manipulation (e.g. still performing manipulation 100% of the time when at least 3 or more of the rule criteria were present) have not changed over the 12 weeks post-course study period. However, the phone interviews revealed some important nuanced changes that did take place.

Immediately after the course John began including his lumbar hypomobility measures as a rule criteria. This was easy to do since he had always measured this, but just did not use it in his short version rule. He also tried out using MODI and FABQ, questionnaires that he had not been using prior to the course. By twelve weeks post-course he was no longer using FABQ and MODI. He reported that his clinic had taken the steps to add these two measurement forms to the formal check-in process, but had not yet received approval from corporate management to make the process change. He indicated that trying to remember to use the forms on his own did not work due to a lack of time and not remembering to use them. He was also concerned about adding more forms for his patients to complete, stating "we don't want the patient to have to do

another paperwork, it is just time consuming for the patient....especially with patients coming late...” Although, he admitted that if his clinic were going to succeed in adopting these tools then it had to be integrated into their normal process and forms.

Another rule related change that is not reflected in the table 15 data is by the end of the study John was now willing to perform manipulation on patients with pain below the knee (before the course he considered that an automatic exclusion for using manipulation). On the 12 week interview he stated:

“Before I was kind of scared to do the manipulation to patients with pain below the knee. Now that I have seen a couple of patients, and have done the procedure with patients with pain below the knee, they turned out better [successful outcomes], and I did not hurt them...”

He further explained that, “after dealing with more patients you just have more confidence that it [manipulation] is working, and you are not really hurting them...”

So, although he did not adopt the FABQ, he did expand his rule to 4 criteria, and he was no longer using an exclusion rule. He noted he had become more comfortable in using manipulation on broader spectrum of low back pain patients, and he felt he was qualifying a higher percentage of his low back pain patients for manipulation allowing him to perform manipulation more than once per week throughout the entire 12 week study period. However, John indicated he continued to use screening criteria when deciding to use manipulation. He stated in his six week interview:

“...a lot of these patients they have so many different motives. They had a car accident 5 years ago, and they are going through lawsuits. When you interview

these patients, a red flag appears that says “Ok, let’s not try anything too aggressive on them”. You don’t know what their motives are.”

Here John seems to consider manipulation an aggressive treatment, not suitable for all patients, even if they qualify for manipulation using the rule.

John suggests that several factors were helpful in the adoption process. He reported that the entire staff met the Monday after the course to have a discussion about implementing these innovations. He indicated, “having everyone on the same page”, made it easier to adopt these tools. Particularly since their clinic model involved sharing patients. He stated in the twelve week interview,

“In our clinic it is a little bit different than any other clinic that I have worked at. Our clinic, if a patient has...if a therapist has an appointment slot open, we put any patient there. We share patients at our clinic. So it just helps when you one therapist is doing a manipulation and the next time a patient comes in and they are not wondering why we are not doing a manipulation, or why we are not doing this kind of exercise. It is just nice for us all to be on the same page, so we can describe the same thing to patients, they understand what we are doing.”

He also indicated that his perception was that the clinic director wanted these innovations implemented, and that he felt accountable to the director to use what he learned in the course. He stated in the six week interview, “he [clinic director] wants to implement it, and I think it is going to be implemented, and when it is we just have to make sure that all the therapists are doing them.” This suggests that making a behavior

change may be easier when driven from the top, and then monitored to insure changes have been made.

In summary, before this study course, John had fully adopted using a short version rule and manipulation following training in his physical therapy education program. By the end of the study, John was using a more standard rule (i.e. more criteria), and was continuing to use manipulation on a routine basis.

#### **Case #4 Todd**

**Summary.** Before the course Todd did not use the rule and manipulation (NR and NM) in his practice. By 12 weeks post-course Todd had partially adopted the rule (PR) and fully adopted (FM) manipulation in his practice.

#### **Pre-Course**

Todd, a physical therapist and clinic director, had been working full time at an outpatient physical therapy clinic in a medium sized (between 100,000-500,000) Mid-Western U.S. city just prior to attending the 13 October 2012 study training course. Todd did not have an orthopedic specialty certification, nor any residency or fellowship training, but he did see low back pain patients on a weekly basis. His low back pain patients were described as typically older with chronic low back symptoms, and very few acute low back pain patients (see table 3).

Todd indicated that he had never received training on the rule or manipulation. So, prior to the 13 October 2012 course Todd reported he did not currently use either of these innovations in his practice. However, he did indicate that one of his two current co-

workers (John) did use the rule and manipulation on a routine basis. He also reported that his clinic would “share patients” between various physical therapists.

Although Todd reported on the baseline questionnaire that he did not use the rule as a decision tool prior to the course, he did report pre-course practice patterns of measuring on a routine basis three of the five rule criteria (see table 15, columns D0, E0, and F0). However, he did not use these measurements together (as a cluster, or treatment based classification system) to match the appropriate patient to manipulation treatment (see table 15, column G0).

### **Course**

One week prior to the course, Todd visited the course website, reviewed the online material, including reading the American Physical Therapy Association white paper on manipulation as a pre-reading assignment for the course. He also reported becoming familiar with the blog and discussion board, but did not make any pre-course postings in either forum.

During the 13 October 2012 course Todd, who attended the course with his two direct co-workers (see table 3), was engaged, and seemed interested in the course material (lectures and cases) and labs. At the end of the lab portion of the course he was rated competent in performing all of the rule and manipulation skills (see table 11).

### **Post-course**

Overall Todd had a good course experience. He rated the training program favorably both immediately after the course and at twelve weeks post-course (see table

7). He also demonstrated pre-course knowledge gains as reflected by his 25% increase in immediate post-course test scores (see table 9). His twelve week knowledge reassessment was not valid since he inadvertently used the rule algorithm as a reference aide while taking the test.

Todd's intention to adopt the rule and manipulation remained steady over the 12 week study period. This was reflected in his initial post-course and twelve week post-course agreement to the statements that he intended to use the rule and manipulation in his practice.

Todd's confidence in using the rule and manipulation is reflected in Table 20 and 22 respectively. While his confidence in his ability to use manipulation remained steady throughout the twelve week post-course period, his confidence in his ability to use the rule changed. Where he initially agreed to the statement that he was confident in his ability to use the rule, by the end of the twelve week study period he changed his agreement level to strongly agree.

**Perceptions.** Todd's perceptions of the rule and manipulation are reflected in table 20 and 22. His perceptions of the rule, including his perceived opportunities to use, initially were favorable and remained unchanged by the end of the twelve week study period. Todd's overall perception of the rule was stated as (on twelve week interview),

“I like that CPR [rule], it is nice to have some pretty straight forward research...especially since it is simple. OK, here are the five points and if you have them, boom, boom, boom, and you can say yes this [manipulation] is going to be an effective treatment. So, I do like it in that case.”

Initially, Todd's perception of manipulation was favorable and generally remained unchanged over the twelve week study period. The areas that did change were his perceptions of his opportunities to use manipulation, and his sense of the risk of using manipulation in terms of injury and being sued. Initially after the course Todd agreed to the statement that he would have opportunities to use manipulation on his patients. However, by twelve weeks post-course he changed this level of agreement to unsure. He explained during this twelve week interview that this change was related to a recent purposeful shift in his patient schedule to include more pediatric patients, resulting in less low back pain patients. This was done to accommodate the needs of a new pediatric affiliation physical therapy student he was supervising.

Todd also had a change in his perception in the degree of risk associated with using manipulation. Right after the course, Todd strongly agreed to the statement that the risk of him injuring a patient while using manipulation was low. However, by twelve weeks post-course he now only agreed with this statement. In addition, at baseline he strongly disagreed with the statement that the risk of being sued for using manipulation is higher than other treatments he typically uses. By twelve weeks after the course he only disagreed with this statement. So, while these statements seem to suggest that Todd still perceived using manipulation to be low risk, it appeared slightly less so by the end of the study. While he did have good outcomes with using manipulation, Todd reported that one patient had some temporary increase in pain while positioning (wind-up) for the manipulation treatment, but overall still improved by 50% after one week of treatments. In his six week interview he stated,

“[if] they are having a significant increase in pain when I am trying to get them into the position to do the manipulation, that gives me some pause as far as do I want to do this position and treatment right yet...”

While this experience got him thinking about how manipulation positioning is tolerated by some patients, this was balanced by his other patients being able to tolerate the manipulation position and maneuver without any concern or discomfort, and by the good outcomes regardless of how the patient tolerated the positioning.

Todd’s overall perception of manipulation at twelve weeks post-course was stated as, “I like that [manipulation]... it is something to adapt into, and to help the patients, and to increase their mobility, when you have a lot of hypomobility in the lumbar spine.”

This favorable perception of manipulation as a useful tool for the appropriate patient was consistent with his individual ratings of all the perceptions listed in table 22.

**Behaviors.** Todd’s self-reported changes in his rule and manipulation behaviors are shown in table 15 and 18. Over the first six weeks after the course, Todd made two, what he described as, “a lot more than I did before” changes from his baseline (he indicated that all the small reported changes in behavior were “about the same”). One of these changes is reflected in his data which shows he went from routinely measuring 3 of 5 criteria at baseline, to routinely measuring 4 of 5 criteria (adding in hip internal rotation) by the end of the twelve week study period. The other change was adding up the criteria at the end of his low back evaluation to decide if manipulation was indicated (i.e. using the rule). At twelve weeks post-course, he indicated that his use of the rule

was only 30% of the time, thus suggesting partial adoption of the rule per the case operational definition.

He summarized all of his rule related behavior changes by stating in his six week post-course interview:

“The FABQ is the one that I don’t do...the other ones I am at least looking at, symptoms distal to the knee I always check that, lumbar hypomobility, I always check that, unless they are severely acute [pain] in which case I can’t get a feel for if they are hypomobile or not, hip rotation I am getting more consistent. I did not do that one [hip internal rotation] in the past, so I am starting to check that one each time. That is the one I am using the most. I always check when their LBP started, so that one I get automatically. So the FABQ is the one I am not getting consistently, and the hip rotation I am getting better at. You get your routines down in the evaluation, so I have to kind of figure out how that fits into my routine.”

Todd brings up the point that part of his adoption process is figuring out how new measurements fit into his existing practice patterns, or in this case his routine low back pain evaluation.

Todd further stated:

“So, when I get them in prone to do the pieces that I normally do when they are in prone, I have to remember to do that [prone hip internal rotation] in my routine. Ok, that is figuring out when to do it, do it in prone, now I just have to remember to do it...that’s why I want it on my [evaluation] form so I remember to look at it.

Right now I just have to remember it. If it is on my form then I will pick it up and remember to do it each time.”

Here Todd describes the value of integrating changes into a formal process, rather than just relying on his memory. He described having made modifications to their standard evaluation template immediately after the course, integrating in the rule criteria.

However, he then submitted these changes for approval from corporate headquarters, and by twelve weeks post-course still had not received approval to officially make the changes. Todd suggested that one of the reasons for his lack of adoption of the FABQ was due to him waiting for this corporate approval.

Finally, in table 15 (column E0) a note referenced a validity concern regarding his baseline self-reported behavior of determining whether pain is above or below the knee during the initial evaluation. In the twelve week post-course interview, when asked why his behavior rating changed from 100% at baseline down to 90% at twelve weeks he stated, “I do it pretty consistently, I do it almost always, but to be realistic I don’t think it do it 100% of the time.” He then agreed that the rate was about the same over the entire twelve week study period.

In terms of his manipulation behavior changes, Todd indicated that by 12 weeks post-course he was using manipulation 80% of the time when the rule suggested manipulation was strongly indicated (i.e. at least 4 of the 5 rule criteria are present), and only 50% of the time when 3 rule criteria were present. Although only performing manipulation on his low back patients 2 times over the last six weeks of the study, this low use was due to him only seeing 1-2 low back pain patients per week. So, his twelve

week self-reported behavior still met my operational definition for full adoption of manipulation. In addition, he reported having some success with getting his patients better with manipulation.

He suggested several things helped him in his adoption process. First, he described having unexpected opportunities to use manipulation soon after the course with several acute low back pain patients (something that he reported as uncommon). He stated,

“over the last 6 weeks we had 1-2 that qualified, that hit the, matched up with the algorithm pretty quickly, which helped us to start implementing it easier. It was like, “OK here is 1 or 2 that fit the criteria immediately.” So, I got a sample of 6-12 evaluations that I have done over six weeks, and a couple of those have hit the CPR criteria so I can start doing it [manipulation] with them.”

Another factor that helped him with adopting the lumbopelvic manipulation was having co-workers “that want to use it and are using it”, in particular, John, who had prior advanced training in manipulation. Todd stated since he was new to all manipulations, John showed him some other non-low back manipulation techniques that were easier to perform (e.g. prone thoracic manipulations which required simple patient wind-up/positioning – patient lie prone). He stated since he was more comfortable performing the thoracic manipulations he was more likely to do them frequently with patients, and was having success in terms of generating cavitation’s and patients were tolerating the maneuvers well. Finally, he stated these successes have “...already encouraged me to, “ok, let’s try and work on the lumbar ones”.” So, gaining confidence with thoracic

manipulations seemed to improve his motivation to use the more challenging manipulation leaned in the study course.

It is important to note one change was made to his original twelve week questionnaire data as reported in table 18, column A12. Todd indicated on his questionnaire that he did not perform manipulation over the last six weeks of the study. However during his twelve week interview he then indicated that he actually had performed manipulation twice during that period (see item D in Appendix P).

Although Todd did not explicitly indicate that he used screening criteria in his adoption process, he agreed to the overall concept. He stated,

“I think that [the conjecture that screening criteria are used early in an adoption process and then decrease as one gains experience] is reasonable. Certainly, because as your confidence level increases and your comfort level increases, and your data base in your head that says “ok this has worked for all of these patients”. The research is out there, but as a therapist I think you still go off of your own personal experiences...”

Todd summarized his thoughts on the process of adoption after a training course as,

“I think the basic inertia you have to overcome with any therapist after a course they go to is they have their routine, and you have to change their routine, and get them to implement it and do it. So, whenever you have small hurdles, like implementing the FABQ, implementing the MODI, changing the evaluation form, those little things we are trying to get through and get done, they are all things

that you have to work at and push through and do. There is a natural tendency among most people to just do what they have always done.”

In this statement he seems to suggest that the more small hurdles that must be overcome in the adoption process, the less likely the adopter is to overcome the natural tendency to remain status quo. In his case, he felt having co-workers made it easier to overcome those hurdles. He stated (12 week interview),

“...what made it easier for me is having others around doing it ...well if others hadn't gone to the course then it is always harder to implement all of it by yourself without others there that can answer questions, or help you out along the way if you are working on it, or remind you, or you see them working on it, so it spurs you on to work on it more too.”

He also stated he felt some accountability to adopt these innovations into his practice due to participating in my research study. He explained this as,

“I think doing the study [participating in my dissertation study] that we are doing makes you more accountable to it because you want to make sure that you are adopting the things that we're trying to include, and when you are being asked about it [on questionnaires and interviews] you are going to be more accountable towards it, that is a piece of it...”

In summary, before this study course, Todd had no prior training in the rule or manipulation, and thus used neither in his practice. Todd worked with his co-workers (John and Mary) early on after the course to partially adopt the rule, and fully adopt manipulation by the end of the 12 week study period.

## **Case #5 Trisha**

**Summary.** Before the course Trisha did not use the rule or manipulation (NR and NM). By 12 weeks post-course Trisha had fully adopted the rule and manipulation (FR and FM) into her practice.

### **Pre-Course**

Trisha, a staff physical therapist, had been working full time at an outpatient physical therapy clinic in a small sized (less than 100,000) South Eastern U.S. city just prior to attending the 20 October 2012 study training course. Trisha did not have an orthopedic specialty certification, nor any residency or fellowship training, but she did see low back pain patients on a weekly basis. Her low back pain patients were described as typically older with chronic low back symptoms, and very few acute low back pain patients (see table 3).

Trisha indicated that while she was in Physical Therapy school she was very briefly introduced to the rule and manipulation, but did not use these in her clinical affiliations. Upon graduating, she did not adopt either innovation into her practice at that time. Then one year later she and a co-worker took a training course on the rule and manipulation. Despite their efforts to adopt both, they did not succeed, she felt, for a variety of reasons.

First, she indicated that their use of FABQ started out strong, but they soon discovered that most of their patients (greater than 60 years old with chronic LBP who were mostly not working) could not complete the FABQW since most of the questions were related to work, and few were working. She reported they became frustrated with

this tool since it did not seem to apply to their patients, and they often had to spend time explaining to their confused patients how to complete the form given that the patient did not work.

Secondly, Trisha reported they had problems performing the prone hip internal rotation on their geriatric patients, many of whom do not like to lie prone. They tried measuring hip internal rotation in sitting instead, but felt this was not as reliable. These facts together led them to inconsistently use this measure in their evaluations.

Finally, they found that many of their patients were either too old for the rule parameters (i.e. generally recommended for patients between 18 and 60), had prior lumbar surgeries (i.e. generally an exclusion criteria for using the rule and manipulation), or were not presenting with less than 16 days of symptoms. Trisha mentioned that her and her co-worker qualified one patient for manipulation using 4 out of the 5 rule criteria (they were not taught to use 3 out of 5 criteria to qualify a patient for manipulation) soon after the course. Despite performing manipulation on that one patient, and that patient improving dramatically, after months of not qualifying any other patient they abandoned their efforts to adopt both of these innovations, and stopped using the FABQ. They did however continue to use the MODI.

So, prior to the 20 October 2012 course Trisha reported she, and her co-workers, did not currently use either of the rule or manipulation in their practice. She also reported that her clinic would sometimes “share patients” between various physical therapists.

Although Trisha reported on the baseline questionnaire that she did not use the rule as a decision tool prior to the course, she did report pre-course practice patterns of

measuring on a routine basis two of the five rule criteria, and the MODI (see table 15, columns A0, E0, and F0). She indicated that her MODI use was high due to her adoption of this measure based on her prior rule training.

### **Course**

Prior to the study course Trisha did not visit the course website, blog, or discussion board, and did not read the American Physical Therapy Association white paper on manipulation as a pre-reading assignment for the course.

During the 20 October 2012 course Trisha, who attended the course with her two direct co-workers (see table 3), was highly engaged, asked questions, had spontaneous discussions with the instructors during breaks, and seemed interested in the course material (lectures and cases) and labs. At the end of the lab portion of the course she was rated competent in performing all of the rule and manipulation skills (see table 11).

### **Post-course**

Overall Trisha had a good course experience. She rated the training program favorably both immediately after the course and at twelve weeks post-course (see table 7). Trisha also demonstrated pre-course knowledge gains as reflected by her 50% increase in immediate post-course test scores (see table 9). Her twelve week knowledge reassessment was not valid since she inadvertently used the rule algorithm as a reference aide while taking the test.

Trisha's intention to adopt the rule and manipulation remained high throughout the entire twelve week study, as shown in tables 20 and 22.

Trisha's confidence in using the rule and manipulation also remained high throughout the entire twelve week study. Immediately after the course she agreed to the statements that she was confident in her ability to use the rule and manipulation, and by the end of the twelve week study period she changed her agreement level to strongly agree for both innovations. In the six week interview Trisha explained her initial confidence in using manipulation as,

“I felt more comfortable doing the manipulations this time. I don't know if it was because it was the second time [taking a course on the rule and manipulation], but I just felt more confident in doing it...”

Over the twelve week period she explained her confidence increased in performing manipulation due to performing manipulation on several large patients, and them having reduced low back symptoms after (i.e. success with manipulation). She stated during her six week interview, “If we can do it [manipulation] on this guy that is that big, we can do it on anybody that walked through that door.”

**Perceptions.** Trisha's perceptions of the rule and manipulation are reflected in table 20 and 22. For the most part, Trisha's perceptions of the rule and manipulation initially after the course were favorable. However, she disagreed with the statement that she would have opportunities to use the rule on patients, and strongly disagreed that she would have opportunities to use manipulation on patients. By twelve weeks post-course she strongly disagreed with both statements about opportunities to use the rule and

manipulation. Her initial unfavorable perceptions on opportunities to use the rule and manipulation were likely related to her past experience of not finding patients that qualified for manipulation using the rule. She stated that by six weeks, and even more so by twelve weeks, after the course, she was having fewer opportunities to use the rule due to having fewer low back pain evaluations compared to immediately after the course (6 visits per week at baseline vs. 2 visits per week at six weeks post-course vs. .33 visits per week by twelve weeks post-course). She stated this was due to getting so many post-operative referrals recently that her clinic did not have enough appointment slots for low back pain patients.

Despite her perceived low opportunities to use manipulation over the twelve week period, many of the initial favorable perceptions in using manipulation became even more favorable by the end of the twelve week study period. For example, her perceived level of risk for using manipulation went down as reflected by her now strongly agreeing to the statement that the risk of her injuring a patient using manipulation was low, and by her now strongly disagreeing that the risk of her being sued was higher than other treatments she typically used. In addition, she now strongly agreed that manipulation was compatible with her current treatment methods and beliefs, and that she could easily try out using manipulations. She attributed all these positive perceptual changes to just feeling more comfortable and confident with manipulation as she was “doing it more” and having good outcomes. In addition, she attributed her more favorable perception of her compatibility with manipulation due to “just having the other therapists agreeing with it, and backing you up and just being there...”.

Trisha's overall perception of the rule was stated in her six week interview as:

"I like it because it has the research to back it up, it is simple, objective measures, which you can test quickly, it is just easy. I guess that is just it, it is just easy to do. It is just easy to measure."

In regards to manipulation she stated:

"...it is easy as well, it is just getting the patients in to do it. I feel comfortable with it, and the research backs it up so that it will help. If it says you have a 68% chance of success with 3 out of 5, it is kind of hard to not do it and just move on to something like [lumbar] stabilization."

**Behaviors.** Trisha's self-reported changes in the rule and manipulation behaviors are shown in table 15 and 18. Over the twelve weeks of the study she increased her adoption of the rule criteria so that she was measuring all five criteria all the time when she had a low back pain evaluation. Also, she indicated that she was now using the rule to decide if manipulation was appropriate with all of her low back evaluations (see table 15, column G12). Admittedly, over the entire study period she had only a few opportunities to actually evaluate a low back pain patient, but she was confident in her belief that in the future she would always use the rule criteria with every one of her low back evaluations.

With such few opportunities to use the rule over the twelve weeks, she indicated several factors were different this time, compared to the last time she tried to adopt the rule and manipulation and did not succeed, that allowed her to succeed. She indicated that the algorithm she used this time was easier to use, and she was able to integrate all

rule related paperwork into her clinical processes (e.g. having the FABQ and MODI forms available in the initial evaluation packets, and completed by patients during the check-in process before they see the therapist). She stated,

“Once we all agreed [during the training transfer lecture group discussion] that it would be something we would want to do we just said that next day when we got into the clinic, “ok let’s make copies, get it in there”, because if we are going to do it we need to have it ready . Make sure we cover all of our bases.”

In addition, Trisha also indicated that the entire clinic had a culture change in terms of accepting manipulation as a valid treatment that should be used when indicated by the rule, rather than using lumbar stabilization as the main treatment for nearly all low back pain patients. She stated,

“Everyone is with it [rule and manipulation], we agree, we are all on the same sheet of page...we are definitely going to do it [manipulation] in the clinic for sure. I know I am. And, Tim goes right to it anytime...like when the co-worker got hurt Britt looked at me and said “ok, time to manipulate”, it is kind of the first thing we go to if we have the right criteria .”

She further explained that this total agreement to adopt the rule and manipulation was facilitated by three of the four co-workers attending this course together. She stated in the twelve week interview, “Having the co-workers there [at the course] with me is huge...” She further explained,

“we often don’t have the time [after a course] to settle down and explain it to everyone [that did not attend the course], it’s just, if a clinic is going to pick it up

all the therapists just need to go to the course.... Just to hold each other accountable, to check with each other and to help each other...”

Trisha’s clear adoption of manipulation is shown in table 18 (columns A12, B12, and C12). She reported now using manipulation at all times when patients met three or more of the rule criteria. She indicated that last time she tried to adopt manipulation she was only considering manipulation if a patient had four or more of the five rule criteria, and with her patient population this was extremely rare. She noted now that she was using manipulation when only 3 of 5 criteria were present this made it a lot more likely to find patients that were appropriate for manipulation. However, she also considered the screening criteria of looking at “the patient as a whole”. In other words, if a patient qualifies with 3 or more criteria, but they come across overall as someone that would not do well with manipulation (e.g. they are too frail), manipulation would not be offered as a treatment.

Even though Trisha was using manipulation after the course, she was still limited on her overall opportunities to perform manipulation. This was mainly due to her low number of low back pain evaluations, particularly over the last six weeks of the study period. Given most of her practice was over the first few weeks after the course and her drop in number of low back evaluations, over the last six weeks of the study she only performed manipulation on two occasions. However, this was still a high use rate (100%) of manipulation given she only had two opportunities (i.e. based on qualifying with the rule).

It is important to note one change was made to her original twelve week questionnaire data as reported in table 18. Trisha indicated on her questionnaire that she did not perform manipulation over the last six weeks of the study. However during her twelve week interview she then indicated that she actually had performed manipulation twice during that period (see item D in Appendix P).

In summary, before this study course, Trisha had prior training in the rule and manipulation. However, she was not using either innovation in her practice prior to the study training program. This time Trisha did fully adopt both the rule and manipulation into her practice by the end of the twelve week study period.

#### **Case #6 Tim**

**Summary.** Before the course Tim did not use the rule or manipulation (NR and NM). By 12 weeks post-course Tim had fully adopted the rule and manipulation (FR and FM) into his practice.

#### **Pre-Course**

Tim, a staff physical therapist, had been working full time at an outpatient physical therapy clinic in a small sized (less than 100,000) South Eastern U.S. city just prior to attending the 20 October 2012 study training course. Tim did not have an orthopedic specialty certification, nor any residency or fellowship training, but he did see low back pain patients on a weekly basis. His low back pain patients were described as typically older with chronic low back symptoms, and none were acute low back pain patients (see table 3).

Tim indicated that while he was in Physical Therapy school he was introduced to manipulation, but not the rule. He reported that he did not have any clinical instructors during his clinical affiliations that used lumbopelvic manipulation. He stated in his six week interview:

“When you are in that position [as a physical therapy student], if your clinical instructor does not do it [manipulation] [then you don’t do it]...I was pretty much afraid of messing up one of their patients, and they would get upset with me.”

So, prior to the 20 October 2012 course Tim reported he, and his co-workers, did not currently use either of these innovations in their practice. He also reported that his clinic would sometimes “share patients” between various physical therapists.

Although Tim reported on the baseline questionnaire that he did not use the rule as a decision tool prior to the course, he did report pre-course practice patterns of measuring on a routine basis three of the five rule criteria, and the MODI (see table 15, columns A0, D0, E0, and F0). He indicated that his MODI use was high due to this being part of the clinic norm when evaluating low back pain patients.

## **Course**

One week prior to the course, Tim visited the course website, and reviewed the online material; including reading the American Physical Therapy Association white paper on manipulation as a pre-reading assignment for the course. He also became familiar with the blog and discussion board, but did not make any pre-course postings in either forum.

During the 20 October 2012 course Tim, who attended the course with his two direct co-workers (see table 3), was highly engaged, asked questions, and seemed interested in the course material (lectures and cases) and labs. At the end of the lab portion of the course he was rated competent in performing all of the rule and manipulation skills (see table 11).

### **Post-course**

Overall Tim had a good course experience. He rated the training program favorably both immediately after the course and at twelve weeks post-course (see table 7). Tim also demonstrated pre-course knowledge gains as reflected by his 25% increase in immediate and 13% increase in twelve week post-course test scores (see table 9).

Tim's intention to adopt the rule and manipulation remained high throughout the entire twelve week study, as shown in tables 20 and 22. His level of agreement to the statement on his intention to use manipulation went from agree to strongly agree over the 12 week period. He explained in his six week interview that this was due to becoming more comfortable with performing manipulation and seeing the immediate benefit of it.

Tim's confidence in using the rule and manipulation also remained high throughout the entire twelve week study period. Immediately after the course he agreed to the statements that he was confident in his ability to use the rule and manipulation, and by the end of the twelve week study period he changed his agreement level to strongly agree for both innovations. Tim suggested his confidence in using the rule and manipulation increased due to practice with both innovations. He further explained the

role of practice in boosting his confidence as, “The more times you do something the better you get at it, and the more comfortable you feel about it.”

**Perceptions.** Tim’s perceptions of the rule initially after the course were for the most part highly favorable, and did not change throughout the study period. His only rating that was less than strongly agrees was his agreement to the statement that he would have opportunities to use the rule on his patients.

Tim’s perceptions of manipulation initially after the course were mostly favorable, except for his perception of being at an increased risk of being sued when using manipulation compared to his other treatments. However, this perceived risk lessened over the twelve week period, where in the end of the study period he was disagreeing that there was a higher risk for being sued when using manipulation. He stated his initial rating was due to his “gut instinct on manipulation in general”. However, over time he reflected more on the APTA white paper (i.e. course pre-reading), and eventually agreed with the paper’s stance that manipulation was generally a low risk.

Over the twelve week period his level of agreement to the statements regarding opportunities to use and being able to try out manipulation both went from agree at baseline to disagree by twelve weeks post-course. He explained these changes were simply due to not having found that many patients that were positive on the rule for manipulation during the study period. He indicated that the hardest criteria to find positive was a patient having symptoms for less than 16 days.

It is important to note that it appears in table 22 (column E0) that Tim changed his agreement level to the statement on compatibility from strongly agree to agree over

the study period. However, during his six week phone interview he indicated that he actually felt like manipulation was more compatible with his current treatment methods and beliefs later in the study, than at the beginning. Thus, per this phone interview his agreement level on the questionnaires should have reflected an increase in agreement (e.g. starting at agree, and ending at strongly agree). This conceptual discrepancy between his questionnaire rating and his interview response is documented in Appendix P (item W).

Finally, Tim's overall perception of manipulation was stated in his twelve week phone interview as:

“I have seen it help two people now [i.e. success with manipulation], so I think it is definitely going to benefit our patients in the future if we can just get them [low back pain patients] in there [to the clinic for evaluation]. I am definitely glad I am not afraid to use it [manipulation] anymore...”

He further suggested that practice and reading the APTA white paper seemed to lower his fear of using manipulation.

**Behaviors.** Tim's self-reported changes in the rule and manipulation behaviors are shown in table 15 and 18. Over the twelve weeks of the study he increased his adoption of the rule criteria so that he was measuring all five criteria all the time when he had a low back pain evaluation. Also, he indicated that he was now using the rule to decide if manipulation was appropriate with all of his low back evaluations. Over the entire study period he had only four opportunities to actually evaluate a low back pain patient (over the last six weeks of the study he only had one low back evaluation and the

person did not qualify for manipulation). However, he still felt that he, and the entire clinic, had fully adopted the rule (and manipulation) into their practice.

It is important to note that Tim's questionnaire data for twelve weeks for his use of MODI in table 15 (column A12) was inaccurate and adjusted to reflect his true use as described in his six week interview (see item E in Appendix P).

Tim's clear adoption of manipulation is shown in table 18 (column A12, B12, and C12). He reported now using manipulation at all times when patients met 3 or more of the rule criteria (which was less than once per week over the entire study period). However, at times he did use other unofficial screening criteria to rule out doing manipulation, even if the person qualified with 3 or more of the rule criteria. Tim explained a recent patient experience that illustrates this point, stating,

“her symptoms were all out of proportion to her description of the injury, and from the doctor's note that I read, he was more or less thinking the same thing. It seemed she was looking for a lawsuit. For her, I think she probably would have met the criteria, she might have had 3 of the 5, since she really seemed like she had alternative motives I was just going to go with something [treatment] conservative as possible. I was almost positive she was faking it, so I took that into consideration. Other than that, I guess it would just be a gut instinct maybe, but I try not to think about it [screening criteria other than the official rule criteria], but you know it [biases, or instinctual screening criteria] will affect you sometimes.”

He stated having all co-worker “on the same page” as helpful in the adoption process. He also stated having co-workers at the course led him to feel more accountable in terms of measuring the rule criteria. He stated,

“ We are kind of holding each other accountable as far as going through the criteria checklist and all that kind of stuff... [if your co-workers did not attend the same course, then] you could just easily take the fast track through the exam, and skip over a couple of those things, and then you would never know if you should do the manipulation or not, if they met the criteria for it or not. So, that’s helped a lot.”

In summary, before this study course, Tim had prior training in manipulation. However, he was not using the rule or manipulation in his practice prior to the study training program. Tim fully adopted both the rule and manipulation into his practice by the end of the twelve week study period.

### **Case #7 George**

**Summary.** Before the course George did not use the rule or manipulation (NR and NM). By 12 weeks post-course George had fully adopted the rule and manipulation (FR and FM) into his practice.

### **Pre-Course**

George, a staff physical therapist, had been working full time at a hospital based outpatient physical therapy clinic in a small sized (less than 100,000) South Eastern U.S. city just prior to attending the 20 October 2012 study training course. George did not

have an orthopedic specialty certification, nor any residency or fellowship training, but he did see a few low back pain patients on a weekly basis. His low back pain patients were described as typically older with chronic low back symptoms, and none were acute low back pain patients (see table 3).

George indicated that he had never been trained in the rule or manipulation (and did not get exposed to these during a clinical affiliation as a physical therapy student), and he, and his only other co-worker, did not use these innovations in their pre-course practice patterns. He noted that his clinic did not “share” patients between various therapists. Although George reported on the baseline questionnaire that he did not use the rule as a decision tool prior to the course, he did report pre-course practice patterns of measuring on a routine basis one of the five rule criteria (see table 15, column E0).

### **Course**

One week prior to the course, George visited the course website, and reviewed the online material, blog and discussion board. He did not read the pre-course assignment, American Physical Therapy Association white paper on manipulation. He also did not make any pre-course postings on the blog or discussion board.

During the 20 October 2012 course George, who attended the course by himself, was engaged, and seemed interested in the course material (lectures and cases) and labs. At the end of the lab portion of the course he was rated competent in performing all of the rule and manipulation skills (see table 11).

### **Post-course**

Overall George had a good course experience. He rated the training program favorably both immediately after the course and at twelve weeks post-course (see table 7). George also demonstrated pre-course knowledge gains as reflected by his 37% increase in immediate and twelve week post-course test scores.

George's intention to adopt the rule and manipulation remained high throughout the entire twelve week study, as shown in Table 20 and 22.

George's confidence in using the rule and manipulation also remained high throughout the twelve week study period. Immediately after the course he agreed to the statements that he was confident in his ability to use the rule and manipulation, and by the end of the twelve week study period he changed his agreement level to strongly agree for both innovations. George suggested in his six week interview that his confidence in using the rule increased due to "being able to use it on patients, or using components of it on patients makes it routine. So, that makes me more confident..."

He also stated that his confidence grew in using manipulation from practice in the course lab and from having success treating a patient with this innovation. However, during the six week interview he stated he was concerned that not using manipulation frequently enough, due to having so few low back pain patients, would cause him to lose confidence over time. By the twelve week interview he stated he was able to maintain his high confidence in using manipulation, despite having only one patient who was strongly indicated to use manipulation on during the entire study period, by practicing pre-positioning maneuvers on patients as a stretch. He stated,

“I have worked with her a couple times putting her in the position for manipulation [but not doing manipulation] just to provide her a low back stretch. This has been enough to keep me familiar with the placement...the positioning of the patient... that was my way of making sure I didn't forget how to position the patient since I didn't have other patients to come in.”

So, even though he felt his patient was no longer appropriate for manipulation, he felt it was appropriate for her to be stretched, and he used this opportunity to practice his manipulation positioning technique.

**Perceptions.** George's perceptions of the rule initially after the course were highly favorable and did not change throughout the study period, with one exception (see table 20). His level of agreement to the statement that he has opportunities to use the rule on his patients changed from agree to strongly agree over the study period. He stated this change was due to getting more low back pain referrals towards the last 3 weeks of the study period.

George's perceptions of manipulation initially after the course were favorable, and for the most part did not change over the twelve week study period with a few exceptions. Two of the changes over the study period reflected a decline in perceived risk of using manipulation. First, he changed his level of agreement to the statement on risk of injuring a patient with manipulation being low from agree to strongly agree. When asked why he made this change, during the six week interview he explained,

“...I would say being able to use it on someone who is in severe pain and seeing how she responded to it. There was not anything negative that she had to say in

response to that treatment, so I think that's what makes me feel stronger about the low risk."

Secondly, he changed his level of agreement to the statement on risk of being sued for using manipulation being high from disagree to strongly disagree. When asked why he made this change, during the twelve week interview he stated,

"Now that I feel more confident in my ability to do it [manipulation], I think when I do it I will be able to do it correctly. With increased confidence and performing the procedure correctly I feel there is less of a chance that I will provide harm to the patient."

The last change during the twelve week study period was in George's perceived opportunities to use manipulation on his patients. At baseline immediately after the course he strongly agreed to the statement that he would have opportunities to use manipulation, but by the end of the 12 weeks, he only agreed to that statement. During his six week interview he stated,

"On the day of the course, I was trying to think of what we had on the wait list, and at the time I think I was thinking we had more LBP patients than we actually had. After a month after the course, seeing that the LBP patients were not coming as frequent as I had thought, I guess that would change my perception there."

Finally, George's overall perception of manipulation was expressed by his 12 week interview statement,

“Me personally, I think manipulation is something that is great to have in your repertoire. I wish it was something I knew coming right out of school, but I am glad that I have been exposed to it now, especially since I have seen the benefits of using it when appropriate. Not only will I be happy, but my patients will be happy also about the fast progress that they will be able to make.”

**Behaviors.** George’s self-reported changes in the rule and manipulation behaviors are shown in table 15 and 18. Over the twelve weeks of the study he increased his adoption of the rule criteria so that he was measuring all five criteria all the time when he had a low back pain evaluation. Also, he indicated that he was now using the rule to decide if manipulation was appropriate with all of his low back evaluations (see table 15, column G12). Admittedly, over the entire study period he had only a two opportunities to actually evaluate a low back pain patient (one the first six weeks, and one the second six weeks of the study; and averaged two low back visits per week), but he still felt that he had fully adopted the rule (and manipulation) into his practice despite its limited use.

George’s adoption of manipulation is shown in Table 18 (column A12 and C12). He reported at twelve weeks post-course using manipulation at all times when patients met 4 or more of the rule criteria (i.e. when manipulation was strongly indicated), but not using manipulation at all when only 3 of the 5 criteria were present. George described first trying out manipulation on a patient that presented with a lot of pain, but had 4 out of 5 rule criteria. Initially he was hesitant to manipulate her for fear of worsening her symptoms during the manipulation positioning. However, he rationalized that based on the strength of the evidence behind the rule and treatment that he should at least try

manipulation to see if the outcomes occur as the research suggests it would. He stated in the six week interview,

“I was thinking at the time was, I will try it and see what happens. If it [manipulation] didn’t work that time, then I will just have to go another route. If [manipulation] did help [the patient] so I was able to continue on that same route.”

This decision to manipulate, despite his initial apprehension, was partly driven by his feeling of accountability to his patients to adopt the rule and manipulation. He stated,

“I think the main individuals that I felt accountable for are my patients. Mainly because by following it, it kind of leads you to the type of treatments that provide the most relief, or most likely chance of having improvement of their symptoms. So by using it as a guideline, I felt that in the long term I would benefit my patients the most.”

Near the end of his twelve week study period, he evaluated a 500 pound patient with low back pain. The patient had 3 of 5 rule criteria, so he chose to try to manipulate him, but then had to abandon the effort. This decision was mainly due to increased pain during setup, but also difficulty maneuvering the patient into the manipulation position based on the patients’ size.

George demonstrated not using screening criteria in his adoption of the rule and manipulation. In his first patient, despite being apprehensive due to the patient’s high level of pain, he was able to talk himself into completing the manipulation. In this last patient, despite the patient’s size (500 pounds), he still attempted (i.e. he did not screen

out the idea of manipulation based on the patient's size, but rather moved forward with the treatment based on the patient having 3 of 5 criteria) the manipulation, and only stopped when it was clear the patient was getting worse and George was having physical difficulty with the setup.

In summary, before this study course, George had no prior training in the rule or manipulation, and used neither in his practice prior to the study training program. Despite on a few opportunities to use the rule and manipulation, George fully adopted both the rule and manipulation into his practice by the end of the twelve week study period.

#### **Case #8 Jeff**

**Summary.** Before the course Jeff fully used the rule and manipulation (FR and FM) in his practice. By 12 weeks post-course Jeff continued to fully use the rule and manipulation (FR and FM) in his practice.

#### **Pre-Course**

Jeff, a clinic director and sole physical therapist (i.e. he has no direct physical therapist co-workers), had been working full time at an outpatient physical therapy clinic in a large sized (greater than 500,000 people) South-Central U.S. city just prior to attending the 3 November 2012 study training course. Jeff did not have an orthopedic specialty certification, nor any residency or fellowship training, but he did see low back pain patients on a weekly basis. His typical pre-course low back pain patients were

described as a mix of ages, 60% of which were workers compensation cases, and 50% having acute low back pain.

Jeff indicated that while he was in Physical Therapy school he was taught the rule and manipulation, and began using both in his practice upon graduating. He attributes this adoption due to practicing and using both tools daily during his outpatient student clinical rotation. His clinical instructor not only encouraged him to use the rule and manipulation, but also modeled that behavior. However, he did note that despite adopting the overall rule, he did not adopt the FABQ measurement tool. He explained in his six week interview that he thought this tool would take up too much time, so he chose to leave it out of his exam. He also did not use the MODI, and stated he was not consistent in measuring hip internal rotation.

Note that in the six week interview he made several references to measuring hip internal rotation prior to the course to some degree, but in the baseline questionnaire he indicated that he measured this 0% of the time. So, this conceptual discrepancy between the questionnaire data and interview data makes it unclear to what degree Jeff actually measured hip internal rotation prior to the course, but likely it was inconsistent at best.

So, prior to the 3 November 2012 course Jeff reported he had no direct physical therapy co-workers. Given he was the sole therapist at his clinic, he could not “share patients” with another physical therapist. Finally, although Jeff reported on the baseline questionnaire that he did use the rule as a decision tool prior to the course, he reported a pre-course practice pattern of measuring on a routine basis only three of the five rule criteria (see table 15, column D0, E0, and F0).

## **Course**

One week prior to the course, Jeff reviewed the American Physical Therapy Association white paper on manipulation as a pre-reading assignment for the course. However, he did not review the post-course training website, blog, or discussion board, nor did he make any postings to the blog or discussion board.

During the 3 November 2012 course, which he attended without any direct co-workers, Jeff was engaged and seemed interested in the course material (lectures and cases). At the end of the lab portion of the course he was rated competent in performing all of the rule and manipulation skills (see table 11).

## **Post-course**

Overall Jeff had a good course experience. He demonstrated pre-course knowledge gains as reflected by his 37% increase in immediate and 12% increase in twelve week post-course test scores, and rated the training program favorably both immediately after the course and at twelve weeks post-course (see table 7).

Jeff's intention to adopt and confidence in using the rule and manipulation over the twelve week study is shown in tables 20 and 22. His intention to adopt the rule and manipulation remained high throughout the 12 week study period. Jeff's confidence increased in his use of the rule and manipulation by the end of the twelve week period, primarily due to practice. He further explained in his twelve week interview that with, "...practice and use you feel like you have mastered something. The more you do it the more you incorporate it the easier it becomes to do it."

**Perceptions.** Jeff's perceptions of the rule, including his perception of the opportunities to use, initially were all favorable and remained so by the end of the twelve week study period. He had three changes (relative advantage, complexity, and trialability) in perception of the rule over the twelve week period. When asked about why these changes occurred, he stated for all three that he did not really feel there was a "real change". These conceptual discrepancies between his questionnaire response and his interview sentiments are shown in detail in Appendix P (items P, R and S). At the end of the twelve weeks, his overall perception of the rule was that it provided "better decision making and better results".

Initially, Jeff's perceptions of using manipulation, including his perception of the opportunities to use, were favorable and remained unchanged over the twelve week study period, with one exception. His perception of the advantages of using manipulation increased. In his twelve week interview he stated this was due to seeing the positive results of using manipulation on a broader group of patients (e.g. those that were qualifying with positive FABQ scores).

**Behaviors.** Jeff's self-reported changes in the rule and manipulation behaviors are shown in table 15 and 18. Looking at the data it appears his self-reported behaviors in using the rule and manipulation both increased over the 12 weeks post-course study period.

After the course Jeff began including the MODI and FABQ. By the end of the 12 week study period, he routinely assessed all five criteria in the rule, and used the MODI to determine the outcomes of using manipulation. Jeff stated what helped him adopt the

FABQ was integrating it into the back of an existing medical history form his patients complete during their check-in process. He also noticed that using the FABQ allowed him to qualify “a little more” patients for manipulation in the 3 out of 5 category, as before without the FABQ these same patients would only have had 2 out of the 5 criteria and thus not qualify for manipulation. Finally, Jeff reported he felt accountable to himself to adopt these measurement tools, stating “Well, I felt, maybe not accountable to anyone, I did feel like it would be a benefit to myself to start looking at the MODI and FABQ, and start using those outcomes measures.”

Also, prior to the course at best he was inconsistent with measuring hip internal rotation as a criteria due to not understanding why it was important (i.e. understanding the link behind having 35 degrees of hip internal rotation, and being likely to have success with manipulation). He stated, once he learned the reasoning behind this criteria in the course, he became consistent in measuring it as a criteria.

Regarding manipulation behavior, Jeff continued to perform manipulation weekly, as he had done prior to the course. However, before the course Jeff was only using this innovation routinely if the patient had 4 of the rule criteria present on evaluation. However, by six weeks after the course, he started using manipulation routinely if the patient had 3 or more of the rule criteria (and he was now measuring all five criteria) (see table 18, column A12, B12, and C12). He stated after the course he felt more comfortable doing manipulation when fewer criteria were present due to learning in the course about the research that states that there is still a 68% chance of a significant

improvement with 3 of 5 criteria present when using manipulation. He stated in his 12 week interview,

“I would say that if anything I am using it [manipulation] a little bit more.... Probably, as to where the 3 out of 5’s before the course [I] may not have been using manipulation on all of them. Now I am if they have 3 out of 5 I say let’s do it. Because it is still 68% likely to have success.”

In particular, he reported now using a manipulation technique (Chicago roll) that he learned in the course more often. For example, during the six week interview he described a particular patient having success and tolerating this new technique much better than his standard side lying manipulation. He explained that before the course he would not have used this new technique, even though he was aware of it,

“For him [patient] I definitely think I would have manipulated him, but I don’t know if I would have used the Chicago. I got a whole lot more comfortable with the Chicago while I was there [at the training course].”

Finally, Jeff indicated at six weeks that he did not use screening criteria during his post-course adoption process and rather stuck to the rule criteria. However, by twelve weeks post-course he stated,

“Unless there is a severe fear or hesitancy [with receiving manipulation as a treatment]. And I have had a couple in the past month that absolutely cannot relax and just cannot imagine themselves being moved [manipulated] like that, so they are just a no all the way across the board...”

This demonstrated that he actually did have some screening criteria in addition to the rule criteria that he used to decide if manipulation should be performed (i.e. in addition to the normal contraindications to manipulation).

In summary, before this study course, Jeff had prior training in the rule and manipulation, and used both in his practice. Even though he routinely used enough criteria to qualify patients for manipulation, he did not use all the criteria to maximize the number of patients who would qualify. After the twelve week study period, Jeff had fully adopted all five rule criteria, and had also lowered his qualification threshold to 3 of 5 rule criteria to trigger manipulation. These two changes allowed him to qualify slightly more patients for manipulation compared to prior to the course.

#### **Case #9 Leslie**

**Summary.** Before the course Leslie did not use the rule or manipulation (NR and NM). By 12 weeks post-course Leslie had fully adopted the rule and manipulation (FR and FM) into her practice.

#### **Pre-Course**

Leslie, a staff physical therapist with no direct co-workers, had been working full time at an outpatient physical therapy clinic in a large sized (greater than 500,000 people) South-Central U.S. city just prior to attending the 3 November 2012 study training course. Leslie did not have an orthopedic specialty certification, nor any residency or fellowship training, but she did see low back pain patients on a weekly basis. Her clinic focused primarily on work site injury care, and her typical pre-course low back pain

patients were described as a mix of ages, about 75% of which were acute injury workers compensation cases.

Leslie indicated that while she was in Physical Therapy school she was briefly introduced to manipulation, but prior to the study course had never received training on the rule. She stated her manipulation training was very basic (and she did not have a clinical instructor who used manipulation), and after school she worked in an acute care hospital setting, where she had no opportunity to use manipulation. She stated prior to the study course she did not use the rule or manipulation in her practice. She noted that her clinic did not “share” patients between various physical therapists (since she had no other physical therapist co-workers).

Note that Leslie reported in her baseline questionnaires that she used the rule and manipulation prior to the study course. However, during the six and twelve week phone interviews these baseline behaviors were clarified to actually be muscle energy techniques (i.e. other manual therapy techniques) and not the rule or manipulation. She ended up making it very clear that she had never actually used the rule and manipulation in her practice, and therefore her raw data was changed to reflect this factual discrepancy between the questionnaire and interview responses and the corrected data is shown in tables 15 (column G0) and 18 (column A0 and C0).

While prior to the study course she did not use the rule, she did measure one of the five rule criteria on a routine basis (i.e. determining if symptoms are above or below the knee). She did not measure the MODI, FABQ, or hip internal rotation range of motion at all in her normal back evaluation.

## **Course**

One week prior to the course, Leslie read the American Physical Therapy Association white paper on manipulation as a pre-reading assignment, and reviewed the post-course training website. However, she did not review or make any posts to the blog, or discussion board.

During the 3 November 2012 course Leslie, who attended the course with no direct co-workers, was engaged and seemed interested in the course material (lectures and cases). At the end of the lab portion of the course she was rated competent in performing all of the rule and manipulation skills, except for one (one rater felt she did not pass 1 of the 8 skills), based on an independent skills assessment by both instructors (see table 11).

## **Post-course**

Overall Leslie had a good course experience. She demonstrated pre-course knowledge gains as reflected by her 25% increase in immediate and 13% increase in twelve week post-course test scores, and rated the training program favorably both immediately after the course and at twelve weeks post-course (see table 7).

Leslie's intention to adopt and confidence in using the rule and manipulation over the twelve week study is shown in table 20 and 22. Her intention to adopt the rule and manipulation remained high throughout the 12 week study period. Leslie's confidence in using the rule on her patients went down slightly as reflected in her change in agreement level in the questionnaire confidence statement from strongly agree at baseline to agree by twelve weeks. Even though this rating change was recorded for the rule, her

description of the reasoning behind the change seemed more related to technical challenges in actually performing the manipulation. She explained this change in her six week interview as:

“I think after applying it...and this is one of the things I brought up in class...one of the problems I perceived as we encounter, we have so many patients with the large abdomens, they are heavier, and it is hard to get the heel of your hand purchase on their ASIS [boney pelvic landmark], it just kinds of slides off, they are harder to manipulate. And, I am not that big of a person, so that is always a challenge. Almost everyone I have applied it has been large.”

In addition, her confidence in using manipulation appears to not have changed based on her questionnaire responses over the 12 week period. However, in her 12 week interview she confirmed that her confidence in using manipulation had actually increased towards the end of the study period and that she was “getting good results [i.e. success with manipulation]...[and]... I feel more confident that there won’t be adverse effects...” It is possible that her confidence just did not increase enough in her mind to warrant a change from agree to strongly agree in her related manipulation questionnaire response.

**Perceptions.** Leslie’s perceptions of the rule and manipulation are reflected in table 20 and 22. Her perceptions of the rule, including her perception of the opportunities to use, initially were all favorable and remained unchanged by the end of the twelve week study period. Her overall perception of the rule at twelve weeks post-course was that it was an effective clinical decision tool.

Initially, Leslie's perceptions of using manipulation, including her perception of the opportunities to use, were favorable and remained unchanged over the twelve week study period, with two exceptions. Her perception of how easily she could try out using manipulation on her low back patients changed from strongly agree to agree by the end of the twelve week period. In her twelve week interview she stated this change was due to the large size of some of her patients, and her small stature, making it difficult to perform the setup and thrust components of manipulation.

She also agreed on her twelve week questionnaire that the risk for being sued when using manipulation would be higher than her other treatments, whereas earlier she had disagreed with this statement. However, in the twelve week interview she then clarified that she did not feel her perception had changed. She did perceive a slight risk, just due to the litigious nature of some of her workers' compensation patients. So, this presents a conceptual discrepancy between what her questionnaire data indicated and what she stated in her interview, and this is detailed in Appendix P (item U).

**Behaviors.** Leslie's self-reported changes in the rule and manipulation behaviors are shown in table 15 and 18. Looking at the data it appears some of her self-reported behaviors in using the rule and manipulation increased over the 12 weeks post-course study period.

After the course Leslie began measuring hip internal rotation, and lumbar spinal segmental mobility, and by the end of the study period these were both a routine part of her exam. She also increased the frequency of determining the number of days since

onset of back pain. She stated she was able to make these changes simply by memorizing the five criteria, and sequencing them into her exam, “just making it a habit”.

So, by the end of the 12 week study period she was routinely measuring 4 of the 5 rule criteria (not the FABQ), which was enough to determine if a patient was appropriate for manipulation. However, she admitted, that if she could qualify a patient with just the 2 heavily weighted criteria (i.e. no pain below the knee and less than 16 days), then she would not bother measuring the other criteria, just to save time. She stated this was why some of her other criteria were not done 100% of the time.

Leslie did not adopt the FABQ or MODI at all. She stated some of the barriers were not having operational support (i.e. front desk administrative support during the check-in process), only seeing many of her patients for three visits, the lower educational level of her patients (which made it difficult for them to complete the forms independently), and the lack of time Leslie had to assist the patients with completing the forms. She felt these forms just did not provide enough value for the amount of time it would take to use them in her setting. Since many of her patients were acute (less than 16 days of low back pain), she was able to qualify a large percentage of her patients for manipulation even without the FABQ criteria.

Prior to the course Leslie did not use manipulation in her practice, but by twelve weeks post-course she was using manipulation routinely when indicated by 3 or more of the rule criteria. This amounted to performing manipulation 2 times a week for the first six weeks of the study, and 4 times a week for the second six weeks of the study. Over the last six weeks of the study she reported having 12 low back evaluations, of which 8

(or 67%) qualified for manipulation with 3 or more of the rule criteria. She performed manipulation on 7 of those 8.

When asked why she did not manipulate all eight, she mentioned that some patients, even if they qualified with the rule, did not seem appropriate to manipulate. She stated,

“In the workman’s comp setting occasionally you will get those people that you really don’t believe their symptoms and they seem to be after a lot of secondary gain. One particular individual that I saw fell into that category and even though I am confident that this [manipulation] is not going to cause any adverse effects I am worried about her perception, “oh the therapist did this thing to me and hurt my back and now I can’t work”.”

She indicated that her use of these screening biases did not change over the twelve week period, despite her increased confidence in performing manipulation.

Overall, she found that the rule and manipulation were an efficient way to evaluate and treat her acute low back patients and get them back to work quickly. She felt these two innovations fit very well with her clinic model. She thus felt accountable to her profession and her patients to adopt these innovations into her practice.

In summary, before this study course, Leslie had no prior training in the rule, but did have previous introductory training in manipulation. However, she was not using either innovation in her practice prior to the study training program. This time Leslie did fully adopt both the rule and manipulation into her practice by the end of the twelve week study period.

## **Case #10 Keith**

**Summary.** Before the course Keith did not use the rule or manipulation (NR and NM). By 12 weeks post-course Keith had fully adopted the rule and manipulation (FR and FM) into his practice.

### **Pre-Course**

Keith, a staff physical therapist, had been working full time at an outpatient physical therapy clinic in a large (more than 500,000) Mid Atlantic U.S. city just prior to attending the 15 December 2012 study training course. Keith had an orthopedic specialty certification, but not any residency or fellowship training. He reported seeing low back pain patients on a weekly basis. His low back pain patients were described as typically older with chronic low back symptoms, and a small percentage of which were acute low back pain patients (see table 3).

Keith indicated that he was aware of the rule, but had never been trained in the rule or manipulation, did not have a clinical affiliation in physical therapy school where this was used by his clinical instructor, and did not use these innovations in his pre-course practice patterns. Initially he indicated that he was unsure if his only co-worker used the rule, but he reported she did use manipulation. Later in the study he confirmed that his co-worker did use the rule as well. He also reported that his clinic did not “share” patients between the two physical therapists.

Although Keith reported on the baseline questionnaire that he did not use the rule as a decision tool prior to the course, he did report pre-course practice patterns of measuring on a routine basis three of the five rule criteria, but not the FABQ or

determining lumbar spinal segmental mobility. He also reported using the MODI on a regular basis, as it was already part of his work's formal check-in process for all low back pain patients' initial evaluations.

### **Course**

One week prior to the course, Keith visited the course website, reviewed the online material, blog, and discussion board, and read the pre-course assignment, American Physical Therapy Association white paper on manipulation. He did not make any pre-course postings on the blog or discussion board.

During the 15 December 2012 course Keith, who attended the course by himself, was engaged, and seemed interested in the course material (lectures and cases) and labs. At the end of the lab portion of the course he was rated competent in performing all of the rule and manipulation skills, except for one (both raters felt he did not pass 1 of the 8 skills), based on an independent skills assessment by both instructors (see table 11).

### **Post-course**

Overall Keith had a good course experience. He rated the training program favorably both immediately after the course and at twelve weeks post-course (see table 7). Keith also demonstrated pre-course knowledge gains as reflected by his 25% increase in immediate and 37% increase in twelve week post-course test scores.

Keith's intention to adopt the rule and manipulation remained high throughout the entire twelve week study, as shown in table 20 and 22. His intention to adopt the rule increased over time, as reflected in his change from agree to strongly agree to the rule

intention statement. He explained this was due to what was taught in the course (i.e. research findings on patient outcomes) matching up with his early experience trying out the rule and manipulation. He stated, “the positive outcomes I am receiving has reinforced the literature [learned in the course].” This in turn reinforced his intention to adopt both of these innovations into his practice. His intention to adopt manipulation remained high throughout the entire study period.

Keith’s confidence in using the rule and manipulation is reflected in table 20 and 22 respectively. Immediately after the course he agreed to the statements that he was confident in his ability to use the rule, and by the end of the twelve week study period he changed his agreement level to strongly agree. Keith suggested this was due to practice and using the innovation consistently. His confidence in using manipulation remained high throughout the entire study period.

**Perceptions.** Keith’s perceptions of the rule initially after the course were highly favorable and did not change throughout the study period, with two exceptions. His level of agreement to the statement that he had opportunities to use the rule on his patients changed from agree to strongly agree over the study period. He stated this change was due to the occurrence of when patients are being seen for one condition, but mention their low back pain as a secondary and unrelated concern. In the past, he would have remained focused on the primary referral condition. However, now he was looking for opportunities to use the rule and manipulation, so if a patient would bring up a low back problem he would go ahead and perform a low back evaluation.

The other rule related perception change was an increase in his perceived advantages of using the rule over his current clinical decision making methods. Keith stated in his six week interview that this change was related to just having more time after the course to think about the criteria, and to gain a better understanding of the rule.

Keith's overall perception of the rule is that it is objective, easy to understand and remember, and "a good tool for qualifying patients for manipulation". He also stated that the objective nature of the criteria facilitated open dialogue about clinical decisions related to manipulation between other providers, physicians, and patients. He indicated that his perception of the FABQ was it was difficult for patients to understand, and he would prefer to not use this criterion.

Keith's perceptions of manipulation, including his perception of the opportunities to use, initially after the course were highly favorable and remained that way throughout the twelve week study period. His overall perception of manipulation was stated in his six week interview as, "it is a rapid, fast technique to get your patients better quickly..." His only concern with manipulation was that if you do not get enough practice, then you may not perform it correctly, and then the results may not be as good as expected. He felt when he initially started using manipulation, not being experienced at performing this treatment, he was at risk in terms of losing credibility with the patient if great outcomes were not achieved, but were promised in the informed consent process (e.g. if 4 of 5 criteria present, then the patient has a 95% chance of having a 50% reduction in MODI with one week of manipulation treatments).

**Behaviors.** Keith's self-reported changes in the rule and manipulation behaviors are shown in tables 15 and 18. Over the twelve weeks of the study he increased his adoption of the rule criteria so that he was measuring all five criteria routinely when he had a low back pain evaluation. Also, he indicated that he was now using the rule to decide if manipulation was appropriate with all of his low back evaluations.

While Keith was able to increase his use of the FABQ during this twelve week study period by including it in the check-in process (along with the MODI), he was not sure if he would continue to use the FABQ long-term. He still felt many of his patients did not understand the form, and/or it did not apply to them since they were not working. He stated in the twelve week interview that in the future, "I think I will want to see if I can qualify them [patients] without the FABQ [for manipulation using the rule]..."

Note that in table 15 Keith's reported baseline use of lumbar spinal segmental mobility testing was changed based on his clarification of his behavior during the six week interview. This factual discrepancy between the questionnaire response and the phone interview is explained fully in Appendix P (item H).

Keith's clear adoption of manipulation is shown in table 18 (column A12, B12, and C12). He reported by the end of the study that he was using manipulation routinely when patients met 3 or more of the rule criteria (i.e. when manipulation was strongly indicated). This resulted in him performing manipulation more than once per week throughout the entire study period.

He also reported that at times, he would still not perform manipulation even if a patient had enough rule criteria present to warrant this treatment. For example, if a

patient has had past success with other treatments, he might start with that over manipulation. Other screening criteria included if a patient had symptoms below the knee, he would not manipulate. However, he indicated that he was less likely to be persuaded by his own screening criteria to not do manipulation as more rule criteria were positive (e.g. he would be more likely to manipulate if someone had symptoms below the knee if the person had 4 positive criteria, rather than 3).

One interesting observation that Keith made was he felt his patients that had more criteria (4 or more) had better and longer lasting improvement with manipulation [i.e. success with manipulation] than did those that only had three positive criteria. The latter would still improve with manipulation, but the results did not seem to last as long or be as significant. He stated that over the last six weeks of the study about 33% of his low back patients had at least 3 of 5 criteria and 17% had at least 4 of 5 criteria present.

During Keith's adoption process, he noted the importance of practicing a new skill if he wanted to adopt it into his practice, but found that he did not have time to coordinate with his co-worker practice sessions. He found it more efficient to just practice on patients, to include positioning some patients in the manipulation position (e.g. when such stretching would be considered beneficial), without actually performing the thrust.

Finally, Keith indicated that he felt accountable to the course instructors to "at least make an effort to do it [use the rule and manipulation]...", and mentioned that having a co-worker also using these innovations served as a source of motivation and

reinforcement to adopt further. He felt this, even though he did not interact with his co-worker directly on his adoption process over the twelve week study period.

In summary, before this study course, Keith had no prior training in the rule or manipulation, and used neither in his practice prior to the study training program. By the end of the twelve week study period, Keith had fully adopted both the rule and manipulation into his practice.

### **Cross Case analysis**

The following section presents three tables (26, 27, and 28) that summarize the primary factors that are included in the 10 case studies. The tables organize these case study factors into three major time periods (i.e. as they were presented in the cases): pre-course, course, and post-course.

Each table has a series of questions immediately under the table (each keyed to a letter that can then be matched to the related column heading). These questions represent the primary case study factors, and are written in a way so that if the answer is “yes” (e.g. Prior training in LM? For John the answer is “yes”) then that factor would likely theoretically favor adoption. Each question was answered “yes” or “no” for each case study participant based on what information was included in their case study. This technique summarized these primary factors in table form.

Percentages of “yes” answers were calculated horizontally for all factors for each case study participant, as well as vertically for each factor. As a result, each case study participant and factor can be compared based on frequency of “yes” answers. This allowed me to more easily identify patterns across the cases as will be described below.

Finally, note that the first two questions (column A and B) are the same for all three tables and reflect whether or not full use of LMCPR and LM was achieved by 12 weeks post-course. This was included for easy reference of the adoption outcome in relation to the other table factors.

**Pre-course.** This first table category looks at the primary factors listed in the cases that occurred during the pre-course time period (not including the pre-course training program components that occurred one week prior to the course, and are included in table 27 (e.g. reading the APTA white paper)). Note that these factors are mostly describing prior training, and work setting context.

**Table 26.** In this table, 14 factors (columns C-P) are listed as questions (located under the table) covering constructs that are included in the cases relating to the pre-course time period. The most notable findings are that 70% of the case participants had prior training in manipulation, 80% had direct physical therapists co-workers in their pre-course work setting, and 70% were already measuring 3 of 5 rule criteria prior to the course.

No pre-course data pattern seemed unique to Susan, and that would help explain why she did not adopt manipulation. Likewise, no pre-course data pattern seemed related to Susan and Todd's partial adoption of LMCPR.

Table 26

*Pre-Course Cross Case Analysis*

Case study name	“Pre-Course” (not including pre-course training program components) related factors that appear in cases (Y=Yes, N=no)																
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	% Y
Susan	N	N	Y	Y	N	N	N	Y	N	N	N	N	N	N	N	Y	29
Mary	Y	Y	N	Y	N	N	N	Y	Y	Y	Y	N	Y	N	N	Y	50
John	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	N	Y	64
Todd	N	Y	N	N	N	N	N	Y	Y	Y	Y	N	N	N	N	Y	36
Trisha	Y	Y	Y	Y	N	N	N	Y	Y	N	N	N	N	N	N	N	29
Tim	Y	Y	N	Y	N	N	N	Y	Y	N	N	N	N	N	N	Y	29
George	Y	Y	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	7
Jeff	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	Y	Y	Y	Y	64
Leslie	Y	Y	N	Y	N	N	N	N	N	N	N	N	N	Y	Y	N	21
Keith	Y	Y	N	N	N	N	N	Y	N	Y	Y	Y	Y	N	N	Y	43
% Y	80	90	40	70	20	20	20	80	50	30	30	20	30	20	20	70	

Questions are worded in a way that would theoretically favor adoption:

A: Full use of LMCPR by 12 weeks post-course?

B: Full use of LM by 12 weeks post-course?

C: Prior training in LMCPR?

D: Prior training in LM?

E: Full use of LMCPR prior to course?

F: Full use of LM prior to course?

G: Had clinical affiliation with clinical instructor who used and encouraged participant’s use of LMCPR and/or LM?

H: Has direct physical therapist co-workers

I: Works in clinic with “share patient” model (where a patient may see different physical therapists throughout the course of treatment)?

J: Co-workers already using the LMCPR?

K: Co-workers already using LM?

L: Orthopedic advanced certification/training?

M: Seeing more low back pain visits per week than the mean (13) of the case study participants?

N: “Typical” low back pain patient described as not chronic and old?

O: % of low back pain patients with symptoms less than 16 days greater than the mean (16%) of the case study participants?

P: Already measuring at least 3 of 5 criteria routinely prior to course?

**Course.** This second table category shows the primary factors listed in the cases that occurred during the course time period (this includes pre-course activities completed about one week prior to the course).

**Table 27.** In this table, 7 factors (columns C-I) are listed as questions (located under the table) covering constructs that are included in the cases relating to the course time period. Most completed the pre-course assignments, except for posting to the blog (0%). All appeared engaged and interested in the course material throughout the course, and most were rated as competent on the skills check list by both instructors.

Once again, no course data pattern seemed unique to Susan, and that would help explain why she did not adopt manipulation. Likewise, no course data pattern seemed related to Susan and Todd's partial adoption of LMCPR.

Table 27

*Course Cross Case Analysis*

Case study name	“Course” related factors that appear in cases (Y=Yes, N=no)									
	A	B	C	D	E	F	G	H	I	% Y
Susan	N	N	Y	Y	Y	N	Y	N	Y	71
Mary	Y	Y	Y	Y	Y	N	N	Y	Y	71
John	Y	Y	N	Y	N	N	Y	Y	Y	57
Todd	N	Y	Y	Y	Y	N	Y	Y	Y	86
Trisha	Y	Y	N	N	N	N	Y	Y	Y	43
Tim	Y	Y	Y	Y	Y	N	Y	Y	Y	86
George	Y	Y	Y	N	Y	N	Y	N	Y	57
Jeff	Y	Y	N	Y	N	N	Y	N	Y	43
Leslie	Y	Y	Y	Y	N	N	N	N	Y	43
Keith	Y	Y	Y	Y	Y	N	N	N	Y	57
% Y	80	90	70	80	60	0	70	50	100	

Questions are worded in a way that would theoretically favor adoption:

- A. Full use of LMCPR by 12 weeks post-course?
- B. Full use of LM by 12 weeks post-course?
- C. Completed pre-course assignment: reviewed online support website?
- D. Completed pre-course assignment: read APTA white paper?
- E. Completed pre-course assignment: reviewed blog/discussion board?
- F. Completed pre-course assignment: made pre-course blog posting?
- G. Rated 100% competent in performing LMCPR/LM skills by both instructors?
- H. Attended course with at least one direct physical therapist co-worker?
- I. Engaged and appeared interested in course material and labs?

**Post-Course.** This third table category shows the primary factors listed in the cases that occurred during the post-course time period (up to 12 weeks post-course).

Note that these constructs include knowledge gain, rating of the course, perceptions of LMCPR and LM, post-course behaviors related to LMCPR and LM, success with innovations, use of screening criteria, social influence, and accountability.

**Table 28.** In this last table, 17 factors (columns C-S) are listed as questions (located under the table) covering constructs that are included in the cases relating to the post-course time period. All case study participants demonstrated knowledge gains, and rated the course favorably. All had a favorable (agree or strongly agree to related statement) intention to use the rule and manipulation, except for Susan, who was unsure at twelve weeks for manipulation (note Susan was the only cases participant that did not adopt manipulation). Opportunities to use manipulation were relatively limited. Everyone had a favorable perception of the rule immediately after and twelve weeks post-course. All those that had success with manipulation adopted manipulation.

Unlike the pre-course and course data, the post-course did seem to have a data pattern that matched up with Susan and Todd's lack of full adoption. Susan, the only case study participant to not adopt LM and only partially adopt the LMCPR, had the lowest % of "yes" counts for the post-course related factors listed in this table. In addition, the only case study participant (Todd) to adopt manipulation, but only partially adopt the rule had the second lowest % of "yes" counts for the post-course related factors listed this table. This adds some support to the importance of the post-course related constructs listed in this table in impacting adoption of LMCPR and LM.

In particular, there were three constructs that Susan seemed to be different than the other case study participants: lack of favorable intention to adopt LM (column F), lack of reporting success using LM by 12 weeks post-course (column P), and lack of feeling accountable to use LMCPR and LM during the 12 week post-course study period (column S).

Table 28

*Post-course Cross Case Analysis*

Case study name	“Post-Course” related factors that appear in cases (Y=Yes, N=no)																			% Y
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	
Susan	N	N	Y	Y	Y	N	Y	N	Y	N	Y	N	N	N	N	Y	N	N	N	41
Mary	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	82
John	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	N	Y	Y	Y	Y	Y	Y	82
Todd	N	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	N	N	N	Y	N	Y	Y	65
Trisha	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y	82
Tim	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	N	Y	Y	Y	Y	82
George	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	Y	76
Jeff	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	94
Leslie	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	N	N	Y	Y	Y	Y	N	Y	71
Keith	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	94
% Y	80	90	100	100	100	90	90	70	90	50	100	50	50	60	50	90	80	50	90	

Questions are worded in a way that would theoretically favor adoption:

- A. Full use of LMCPR by 12 weeks post-course?
- B. Full use of LM by 12 weeks post-course?
- C. Demonstrated knowledge gains (as reflected in increased test scores) over entire twelve week study period compared to baseline test?
- D. Rated the course favorably (8 or higher) immediately post-course and at 12 weeks post-course?
- E. Intention to use LMCPR rated as agree or strongly agree at baseline and at 12 weeks post-course?
- F. Intention to use LM rated as agree or strongly agree at baseline and at 12 weeks post-course?
- G. Confidence to use LMCPR increased (or remained strongly agree) at baseline and at 12 weeks post-course?
- H. Confidence to use LM increased (or remained strongly agree) at baseline and 12 weeks post-course?
- I. Opportunities to use LMCPR rated as agree or strongly agree at baseline and at 12 weeks post-course?
- J. Opportunities to use LM rated as agree or strongly agree at baseline and at 12 weeks post-course?
- K. Favorable perception (i.e. agree or strongly agree to advantage, compatible, and try out, and disagree or strongly disagree to complexity) of rule at baseline and at 12 weeks post-course?
- L. Favorable perception (i.e. agree or strongly agree to advantage, compatible, try out, and risk of injury being low, and disagree or strongly disagree to complexity and risk of being sued higher) of manipulation at baseline and at 12 weeks post-course?
- M. Measuring all five LMCPR criteria routinely at twelve weeks post-course?
- N. Performing LM routinely if 3 or more criteria present at 12 weeks post-course?
- O. Reported using LM weekly for the 12 week post-course adoption period?
- P. Reported success with using LM during 12 week post-course adoption period?
- Q. Used screening criteria, in addition to rule criteria, during 12 week post-course adoption period?
- R. Group effort to use LMCPR and LM (i.e. 1 or more co-workers also trying to adopt rule and manipulation) during 12 week post-course adoption period?
- S. Reports feeling accountable to use LMCPR and LM during 12 week post-course adoption period?

## **Chapter Six: Discussion and Conclusion**

As discussed earlier in this dissertation, low back pain is a condition that is not being optimally treated in our country (Fritz et al., 2007; Jette & Delitto, 1997; McGlynn et al., 2003; Mikhail et al., 2005; Poitras, Blais, Swaine, & Rossignol, 2005; Willett et al., 2011). Two innovations have been shown to effectively treat low back pain in a highly efficient manner (Armstrong, et al., 2003; Brennan, et al., 2006). Given their proven effectiveness, it may be surprising to some that these innovations have not been widely adopted by many physical therapists, despite education and training efforts to make these behaviors standard practice (Fritz, 2012). This low adoption was initially reflected in my study participants as only 3 of 12 (25%) previously trained in LM CPR had fully adopted this innovation prior to my study course. Also, only 8 of 15 (53%) previously trained in LM had fully adopted LM into their practice prior to my study course. While higher adoption rates are needed, these rates are in line with typical training transfer researchers' findings of the training transfer problem (Davis et al., 1999; Saks & Belcourt, 2006). This problem suggests that many workers who attend training do not fully adopt what they learned in class and that targeted behavior changes are often not seen long term (Saks & Belcourt, 2006).

Researchers are beginning to test various interventions in an attempt to improve adoption of these innovations, so far with mixed results (Brennan et al., 2006; Cleland et

al., 2009; Willett et al., 2011). However, researchers have yet to explore the reasons behind adoption or non-adoption of these innovations in licensed physical therapists. Knowing why physical therapists are adopting or not adopting the LMCPR and/or LM could provide insights that would lead to more targeted and effective interventions, in turn leading to increased adoption. Ultimately improved adoption should result in lower healthcare costs and improved low back pain patient outcomes. Thus, my research questions focused on understanding process oriented questions related to the adoption of LMCPR and LM following a multi-component training program on these topics.

In order to have a complete picture of changes that occurred, and why, during this adoption process I have two main research questions focused in that direction. The first looks at what happens to participant's knowledge, perception, and skills of the LMCPR and LM innovations following their participation in a multi-component training program on these topics. The second main research question looks at what participant's reportedly do with the training once they return home.

In addition to looking at these process oriented questions, a third main research question was created to look specifically at the multi-component training program that was designed based on training transfer research, and three prior pilot cycles (evaluation: local impact) in an overall design based research program (i.e. ILDF). Treating this dissertation as another cycle of design based research (evaluation: local impact) on this PraTT based multi-component training program, provided insights that can be used to make changes to such a program in preparation for future design cycles (e.g. evaluation: broader impact) (Bannan-Ritland, 2003).

So, in this chapter I will first directly answer all three of my main research questions, and all their related sub questions. I will then discuss the adoption process and present an inductively generated theory that I have developed based on the results of this study. I will then make clear what I believe can be taken away from this research in order to help future researchers, educators, and trainers maximize adoption of LM CPR and LM among physical therapists. I will then focus my attention on how this study has implications for the field of instructional systems design and design based research in general, and the PraTT model specifically. Finally, I will present some validity threats to this study and make recommendations for future research.

### **Research Questions**

Below are the three main research questions and their related sub questions all answered:

**Research question (RQ) #1.** What are participants' knowledge, perceptions, and skills of the LM CPR and LM innovations?

**RQ1a.** What are participants' knowledge of LM CPR and LM prior to the course, and how do these change over time after the course?

**Summary.** Participants had some knowledge of LM CPR and LM prior to the course. This knowledge increased immediately after the course and remained increased at 12 weeks post-course.

Prior to this study course, 12 of the 22 study participants (see table 13) had received training on LM CPR, this included training during their entry-level physical

therapy education program (n=7), on the job (n=4), and in previous CEU courses (n=5, note that 4 of these had first received this training in PT school, and then again in CEU training). 15 of the 22 (see table 16) had received prior training on LM before this course, this included exposure in their entry-level physical therapy education (n=9), on the job (n=1), and from previous CEU courses (n=11, note that 6 of these had received LM training initially in physical therapy school, and then again in CEU training courses). Interestingly, participant's with prior training pre-course test scores (n=16) were 62%. Whereas those that did not have any prior LMCPR and/or LM training before this course (n=6) had mean pre-test score of 67%.

Table 8 shows that pre-course testing results on the topics of LMCPR and LM were similar for study participants and non-study participant course attendees. At the end of the course, attendees increased their test scores on the same test by a mean of 32% for all study participants (n=22), 30% for the subset of the 10 case study participants, and 26% for the remaining course attendees (non-study participants). At twelve weeks after the course, the 10 case study participants took the same test for their final time. The twelve week mean increase in pre-course test scores remained about the same (29%) compared to their increases seen immediately after the course (see table 9 for individual case study participant changes in test scores).

During a follow-up interview with the twelve week respondents I asked if they had taken this final test from memory, as requested, or if they had used a memory aide. Two indicated that they had used the algorithm during the test so I did not include their 100% test scores in the final mean twelve week post-course test results.

I also asked the twelve week respondents what seemed to help them retain the knowledge they learned in the course and they suggested using the algorithm as a job aide, using the techniques on patients, practicing, and teaching others this topic (e.g. physical therapy students). Mary (twelve week phone interview) suggested that:

“I can go through an evaluation and the tests that I have gotten and already decide in my head, since I use it [algorithm/LMCPR] a lot and it is now in my memory bank, which is awesome...and again too, even just, I did not do any of these prior to this, so the idea of just practicing and figuring out how to position a patient all those things just from practice.”

This certainly makes sense that if a course attendee uses the information learned in a course that they should retain that information.

However, the converse is not necessarily true, that if someone does not use the information that it will be lost by the twelve week post-course point. For example, Susan, the only case study participant that did not fully adopt LMCPR and LM, scored 100% on the twelve week test, the same test result as immediately after the course. This demonstrates that even without using LMCPR and LM in practice, test specific knowledge can be retained on these topics over twelve weeks. This is consistent with the long standing observation that knowledge gains do not automatically translate into behavior changes (Baldwin & Ford, 1988).

Regardless of individual situations (each described in more detail in the cases), in the final analysis all of the 10 case study participants scored higher on their 12 week test than on their baseline test (see table 9).

**RQ1b.** What are participants' perception of LMCPR and LM, and how do these change over time?

**Summary.** LMCPR and LM were perceived as helpful tools that add value to existing practices. Initially after the course both innovations were, for the most part, seen as having a relative advantage, being compatible, being triable, and not being complex. These perceptions generally remained the same by the end of the 12 week study period.

**LMCPR.** General perceptions of LMCPR by the study participants include that this innovation is evidence based (i.e. well supported by strong research), easy to use, simple, uses objective measures, and is an efficient decision making tool. This general positive vibe was well summarized by Clay (six week phone interview):

“I think it [LMCPR] is a great tool. I think if you are not doing it you are doing a disservice to your patients. There is too much evidence behind it, there really is no reason not to. You should be looking at all that stuff [LMCPR measures] anyways, so it is definitely something outpatient PTs need to incorporate into their practice.”

No respondent made any negative statements about the LMCPR tool as a whole.

When looking at the individual LMCPR five criteria, a common perception was most of the criteria were already being used by the therapist, just not put together as one cluster based decision tool to decide if someone was appropriate for manipulation. As Mary stated in her twelve week phone interview:

“...again I was already doing half of them [LMCPR criteria measurements] to begin with. So it is not like I have had to put any extra effort into the evaluation, I have just had to think about it a little differently, so it has worked for me...”

Everett Rogers (2003) suggests that adoption of innovations is influenced by one's perception of five key characteristics of the innovation: relative advantage, compatibility, trialability, complexity, and observability. My questionnaires looked at assessing only the participant's perceptions of the first four characteristics (i.e. not observability) over the twelve week study period since observability was dependent on observing others using the innovations.

Over the entire twelve week period, all case study participants perceived using LMCPR as providing a relative advantage over current decision making tools, being compatible with current clinical decision making methods and beliefs, being easy to try out on LBP patients, and not being complex or difficult to use. Table 19 shows the study participant's perceptions on these four characteristics and how they changed for the case study participants over the twelve week study period (see table 20 for individual questionnaire responses).

***Relative advantage.*** Looking at the results of the perception of relative advantage, 96% of the 22 participants immediately after the course either “agreed” or “strongly agreed” with the statement that “I feel using the LMCPR provides advantages over my current clinical decision making”. The 10 case study participants that I was able to follow over the 12 week study period all “agreed” or “strongly agreed” with this statement at the start of the study and by the end of the study (see table 19). Over that

same period the percent of these case study participants that “strongly agreed” went up from 40% at the start of the study period to 60% at the end. One participant, John (twelve week phone interview), explained his change from “agree” at baseline to “strongly agree” at twelve weeks was based on:

“before [adopting the LMCPR] I was so hesitant to use it [LM] with a patient that had pain below the knee [he considered this an exclusion criteria for LM before]. But, now that I have used it for patients with pain below the knee [since they qualified for LM using LMCPR with other criteria] and it [LM] has worked, I am more likely to use it [LM] on a more broad base of patients.”

So, the advantage John eventually realized of using LMCPR was that it allowed him to qualify a wider range of LBP patients for LM compared to his baseline decision making. Other therapists noted the same impact as they commented that LMCPR allowed them to qualify more patients for LM compared to their baseline non-LMCPR decision making.

Jen, an experienced manipulator, indicated that one relative advantage she saw with the LMCPR over her current decision making in deciding who should receive LM was how it formalized and made transparent how the decision to do LM was made. She felt this would help in justifying actions to third parties such as insurance adjusters, referring providers, patients, and litigators. She also felt it would improve communication with physical therapy students making her decision making more observable to her students. So, it appears the participants perceive that LMCPR provides relative advantages over their current clinical decision making.

**Compatibility.** Most (91%) of the study participants “agreed” or “strongly agreed” to the statement on how using LM CPR would be compatible with their current clinical decision making methods and beliefs. Once again 100% of the subgroup of the 10 case study participants either “agreed” or “strongly agreed” at baseline, and twelve weeks post-course. Only one case study participant changed his rating from “strongly agree” at baseline to “agree” at 6 weeks. However, during the six week phone interview John clarified his response as not a real change in his perception:

Jesse: “What about compatibility. Before [baseline questionnaire response] you said you strongly agree, and now you are saying that you agree using the LM CPR is compatible with your beliefs...”

John: “Yes, I guess I really strongly agree with that. Because I have used it [LM CPR], but just in a modified way throughout my career.”

This exchange demonstrated an important role that my phone interviews played in my study, that of validating and clarifying any questionnaire changes over time (baseline, six week, and twelve week questionnaires on the same questions). In this case, what appeared to be a questionnaire change in John’s perceptions of the compatibility of LM CPR on further investigation did not seem conceptually consistent with his interview comments. Fortunately, most comparisons in my study between questionnaire responses and interview responses on the same topic matched and reasoning was logical and supported the changed response. When a disagreement between a questionnaire response and the interview response existed, this was documented as a disagreement (see table 25),

and then described in detail (see Appendix P). In addition, each of these disagreements is identified in each of the data tables.

Disagreements were classified as factual or conceptual/perception. Factual discrepancies were clearly a mistake in facts as reported in a questionnaire (e.g. Jeff stating he had never had prior training on LM CPR on the questionnaire, and then later in a phone interview stating he received prior training on LM CPR in physical therapy school – See Appendix P, item A). Conceptual/perception discrepancies were more complex, theoretical, and perception based discrepancies between questionnaire and interview responses. I only made changes in my database to the raw questionnaire data for factual discrepancies when the participant was able to confirm the correct facts during a phone interview. For the conceptual/perception discrepancies I left the raw data in my database in its original state. For example, in the case of John’s conceptual discrepancy on his questionnaire response on compatibility of LM CPR, no change to his raw questionnaire data was made. Thus, it appears his rating changed over time, but in the interview he later makes it seem that his perception on the compatibility of LM CPR with his current decision making at six weeks remained the same as at baseline (i.e. “strongly agree”) (Appendix P, item Q). So, it appears that the participants felt LM CPR was compatible with their current clinical decision making methods and beliefs.

***Trialability.*** All but one of the study participants “agreed” or “strongly agreed” to the statement that “I feel I can easily try out using the LM CPR with my MLBP patients” at baseline. Overall the 10 case study participants maintained the same level of

agreement to the statement at baseline compared to twelve weeks. So, it appears the participants perceived that LM CPR was easy to try out.

**Complexity.** 96% of the study participants (n=22) immediately after the course “disagreed” or “strongly disagreed” to the statement “I feel the LM CPR is complex and difficult to use”. This suggests that they perceived the LM CPR was the opposite of this statement, or simple and easy to use. This conjecture was supported by the statements of many of the participants that they overall felt that the LM CPR was indeed simple and easy to use. In addition, all of the case participants (n=10) “disagreed” or “strongly disagreed” with the complexity statement at baseline and by the twelfth week post-course. Mary summarized what many participants indicated in their questionnaire responses, “...the CPR itself is really easy to follow, it makes sense...” Todd further stated, “...it is simple. OK, here are the five points and if you have them, boom, boom, boom, and you can say yes it is going to be an effective treatment...” Finally, Trisha stated, “it is just easy to do. It is just easy to measure.”

Despite many comments indicating the lack of complexity of LM CPR as a tool, one criterion, FABQ, of LM CPR did seem to be perceived as more complex. The FABQ was perceived as time consuming, confusing to patients, something you could get a gut feel for without actually doing the form, and did not add much value to the exam process. Incidentally, none of the study participants were using the FABQ prior to the study.

Three of the participants (John, Todd, and Keith) indicated they were concerned with managing the limited time they had with patients. Having patient’s complete extra forms (e.g. FABQ and/or MODI) before or during the evaluation was perceived as an

undesirable burden to place on patients. For example, John (six week phone interview) stated:

“...we don’t want the patient to have to do another paperwork, it is just time consuming for the patient... I think that is a huge barrier. Especially with patients coming late and things like that...”

Most of the study participants indicated that their patients already have to complete multiple intake forms during the check-in process (although none of the 22 study participants reported using the FABQ at baseline). Some of the therapists were concerned that adding the two additional forms related to LMCPR (FABQ and MODI) would just be too many to reasonably ask a patient to complete in one sitting. Also, considering many patients are late to appointments, insisting that these forms be completed before the therapist is able to start their evaluation would just further take away from time left to complete the evaluation and treatment. In other words, the FABQ appeared to be perceived as the inefficient part of the efficient LMCPR decision tool.

In addition to time being perceived as an issue with the FABQ, four therapists (Keith, Todd, Leslie, and Trisha) indicated that their patients had trouble understanding or relating to some of the questions. Keith (six week phone interview) explains some of the confusion as:

“I think what I do not like about it [LMCPR] is the FABQ, it is kind of...it is a language twister. When a patient reads over it is hard to...let’s say if they are well educated reading it ...they have to have a certain level of education reading it. To understand the wording...it is almost like a riddle to go through. It is hard for them to

understand. I really don't understand...I don't think patients really know what is being asked of them, I think they just mark whatever is there..."

His statement suggests not only confusion, but also the perception that some patients do not have the reading level to independently understand and complete the form. This concern about the reading level was also held by Leslie. Todd (twelve week phone interview) perceived that when the LBP episode was not related to work, this created confusion for the patient:

"The FABQ[W] is a hard one to feel like it adds a lot of value because it has to do with work specifically. And, if the injury is in no way related to work, it seems kind of an awkward one to have someone still fill out. When you are limited for time, it is one of those that you are like "ok what is the value in having this one" unless it is going to point you to that one criteria to do LM. If it doesn't do that it doesn't seem as valuable."

Todd's statement not only expressed concern for how the patient would relate to the questionnaire, but also its lack of value unless only one more criteria was needed to qualify someone to receive LM (e.g. they already have 2 criteria present, and the therapist will only do LM if the patient has 3 positive criteria present. In this scenario, having a FABQW score may provide the 3rd positive criteria). Trisha also perceived that some of the confusion occurred if patients did not work, since they then did not seem to know how to answer the work related questions.

While some therapists perceived the FABQ taking too much time, or being too confusing, others felt that it was unnecessary as a formal tool, and that they could assess the same questionnaire construct (patient avoidance behavior) just from a normal

subjective exam. For example Susan (twelve week phone interview) stated, “In the subjective you can kind of get an idea of how much they are limiting themselves.”

Clay perceived the FABQW criteria was being used to screen out symptom magnification patients and that he could determine this by just “feeling them out” during the normal exam process.

As Todd suggested earlier, if the FABQ were perceived as making a difference in qualifying a patient for LM, then it would likely be perceived as adding value and would then be used. For Mary and Keith, this was not the case (i.e. they did not feel the FABQ added value). Mary (twelve week phone interview) stated:

“...like I said I can usually qualify patients with 3 or 4 of those criteria anyway without the FABQ, so I guess that’s why I have not been more diligent about getting the paperwork part of it done”

Keith also indicated that he would not qualify anymore patients for LM with or without the FABQ.

Given all the negative perceptions of the FABQ, and the lack of perceived added value, it is no wonder that prior to the study it was the lowest used component of the LM CPR, and at the end of the twelve week study period remained the lowest used component of the LM CPR.

In summary, the perceptions of nearly all of the participants at baseline, and the case study participants over the twelve week study period for using LM CPR were favorable for adoption. Specifically, using LM CPR was perceived as providing a relative

advantage, being compatible, being easy to try, and not complex. In general these perceptions remained pretty constant throughout the twelve week period.

**LM.** General perceptions of LM by the study participants are that it is a fast and effective treatment for the right patient, but that it has not been fully accepted into the psyche of physical therapists as our standard of practice. It is perceived as an aggressive and efficient treatment that is backed-up by research, and that it is particularly effective on acute LBP patients with localized symptoms. Some were apprehensive that using this treatment opened them up to an increased risk of litigation, or of making their patients' symptoms worse. Overall a mix feeling of intellectually LM is safe to do, effective, and should be used, but a persistent gut feeling of some underlying fear of performing this maneuver persisted. This paradox of feelings was exemplified in a statement by Mary (twelve week phone interview):

“... I don't know if being afraid of it [LM] is a good term, but the idea of manipulation, you know you kind of think about the idea that you don't use them all the time and that maybe it is more of a chiropractic intervention, and we are blurring those lines a little bit, but I think that it is definitely within our scope of practice. I think they are safe to do, and I think obviously there are red flags you look for and wouldn't do them. So as long as you are thinking, and keeping all those things in mind, that they are really safe.”

Just like with LMCPR, I questioned study participants on their perception of using LM based on the constructs of relative advantage, compatibility, trialability, and complexity. The results are listed in table 21 for all study participants at baseline, and for

the subset of case study participants at baseline and twelve weeks post-course. In addition, for LM two other perceptions were assessed that covered common areas of concern (risk of injuring patient and risk of litigation) that prior researchers have highlighted as barriers to physical therapy students using LM (Struessel et al., 2012).

***Relative advantage.*** Looking at the results of the perception of relative advantage, 96% of the 22 participants immediately after the course either “agreed” or “strongly agreed” with the statement that “I feel using the LM provides advantages over my current treatment methods”. The 10 case study participants that I was able to follow over the 12 week study period all “agreed” or “strongly agreed” with this statement at the start of the study and all, but 2 (Susan and Mary), continued to feel this way by the end of the study (see table 22 for individual questionnaire responses). Over that same period the percent of these case study participants that “strongly agreed” went up from 40% at the start of the study period to 60% at the end (see table 21).

One case study participant (Tim) felt that LM was the most efficient treatment option for LBP patients he now had. Likewise, George and Keith noted the speed of the intervention and the rapid improvement of the patient. So, it appears the participants perceived that LM provided advantages over their current treatment methods.

***Compatibility.*** Most (96%) of the study participants “agreed” or “strongly agreed” to the statement on how using LM would be compatible with their current treatment methods and beliefs. Once again 100% of the subgroup of the 10 case study participants either “agreed” or “strongly agreed” at baseline and this declined to 90% by twelve weeks post-course. The percent of case study participants that “strongly agreed” went

from 50% at baseline to 60% at the end of the twelve week period. Susan (six week phone interview) explained her decline in her rating on the statement over time (baseline “agree” to “disagree” at six and twelve weeks post-course) as due to her desire to be less aggressive with the type of LBP patients she was seeing (chronic and older). She stated, “I want to play it very safe and conservative, at least with the current case load that I have.” This supports the common belief that LM is an aggressive treatment where the therapist is doing something to the patient, rather than a more conservative treatment approach where the physical therapist is telling the patient what to do (e.g. exercise) and the patient is doing the treatment to themselves. Some refer to this latter approach as hands-off therapy. This demonstrates that LM is perceived as not compatible with a conservative therapy treatment approach.

Trisha had changed her rating from “agree” to “strongly agree” with the compatibility statement by six weeks post-course. She (six week phone interview) explained that this was influenced by her perception of her co-workers acceptance of LM, “... just having the other therapists agreeing with it and backing you up and just being there.” This points to the importance of the social process of adoption, and supports the idea in the theory of reasoned action that subjective norms (i.e. what Trisha believes co-workers think she should do) are an important influence in behavior change.

So, it appears that the participants felt LM was compatible with their current treatment methods and beliefs.

***Trialability.*** Most (91%) of the study participants “agreed” or “strongly agreed” to the statement that “I feel I can easily try out using the LMs on my MLBP patients” at

baseline. Overall the 10 case study participants maintained about the same level of agreement to the statement at baseline compared to twelve weeks. Participants indicated that having few patients that qualified for LM made it hard to try out LM. Also, several pointed out that trying out the LM on larger patients can be difficult. One factor that was suggested that increased the perception of trialability was confidence in using LM. Trisha suggested that increasing her confidence in using LM led to an increase in her perception on how easily she can try using LM. This was interesting since it suggested that her perception about the trialability of LM was based on her own confidence in using LM, not on some intrinsic feature of LM. Overall, it appears the participants perceived that LM was easy to try out.

**Complexity.** 96% of the study participants “disagreed” or “strongly disagreed” to the statement “I feel LMs are complex and difficult to use”. Much like with LMCPRs, this suggests that the study participants perceived that LMs are simple and easy to use. Furthermore, all of the case participants “disagreed” or “strongly disagreed” with the complexity statement at baseline and by the twelfth week post-course. John was the only case study participant who’s rating on complexity of LM changed at twelve weeks (“strongly disagree”) compared to baseline (“disagree”). Part of his perception change was not only his own belief in the simplicity of the LM technique, but also how easily his own physical therapy student was picking it up (from his six week phone interview):

“Yes, it is a pretty simple technique. I am teaching my co-workers ...I have a student right now, teaching her to do it...they are catching on pretty quick.”

Once again, this demonstrates the social nature of the adoption process and how perceptions are shaped by interaction with others (in this case as student), and not just the innovation itself. The questionnaire responses demonstrate that the participants perceive that LM is not complex.

***Risk of injury.*** At baseline, all but two of the study participants “agreed” or “strongly agreed” to the questionnaire statement, “the risk of me injuring a patient while using a lumbopelvic manipulation is low.” By the end of the twelve week study period, all of the study participants either “agreed” or “strongly agreed” with the statement on risk of injury. Also, the percent of the case study participants that “strongly agreed” to that statement increased from 50% at baseline to 60% by twelve weeks post-course.

One participant, Susan, increased her response from “unsure” at baseline and six weeks post-course to “agree” at twelve weeks post-course. During the twelve week phone interview she stated this rating change was made due to her patients at a new job site being younger (i.e. less than 60) than her old job site, and this made her feel more comfortable in considering using LM. In other words, she feared using LM on older patients, something several other study participants also feared. Another participant who changed his response from “agree” to “strongly agree” by the twelfth week indicated this was due to his actual experience using LM on a patient. George (six week phone interview) stated:

“being able to use it [LM] on someone who is in severe pain and seeing how she responded to it. There was not anything negative that she had to say in response

to that treatment, so I think that's what makes me feel stronger about the low risk [of injuring a patient with LM].”

This shows that some perception changes are based on pre-conceived notions of risk based on theoretical factors (i.e. Susan), and some perceptions change due to actual experience using an innovation (i.e. George). Also, this highlights the reality that baseline responses (right after the course) for all of those participants who had not used either innovation prior to the study were based on assumptions and pre-conceived notions about the innovations, and not personal experience. Whereas responses at six and twelve weeks were usually (although not always, in the case of Susan who still had not tried LM by the end of the twelve week study) based on experiences trying out the innovation. Overall, responses on this question demonstrated that LM was perceived as a low injury risk treatment.

***Risk of litigation.*** Immediately at the end of the course, 82% of the study participants “disagreed” or “strongly disagreed” with the statement “the risk of me being sued for using LM is higher than other treatments I typically use.” For the subset of case study participants, 70% “disagreed” or “strongly disagreed” with this statement at baseline, and this increased to 80% by twelve weeks post-course. Only 20% of the case study participants “strongly disagreed” to this statement at baseline, and this changed to 30% by twelve weeks. The overall sentiment was best reflected by Leslie’s statement during her twelve week interview:

“I guess I always have that litigious fear in there that this [LM] is something that adds a lot more risk [of being sued] to it, but I feel more confident that there won't be adverse effects [a true patient injury].”

In other words, the perception of being at more risk for litigation when using LM is present, even if it is not based on a feeling that the patient is really more at risk for injury. Tim described this increased feeling of being at risk for being sued when using LM as a “gut instinct on the manipulation in general” even though after he read the APTA white paper he admittedly knew the evidence did not support this increase risk.

In addition, several other comments were made by multiple study participants about the litigious nature of some worker's compensation patients, and the overall occurrence of secondary gain patients in general, and perhaps using an aggressive treatment like LM would provide these types of patients the opportunity to make false accusations of injury against the therapist. Perhaps these statements are describing some of the underlying perceptions that create the “gut feel” that Tim referred to, but this connection was not clearly made by a direct statement from a participant. These perceptions and biases are important because as I will explain later in this paper, they play a role as screening criteria that are used as a defense mechanism during the trial period of testing out the LM innovation.

On the other hand, some perceptions of increased risk for litigation can be founded in a real fear of injuring a patient while using LM, particularly if not done correctly. This seems particularly relevant while first starting out using LM based on low confidence and technical expertise as demonstrated by George. George changed his

response over time from “disagree” to “strongly disagree” based on his feeling that the risk of harming a patient was being reduced as he became more experienced in performing LM. This insinuates his assumption that litigation follows injury. George (twelve week phone interview) explained the reasoning for his change in response and stated:

“Now that I feel more confident in my ability to do it [LM], I think when I do it I will be able to do it correctly. With increased confidence and performing the procedure correctly I feel there is less of a chance that I will provide harm to the patient.”

What is not stated at the end of his comment, but is inferred based on the context of the question is “thus less risk of litigation.” John (twelve week phone interview) also explained his perception change over time from “agree” at baseline to “unsure” at six weeks, to finally “disagree” at twelve weeks due to gains in confidence based on his growing experience using LM:

“After dealing with more patients [using LM as a treatment] you just have more confidence that it [LM] is working, and you are not really hurting them.”

What is interesting about John is he was already a frequent and long-time user of LM before my course. However, he indicates that his continued success with using LM without injuring patients (e.g. after the course he started using LM on patients with symptoms below the knee, but who still qualified for LM using the LMCPR. Before the course he would use symptoms below the knee as an exclusion criteria for LM), seems to

have reduced his perception for being at risk for litigation if using LM. Overall, study participants seemed to not perceive an increased risk of litigation when using LM.

**RQ1c.** How competently can participants perform the LM CPR and LM by the end of the course?

**Summary.** By the end of the course 17 of the 22 (77%) study participants were deemed fully competent to perform LM CPR and LM by both raters (see table 10). Whereas 70% of the subset of 10 case study participants were cleared as fully competent to perform LM CPR and LM by both raters. Table 11 shows the individual competency assessments for the 10 case study participants.

The skills check list included eight skills related to competency in performing the LM CPR and LM (see Appendix F). Skills were rated as “Go” (i.e. passed by demonstrating basic competency in the specific skill) and “No Go” (i.e. did not pass, and did not demonstrate correctly the specific skill). The only skill that was missed by 5 of the 22 study participants was skill number six: “end range thrust w/ the appropriate force”.

Overall interrater agreement was very high. Out of 176 (22 participants x 8 skills per participant) total skills checked off by each rater, the two independent raters agreed on all but 2 items, for a 99% agreement rate on the study participant’s skills assessment (see table 12).

In summary, while 77% of the study participants demonstrated full competency with the LMCPR and LM skills by the end of the course, 23% did not. However, only one skill was missed by those that did not pass. Of the five that did not pass the skills check list, 3 of them belonged to the subset of case study participants. All three (Mary, Leslie, and Keith) of these participants went on to fully adopt LMCPR and LM, each stating that they were having success with getting patients better when using LM as a treatment. On the other hand, it is interesting to note that the one case study participant who did not implement LM, Susan, during the course lab demonstrated 100% competency in performing all skills as independently assessed by both raters. This just shows that either being 100% competent in performing the skills, or not being competent was no guarantee that a person would either adopt or not adopt LMCPR and LM over a twelve week period after the course. This makes sense given the complexity of the determinants of adoption.

**RQ #2.** What do participants reportedly do with the training once they return home?

**RQ2a.** What are the participants' intentions with respect to adopting LMCPR and LM into their practice, and how do these change over time?

**Summary.** Nearly all study participants “agree” or “strongly agree” with the statement that they intend to use LM and LMCPR in their practice. These feelings, with only a four exceptions, did not change over the twelve week study period.

**LMCPR.** The intention to adopt LMCPR is shown in table 19, with 91% of all study participants indicating immediately after the course that they “agreed” or “strongly agreed” with the questionnaire statement that “I intend to use the LMCPR in my practice.” Of the subset of 10 case study participants, 100% “agreed” or “strongly agreed” to this statement at baseline and at twelve weeks after the course. At baseline, 60% of the case study participants “strongly agreed” to this statement, and by twelve weeks post-course 80% “strongly agreed”.

It is interesting to note that the 2 case study participants (Susan and Todd) that only “agreed” to this statement at twelve weeks, were the only 2 case study participants that by the twelfth week were considered only partial adopters (PR) of LMCPR (see table 5 and 20). Whereas all of the remaining 8 case study participants who “strongly agreed” with the statement at twelve weeks post-course had all fully adopted (FR) LMCPR. This could suggest the case study participant’s intention to adopt over time is related to their adoption of LMCPR over a twelve week period.

Two of the case study participants (Keith and Mary) increased their intention to adopt LMCPR over the twelve week period from “agree” to “strongly agree”. At six weeks post-course, Keith changed his response from “agree” at baseline to “strongly agree”. When asked to explain why this change occurred, he stated (six week phone interview),

“I think it is the results. Two factors, one is the understanding of the evidence that was presented [in the course] and the outcome of both the research and my

outcomes when I use it, the positive outcomes I am receiving has reinforced the literature.”

This last sentence of his statement suggests his trial of using LMCPR was confirming what the research suggested would happen, that he would have good outcomes by identifying who should receive LM by using LMCPR as a decision method. This personal validation of the literature seemed to strengthen his intention to continue his adoption efforts of LMCPR.

The other case study participant, Mary, “agreed” to the intention statement at baseline, and six weeks post-course, but by the twelfth week she had changed her response to the intention statement to “strongly agree”. When asked why this change occurred she indicated (twelve week phone interview):

“I think again, because I have become a lot more comfortable with it, I can see the benefit in it, I am qualifying more people [for LM using LMCPR].…”

Once again, the theme of personally seeing the benefit in using this innovation seems to have some influence on her intention to adopt LMCPR, just as Keith reported.

**LM.** The intention to adopt LM is shown in table 21, with 96% of all study participants indicating immediately after the course that they “agreed” or “strongly agreed” with the questionnaire statement that “I intend to use LMs as a treatment in my practice.” Of the subset of 10 case study participants, 100% “agreed” or “strongly agreed” to this statement at baseline and 90% “agreed” or “strongly agreed” at twelve weeks after the course. At baseline, 60% of the case study participants “strongly agreed” to this statement, and by twelve weeks post-course 70% “strongly agreed”.

The only case study participant to not “agree” or “strongly agree” at twelve weeks post-course to the intention to adopt LM statement was Susan (see table 22). At the baseline Susan “agreed” with the statement, but then by six weeks post-course, and again at twelve weeks post-course she responded that she was now “unsure”. It is important to note that Susan was also the only case study participant that did not adopt LM over the twelve week period (i.e. NM). As was seen in LMCPR, this suggests a possible relationship between intention to adopt and actual adoption.

In her six week interview, Susan linked her “unsure” rating to her lack of confidence in using LM. Her drop in intention ratings seemed to mirror her drop in confidence ratings over the same time period, thus adding validity to her statement about such a link (see table 22).

Tim was the only other case study participant to change his level of agreement to the statement about intention to adopt LM. At baseline he “agreed” to the statement, but by six weeks post-course, and again at twelve weeks post-course he responded that he now “strongly agreed” with the statement. During his six week phone interview he suggested this change was due to,

“... I can see the benefit that the patient can have. I have seen one of Britt’s [Tim’s co-worker that also attended the course, but is not a study participant] patients the other day have an immediate benefit after she did it [LM] on them. I just feel more comfortable doing it now...”

Similar to the theme with Keith and Mary in LMCPR intention, here Tim is seeing first hand that LM works. He is also growing more comfortable with the innovation, something Mary emphasized with LMCPR.

**RQ2b.** How do participants' self-reported use of the LMCPR and LM change after participation in the course?

**Summary.** Of the 10 case study participants that completed the 12 week study, 20% used LMCPR and LM before the course. By twelve weeks after the course, 80% had fully adopted LMCPR and 90% had fully adopted LM into their practice (see table 5).

**LMCPR.** Prior to the study course, 20% of the case study participants were using LMCPR on a routine basis in their practice. Table 3 and 13 shows that 40% of the 10 case study participants had prior training in LMCPR before the study course, and table 13 also shows how this compares to the other non-case study participants. This means that 2 (Susan and Trisha) of the 4 prior trained did not adopt LMCPR into their practice after their previous training on this topic.

Susan, who was trained on LMCPR while in physical therapy school, attributed her prior lack of adoption of this innovation due to not having an opportunity to use this skill while on her student clinical affiliation. She stated (6 week interview):

“...I think because maybe my clinicals, I really only had one outpatient clinical and they were, they only did McKenzie, so they were so far out of the box...and when you do the actual internships [clinicals] the hands-on training with patients,

I think that is where you really develop your evaluation skills, theory, and diagnostic skills, so I think for me that's probably why I did not carry it over so much from school.”

Trisha, who was “briefly” exposed to LMCPR in physical therapy school in 2007, and then took a training course on this topic in 2008, suggested the reason why she did not adopt LMCPR before was generally due to not having supporting documents to make implementation easy. She stated (6 week interview):

Trisha: “Last time I think the paperwork was an issue, which was one of the reasons why we did not adopt it. I can't remember exactly what the details were, but it was something to do with the paperwork. This time we had access to download what we needed, we had that at our fingertips so it was easier.”

Jesse: “That was because of the website access?”

Trisha: “correct.”

The fact that only half (2 out of 4) of the case study participants trained in LMCPR in the past had actually adopted LMCPR, lends support to the argument that training transfer, or incorporating LMCPR into a physical therapist's clinical decision making, is not guaranteed to happen after training. This same pattern of incomplete training transfer was also seen among the 22 study participants, as 55% had prior training in LMCPR, but at the time of my study course only 14% reported actually fully using the LMCPR in their practice (see table 13).

Of the 10 case study participants, 6 had not been trained before in LMCPR. By twelve weeks following the study training course on LMCPR, 5 of these 6 were reporting

that they were now fully using (FR) LMCPR on a routine basis and 1 of the 6 was partially using (PR) LMCPR (see table 5). Note that these use terms were previously operationally defined in chapter four of this paper. This is a full use adoption rate of 83% (5 out of 6). Compare this to the prior adoption rate of 50% (2 out of 4).

In addition, as would be expected, the two participants (John and Jeff) that had prior training and had already previously adopted using LMCPR in their practice, continued to report full use of LMCPR following the study training course.

Finally, the two (Susan and Trisha) that had prior training on LMCPR, but that had previously not adopted LMCPR into their practice, this time made some progress. After the study training course, Trisha was able to fully adopt LMCPR into her practice. Whereas, Susan was able to partially adopt LMCPR into her practice. Meaning she was now using the LMCPR as a decision tool about 30% of the time (see table 15, column G12).

Pre-course and twelve week post-course self-reported LMCPR related behaviors are listed in table 15 (and the same behaviors in aggregate can be compared between all study participants and just the 10 case study participants in table 14). What stands out in the data (questionnaires and interviews), is that the two “paperwork” based measurements (table 14, column A and B) had the least adoption of all the LMCPR behaviors. The other LMCPR behaviors were seen as more typical evaluation tools, and were commonly being done already by physical therapists (see table 14 and 15, columns C0, D0, E0, and F0). On the other hand, the MODI and FABQ were not commonly used before the study course, this was also seen in the mean use rates among all study participants (see table 14,

column A and B), and their post-course use remained lower than the other LM CPR behaviors.

In summary, prior to the start of the study course, 2 out of 10 of the case study participants were fully using LM CPR. By the end of the 12 week study period, 8 out of 10 of the case study participants were fully using LM CPR (see table 13).

**LM.** Prior to the study course, 20% of the case study participants were using LM on a routine basis in their practice. Table 3 and 16 shows that 70% of the 10 case study participants had prior training in LM before the study course, and table 16 also shows how this compares to all 22 study participants. This means that 5 of the 7 prior trained did not adopt LM into their practice after their previous training on this topic. The two case study participants that did adopt LM CPR with prior LM CPR training also were the same two (John and Jeff) that were able to adopt LM with prior LM training.

The fact that only 29% (2 out of 7) of the case study participants trained in LM in the past had actually adopted and were using LM on a routine basis, supports the argument that training transfer in the form of full adoption of newly learned skills can be low. This same pattern of incomplete training transfer was also seen among the 22 study participants, as 68% had prior training in LM, but at the time of my study course only 36% reported actually fully using the LM in their practice (see table 20).

Pre-course and twelve week post-course self-reported LM related behaviors are listed in table 18 (and the same behaviors in aggregate can be compared between all study participants and just the 10 case study participants in table 17). Three patterns are seen. First, an increased routine use of LM compared to pre-course use. Next, an

increase use of LM if 3 or more of the LMCPR criteria is present. Finally, an increase use of LM if 4 or more of the LMCPR criteria is present. These patterns are all consistent with a general increase use of LM.

Of the 10 case study participants, 3 (Todd, George, and Keith) had not been trained before in LM (see table 3). By twelve weeks following the study training course on LM, all 3 were reporting that they were now fully using (i.e. FM) LM on a routine basis when strongly indicated (per operational definition) (see table 5). This is a full use adoption rate of 100% (3 out of 3). Compare this to the prior adoption rate of 29% (2 out of 7).

In addition, as would be expected, the two participants (John and Jeff) that had prior training and had already previously adopted using LM in their practice, continued to report full use of LM following the study training course. Both even suggested that they are now using LM a little more frequently since they both are using more of the LMCPR criteria more consistently (see cases for John and Jeff for a detailed description of these related changes). Note the changes in Jeff's LMCPR use that have resulted in his increased use of LM are reflected in table 15 and 18. However, the data that supports John's increase use of LMCPR criteria is not reflected in table 15 and 18. This is because the two major changes in John's use of the LMCPR that have increased his use of LM are not reflected in the table data, namely: use of lumbar hypomobility as a criteria (this shows on table 15 that he was always measuring it before (100%), but he did not previously use it as a criteria that indicated a patient should be treated with LM), and no longer ruling out patients for manipulation if they had symptoms below the knee, but still

have at least 3 other LM CPR criteria (before this training program, if a patient had symptoms below the knee he would not use LM, regardless of how many other LM CPR criteria the patient had).

Finally, the five that had prior training on LM, but that had previously not adopted LM into their practice, this time made some progress. By twelve weeks after the study training course, four out of the five reported that they had fully adopted LM into their practice. Only one of the five (Susan) still had not adopted LM into her practice (see table 5 and 18). Descriptions of factors that facilitated and served as barriers to this process are described in their individual cases.

In summary, prior to the start of the study course, 2 out of 10 of the case study participants were fully using LM. By the end of the 12 week study period, 9 out of 10 of the case study participants were fully using LM when strongly indicated (see table 16 and 18).

**RQ2c.** What factors do participants report as facilitators in adopting LM CPR and LM as part of their practice?

**Summary.** There were many factors that were reported as facilitating the adoption of LM CPR and LM. These included training design, trainee characteristics, and work environmental factors.

Training transfer researchers Baldwin and Ford (1988) describe three categories of input that seem to influence the outcome of the general training transfer process. The first is training design, or how the training is actually planned and conducted. Examples

include small classroom environment vs. online training, serial training conducted over time vs. a one-time training event, hands-on training vs. lecture based, and any number of endless instructional design based variables.

The second category is trainee characteristics. They describe a trainee's personal characteristics, such as motivation and self-efficacy, as influencing training transfer (Baldwin & Ford, 1988). For this category, I also considered any factor that was trainee centered (i.e. the participant primarily had control of the factor, such as a decision to adapt the LM CPR criteria) as a trainee characteristic.

The final category is the work environment. This would include external factors that are typically outside the direct control of the trainee, such as co-workers using the innovation and supervisor support.

I organized the participant's open-ended questionnaire and interview responses of factors related to their adoption of LM CPR and LM into the three training input categories as listed above. An outline of all the reported facilitating factors is shown in Appendix R. This outline includes a count of the number of participant's that reported a particular code as facilitating their adoption process. While codes that were reported frequently stand out as important facilitators in the adoption process, there were some codes that were not frequently reported, but still played an important role in a specific participant's adoption process. These will all be highlighted below.

**Training design.** Training design factors that were reported as frequent and important facilitators to their adoption of LM CPR and LM include one pre-course activity, several course activities, and several post-course activities. The single pre-

course activity that was reported as an important facilitator (6 participants) to the adoption of LM was reading the American Physical Therapy Associations (APTA) white paper on manipulation. This paper, which was assigned as a pre-reading assignment one week prior to the day-long course, explains the research behind manipulation and highlights the low historical risks associated with this treatment. Five of the twenty-two participants indicated that this paper helped them in their adoption process in two primary ways. First, three case study participants indicated that reading this paper decreased their apprehension of using manipulation. Tim's responses reflected the reassurance the paper provided:

“Until I read that [APTA] white paper, I wasn't really sure how safe it [manipulation] was, and the percentage of the time you could injure someone doing it...so that [APTA white paper] really made me more apt to go about doing that manipulation... it gave me peace of mind about the dangers of performing a manipulation.”

Secondly, two other participants indicated that it affirmed that manipulation was important to adopt and clearly in the scope of physical therapy practice.

Several course related activities were reported as facilitating adoption of LMCPR and LM. The most commonly (12 participants) reported course related factor was participating in the hands-on lab. During the eight hour course, the participants were provided 3 hours of hands-on lab time, this included all course attendees practicing LMCPR related measurements and lumbopelvic manipulation on each other, with instructor feedback, for about 1.5 hours. Clay stated:

“The biggest help for me was the lab portion of your course. It was good to go through all the lecture to lay the foundation. But, to actually go through and get the hands-on experience was the biggest thing for me.”

Manipulation and parts of the LMCPR are psychomotor skills which are effectively learned through doing it, rather than simply thinking or talking about it (Rappolt & Tassone, 2002; Salbach et al., 2011). George supports this point when he responded, “I felt the lab section was the most helpful because it allowed me to be able to immediately be able to put what I had just learned to practice.”

Another course related activity that was frequently reported (10 participants) as a facilitator to adopting LMCPR and LM was the 15 minute training transfer lecture and group activity, presented at the end of the course. This course component was designed to facilitate awareness and self-reflection on the training transfer process by presenting research on the “training transfer problem”. It also included a small group discussion (ideally with co-workers), where group members were asked to discuss possible barriers to adoption they would face once back on the job, and how they would overcome them. Also, it provided them an opportunity to start an implementation plan related to adopting the newly learned skills once they returned to work.

While training transfer researchers (Carnes, 2010) have suggested that establishing implementation plans are helpful in the adoption process, no course attendee indicated that they had ever attended a physical therapy course before where training transfer was discussed so openly and was a focused activity. Many commented on the value of this part of the course in their adoption efforts. These comments included

descriptions that this activity helped facilitate their thinking about adoption, adjusted their expectations about the difficulties in adopting, and served as a personal challenge that motivated them to make extra efforts to adopt LMCPR and LM. Trisha's six week interview response illustrates the first comment about facilitating thinking and reflection on the topic of adoption,

“It [training transfer course component] forced you to think right then, when I get back to the clinic what is going to happen, instead of...you know, what are we going to need to do to incorporate this...because a lot of times at the end of a day, or at the end of a course, you are already brain dead, and you leave there and that is the last thing on your mind...then when you start work the next day, and you just pick up with that patient and keep going and that's when it gets forgotten about. That's definitely a huge part of what everyone needs in order to start incorporating it into their clinic, to make them think...it forces you to think, “how would we realistically adopt this, what would we need to do to the way things are going now”. I think we discussed [in the small group discussion activity] the paperwork, and the things we needed to change, and we made notes right then instead of waiting to when you return to work and you are busy. It forces you to take time to stop and write down what needs to take place. That's why I liked it.”

Clay demonstrates the next point about how this training transfer component helped set expectations about how hard it can be to actually adopt training into practice. He stated in his six week interview:

“You know it kind of makes you aware that the odds are stacked up against you. When you go to a course like that you get all amped up, like “I am going to do this”, and then Monday comes around and you are like “how do I do this again?” Just to know that it is hard to adopt, and that there are barriers to adoption. I think that does help, it just gets you in the right mind set.”

Finally, two attendees mentioned how it served as a personal challenge to them to put in extra effort to improve their chances of succeeding with adoption. Leslie stated in her six week interview:

“I think back on other courses I have taken , and some that I adopted and some that I haven’t, and some that you start trying it out and it just seems cumbersome and doesn’t seem that effective so you drop it, but you probably didn’t give it a full chance. I think when you brought that up [training transfer problem] it challenged me a little bit to really stick with it to see if it works...”

Jen stated in her six week interview:

“... I think it is a great challenge for people who did take the course to say “hey, let’s be the exception to the rule, this is what typically happens and lets change this...”

The last training design factors that participants reported facilitated their adoption of LMCPR and LM were post-course components of the training program. Research shows that post-training support is generally helpful in the adoption process (Brennan et al., 2006; Cleland et al., 2009; Davis, et al., 1999). There were three frequently mentioned post-course components of the training program that were perceived as

facilitators in the adoption process: the blog, participating in the research study, and the algorithm (job aide).

The first post-course training component, as reported by 13 different participants, was the blog weekly email and blog system. The blog was introduced as a means to try to establish a post-training electronic community of practice (eCoP). Such a community has been shown to have some influence on members' behaviors, and provides support to like-minded peers, ideal for a geographically dispersed cohort group (e.g. CEU course attendees) who are all trying to achieve a common goal (i.e. adoption of a new skill) (Barwick, et al., 2009; Fung-Kee-Fung et al., 2008; Ranmuthugala et al., 2011; Tax et al., 2012).

The blog component consisted of a weekly blog email, which included the blog message and a link to the blog website. The blog site provided password protected access to all past blog postings made by the instructor or past course participants on the topic of LMCPR and LM, as well as allowed any participant to post a blog comment. Throughout the study period from September 2012 to March 2013, the primary blog activity consisted of the weekly posting by the primary instructor/researcher. The only participant postings during this time were three postings by two participants (see Appendix S). While the lack of interaction between participants on the blog clearly did not make this forum an electronic community of practice (Wenger et al., 2002), most all study participants (and all 10 case study participants) indicated that they received the weekly blog email, and many said they read at least some of the instructor blog postings (see table 23).

There were two primary ways the weekly blog email and blog system reportedly facilitated participant's adoption: increasing knowledge and serving as a reminder. The weekly postings were designed so the instructor/researcher (blog master) could introduce, throughout the September 2012-March 2013 study period, current research related to LMCPR and LM, address common questions that come up in courses, and share any information received from participants that the blog master felt would benefit all course attendees (e.g. success stories, or difficulty with certain aspects of using the innovations with recommended solutions). This weekly posting of new information provided a form of extended training for some participants. Many stated certain topics helped them learn something new, and this had an impact on their adoption. One example comes from Lilly, who was explaining that her use of hip internal rotation measurement had increased after the course due to having a better understanding of why this measurement was important, and this came from a post-course blog posting. She stated,

“I still look at ...my challenge with it [hip internal rotation], and one of your recent blogs kind of helped in making the connection of hip internal rotation.

Because I can make the connection with the other four criteria, but it was always questionable on the hip internal rotation...”

Not only did the blog increase participants' knowledge of LMCPR and LM related topics, but the weekly blog email and blog system also seemed to serve as a reminder. For example, Mary stated,

“I would think yup, I look at my schedule and I usually check my emails in the morning and at lunch, and it [weekly blog email] was just a constant reminder that

I see your blog and I know if I have an evaluation that day, I kind of plant it in my head that I need to make sure, especially if I know if it is a LBP, that my main focus of my evaluation will include taking time to include all those [LMCPR] criteria. So, yes I think it [blog email] is a good reminder to just kind of put a pre-thought in your head of what you are going to do...”

Not only did it remind participant’s to perform aspects of the LMCPR and LM innovations, but several participants also reported it also kept the previously learned content fresh in their minds, making it easier to use.

The second post-course training component that was frequently (11 participants) indicated as a facilitator of adoption of LMCPR and LM was receiving serial post-course questionnaires and interviews. This, combined with the understanding that they were participants in a research study, seemed to remind and motivate them, and in some cases even created a sense of accountability to the researcher, to try out the innovations. Todd stated in his twelve week phone interview,

“I certainly think doing the study that we are doing makes you more accountable to it [adopt LMCPR and LM] because you want to make sure that you are adopting the things that we’re trying to include, and when you are being asked [in follow-up questionnaires and interviews] about it [LMCPR and LM] you are going to be more accountable towards it...”

In addition, the phone interviews and questionnaires were reported as being helpful in stimulating reflection on the course content and the adoption process, and provided opportunities for the participants to ask questions and have a conversation about

the course topics with the lead instructor (who conducted the interviews as the researcher). One example is expressed by Keith in his twelve week phone interview as he explains why he increased his use of LM when patients have 3 of 5 LM CPR criteria present,

“I think after the [six week] interview. I think it was clarified by you in our last interview. There is a 68% chance that you will have a 50% reduction in MODI [if the patient has 3 of 5 criteria]. Last time I could not remember the numbers, but after talking to you, you reminded me that if they still have 3 criteria, they still have a 68% chance that the MODI can decrease by 50%. So, it was a reinforcement that don't just go for the 95% chance of a 50% reduction [with 4 or more criteria], but 68% chance is just as good.”

Jesse: “Yes. So, you got that during our last interview.”

Keith: “Yes, it was a reminder.”

For some, these influences are subtle and consistent with what would be expected from the Hawthorne effect (McCarney et al., 2007). For example, Mary and I had the following exchange in her six week phone interview,

Jesse: “Do you think your participation in the study changed your adoption process or your outcome?”

Mary: “If you would not have asked that question I probably would not have thought about it, but now that you say it I think subconsciously, yes a little bit, just doing some extra stuff outside of work, and that I want to make sure that I

was at least trying it. Again, I would not have thought that of it, but since you asked.”

While some researchers would be concerned that this influence of participating in a study has skewed my adoption data, I take the stance that it was being skewed purposefully (i.e. by design) with using post-course questionnaires and interviews as components of the overall training program, and at the same time for research purposes. For example, an instructor following up with students after a course and showing a concern for what they are doing with their new skills should have an influence towards improving their adoption. Why not use this as a tool to facilitate adoption, and collect student/participant feedback at the same time?

However, it is not clear to me how much of this positive influence was attributed solely to the questionnaires, interviews, or knowing that they were participating in a study. It seemed to vary from person to person. For example, one participant indicated that the questionnaire got him to reflect more than the interviews. Several others suggested the interviews had more of an impact. For example, Jen in her six week interview stated,

“I think up until this point it hasn’t, but I will guarantee you, I wouldn’t guarantee you, but I would say there is a high likelihood after the interview, and we’ve chatted a little bit more and I have put this into perspective that hey, I have been given these tools and I am not formalizing it, pretty much due to the excuse that I am too busy, which to me that translates into a little bit of laziness. I am going to be more likely now that we have had a verbal conversation post – course as the

reminder that hey these are here as an available resource for you...you haven't used it, but you still can. I think the fact that you are doing an interview, as opposed to just a paper survey is going to increase the likelihood that if someone has not adopted they are more likely to do so moving forward.”

Still others suggested that the combination of questionnaires and interviews were influential in their adoption process. Finally, for some the fact that they were participating in a study influenced them to adopt or at least try out the innovations more steadfastly than they might normally.

So, with support for all three post-training factors related to following up with the participants (i.e. questionnaire, interviews, and letting people know that their data is being used for research purposes), I have packaged these together as one post-course training component. Realizing that typical CEU companies cannot reproduce the quantity of post-course questionnaires and interview time that I completed in my study for all of their students, perhaps using these elements in a more simplistic form might still hold some benefit in terms of facilitating adoption. For example, a model where the course instructor sends a post-course email-based questionnaire checking on the student's post-course adoption, conducting a brief one-time phone interview asking about their use of newly learned skills on the job, and even suggesting that their participation in the post-course data collection is being used to improve future courses and help future course attendees (perhaps this may be perceived as a form of research by course attendees), would have a similar impact as what I have done in this study. The extra benefit of this post-course training component is that feedback/data gained from the follow-up method

(e.g. questionnaire) can then be shared with the course attendee community through the instructor's future blog postings (i.e. sharing real-time user feedback with ongoing course participants). Several participants indicated that such feedback incorporated into the blog content gave them ideas on how to better adopt LM CPR and LM. This point will be discussed later in this chapter as I present findings related to design based research.

One final post-course component that was frequently (10 participants) reported as facilitating adoption of LM CPR and LM was the clinical prediction rule Algorithm (see Appendix H). This was given to all course attendees and used during the course on case studies to provide practice using this job aide. The attendees were encouraged to use the algorithm as a job aide once back on their work site so that they could easily remember the criteria to measure and the evidence on the likelihood of success given the presence of a certain number of criteria. It also provided the perspective of how to decide if a low back pain patient should be treated with manipulation, stabilization, or directional specific exercises using three independent clinical prediction rules. Once again, the primary focus on this study was the adoption of the LM CPR and LM only.

One mechanism by which the algorithm facilitated adoption of LM CPR and LM was by helping the participants keep their thoughts organized during the evaluation process. Trisha expressed this idea in her six week phone interview by stating,

Jesse: "So, why do you think you were successful [in adopting LM CPR and LM] this time? What is different this time compared to last time [in 2008] when you attended similar training and did not adopt?"

Trisha: “I think the algorithm is easier to follow... It just keeps everything in order and keeps your mind on track.”

In addition, some participants felt that the algorithm served as a reminder of what they had learned in the course and what had to be measured during an evaluation. This was particularly helpful as the clinical prediction rules require knowing detailed facts such as five criteria, cut-off scores and measurements, and percentage likelihood of success given the number of criteria present. George indicated in his six week interview,

Jesse: “How did you remember at that point to do the MODI and FABQ?”

George: “I keep the algorithm. So, just based on looking at that, and seeing what each one entails, it teaches me to get the patient to fill out the MODI and FABQ beforehand.”

Several work environment factors that facilitated adoption among participants highlighted the importance of social factors when making changes to practice behaviors. These will be discussed below. However, the algorithm seemed to serve a central role in facilitating getting co-workers standardized, and helping to establish new clinic norms on performing low back pain evaluations. Tim explained in his six week phone interview, “...I think it [algorithm] has helped out a lot that everyone is on the same page, and that we all want to try and use the algorithm.”

John further supported this concept during his twelve week phone interview by saying,

“ Yes. We just hired a new PT. They are shadowing right now, but they start next week. We have the algorithm posted next to the computer, so we went over that with them. We went over what our beliefs, and how we do our treatments.”

Finally, several participants gave examples of how the algorithm helped facilitate communication between co-workers, physicians, physical therapy students, and patients. When communication is going well, this seemed to facilitate the acceptance of new methods such as using LMCPR and LM.

**Trainee characteristics.** There were many factors (see Appendix R) that participants indicated helped them adopt LMCPR and LM that were related to the specific characteristics, decisions, and/or that were centered on the trainee. All of these codes and themes are listed in Appendix R under Trainee Characteristics. The most frequently (12 participants) reported trainee centered facilitating factor in leading to adoption of LMCPR and LM was the participant using (and/or practicing) the innovations. Simply put, this seems to support the old adage if you don't use it (i.e. either on patients or co-workers) you lose it, especially when you are just starting to use it.

While some participants made the decision to practice systematically for the first few weeks after the course (e.g. over planned lunch periods with co-workers), others practiced more informally whenever they had time (e.g. if a patient cancelled), and still others skipped practice, and preferred the efficiency of just using the new tools directly on patients. So, while not all case study participants practiced (although most did), all case study participants did perform manipulation on patients by the end of the twelve week study, except for Susan, who was the only one to not adopt LM (see table 5).

Whether using LMCPR and LM on patients or practicing with co-workers, participants described some common mechanisms by which use of the innovations

seemed to facilitate their adoption. These mechanisms included building confidence, as reflected by Tim and George's twelve week interview statements:

Tim:

Jesse: "Your confidence for using LM has gone from agree to strongly agree, so it seems your confidence has increased for doing manipulation, is that true?"

Tim: "Yes, I would say so."

Jesse: "Why is that?"

Tim: "Just a little bit more practice..."

George:

Jesse: "Your confidence for using manipulation increased from agree to strongly agree?"

George: "That goes back to the practice that I did."

Participants further linked their increased confidence with a decrease in their perceived risk of injuring a patient with manipulation. For example, John stated in his twelve week interview, "After dealing with more patients you just have more confidence that it is working, and you are not really hurting them."

Also, this increased confidence was linked to decreasing the use of screening criteria (or unofficial exclusion criteria). Clay stated in his six week interview that as he gains confidence, he would be more willing to use LM on patients with symptoms below the knee. Note that symptoms below the knee is not an official LMCPR exclusion criteria, but a screening criteria that he added early on in order to make trying out LM safer (i.e. he felt he would be less likely to hurt someone with LM if he did not use it on

anyone with symptoms below the knee, regardless of how many other LM CPR criteria the patient had),

“...I am relatively new at this [doing LM]. I feel a lot more confident than I did even a month ago. So, as I build confidence, if I try it [LM] on 1 or 2 patients and have good outcomes, I may be a little bit more relaxed about rolling it out just a tad, with their little bit of radicular symptoms [i.e. symptoms below the knee] or whatever.”

I will describe the impact of lessening screening criteria on adoption of LM in more detail later in this chapter as I describe inductively developed theories related to the adoption process and screening criteria. However, a quick synopsis of this theory is using less screening criteria allows the participant to qualify more patients for LM, which provides more opportunities to use LM, and this then leads to increase use of LM.

Finally, increased use of LM builds confidence, which in turn facilitates adoption of LM.

In addition to building confidence, using the innovations reportedly increased comfort in performing the manual skill of manipulation and the concept of using the innovations in general. John stated in his six week interview, “and I think the more you practice winding patients up and stuff like that it just helps you feel more comfortable when you do have to do the manipulation.”

Mary stated in her twelve week interview,

“I had been practicing a lot more and utilizing it [LM] a lot more since our last conversation, and I find that that makes me a little more comfortable too...”

Another mechanism by which the use of LM is increased is through the participant's decision to use the LMCPR tool (i.e. all five criteria). While it was pointed out early in this paper that LMCPR and LM are two separate innovations, adopting LMCPR seems to facilitate the use of LM by efficiently and thoroughly identifying patients that would be appropriate for LM. This seemed to be true for both therapists new to manipulation as well as those that were already using manipulation (e.g. John and Jeff).

Finally, increase use of LMCPR and LM facilitates adoption of both innovations by making it easier to recall the procedures, which then requires less work to use. This was explained by Mary,

“At this point, I have been using the [LM]CPR with most all of my MLBP evaluations, probably because I have used it enough that I really have most of it memorized so there is really no extra work involved.”

Another trainee characteristic that was reported frequently (8 participants) as facilitating adoption of LMCPR and LM was feeling accountable to adopt or use these innovations. Participants reported they felt accountable to their patients, co-workers (that attended the course), supervisor (that played an active role in the adoption process), profession, themselves, and the researcher. These feelings of being accountable to change seemed to manifest primarily in increased efforts in trying out the innovations. Tim indicated his sense of accountability to his 2 other co-workers that attended the course with him,

“Yes, I guess [I feel accountable] especially to the people at the clinic that were there. Especially since we were trying to do it as a whole clinic thing, I didn’t want...you don’t want to be the one that starts slacking off on it so...”

Mary, in her role as a study participant, indicated her sense of accountability to me, the researcher, to at least try the innovations. She stated,

“To be honest I also felt a little responsible to report back to you about how it was going because of being in this study for you. So I felt like if I was going to give you any accurate information I might as well give forth an effort, practice it, and use it, and tell you what I really think.”

George focused on his sense of accountability to his patients in providing the best care available, by stating,

“I think the main individuals that I felt accountable for is my patients. Mainly because by following it, it kind of leads you to the type of treatments that provide the most relief, or most likely chance of having improvement of their symptoms. So by using it as a guideline, I felt that in the long term I would benefit my patients the most.”

Furthermore, five participants indicated that adopting LM CPR was made easier because they were already measuring some of the five criteria before the course, indicating that some of the criteria were consistent with their existing personal practice (see tables 14 and 15 for pre-course LM CPR behaviors). In these cases, instead of having to learn a new behavior, they just needed to think about data they normally

collected a little differently. When I asked Clay in his six week interview, what seemed to help him adopt using LMCPR, he stated,

“I think I was already doing a lot of that stuff. There were a couple of things that I was not measuring. It [LMCPR] definitely helped me look at it in a more organized fashion, but I was already measuring a lot of that stuff.”

Finally, one trainee characteristic related facilitator that was derived from the close-ended questionnaire data (and thus is not included in the Appendix R outline) is the overall favorable perception of LMCPR and LM by the participants. These perceptions, and the related questionnaire constructs, were described in detail in research question #1b. While no one favorable perception construct (e.g. relative advantage) seemed to act alone as a facilitator, the overall cluster of favorable perception constructs as reflected in tables 20 and 22 seemed to match up with the overall high rate of adoption of LMCPR and LM. This is consistent with Rogers (2003) findings regarding perception of characteristics of innovations and adoption rates (i.e. the more favorable the perception of the innovation, the more likely adoption will occur). In addition, the only person to not have an overall favorable perception of LM based on the 9 constructs in table 22 was Susan (i.e. only 2 of 9 constructs were favorable at 12 weeks post-course, whereas the other case study participants had 7 or more of the 9 constructs as favorable at 12 weeks post-course). Once again, Susan was also the only case study participant to not adopt LM.

**Work environment.** The third category of training inputs that influence adoption are work environment related factors. Most of these factors reported by my study

participants reflected the social nature of the adoption process. For example, one of the most commonly reported (8 participants) work environment related facilitators of adoption of LMCPR and/or LM was attending training with a co-worker.

Half of my case study participants attended training with co-workers (see table 3). Of the 10 case study participants, only 4 did not have co-workers. This left only one participant, Keith, who had a co-worker, but attended on his own. The participants who attended with co-workers suggested that these co-workers facilitated their adoption process after the course by providing a form of peer influence to change, support, being on the same sheet of music in terms of knowledge and forms required to facilitate use, and serving as trained practice partners.

Peer pressure is usually associated with peers influencing others to join in undesirable behavior. However, in this case, co-workers (peers) are influencing each other to follow through with plans to adopt new behaviors. At the same time they are providing support to each other in these endeavors. This was reflected in Tim's exchange with me during his twelve week phone interview,

Jesse: "What do you think helped the most in terms of you guys succeeding in doing that [Tim and all co-workers adopting LMCPR]?"

Tim: "I think it was having multiple members of our staff at the course. We had three of our four PTs at the class. So it was kinda like, everyone was doing it and keeping the practice up, and we were all motivated to make it work that way you can't ...if you see someone that is about to get a new back patient you can bring it up and just remind them. "

Another way attending a course with a co-worker was reported as facilitating the adoption of LM CPR and LM was by insuring that everyone in the clinic (or however many attended the course) all have the same knowledge base (i.e. explaining is not needed between the co-workers). This seems to be part of the process of changing a clinics norms and standardizing new practices without a mandate. Trisha stated in her six week interview,

“...It would be hard for me, for one, to take the time... with here we hit the door and we are seeing patients and we are busy you know. We have lunch together, not every time, but it is just so busy, we often don't have the time to settle down and explain it to everyone, it's just, if a clinic is going to pick it up all the therapists just need to go to the course...”

Another part of the process of standardizing a clinics practice is ensuring standard paperwork is incorporating newly learned tests and measures. Having co-workers attend the same course was reported as helpful in getting changes to forms implemented. This type of formal system change was linked to increased adoption, and will be explained more below. Tim supported this point by stating,

“Without having a group effort we might not have made the changes to the exam forms... I think it is definitely more likely to work out in the long run if you have more than one person that goes to the class.”

Finally, co-workers that attend a course together can serve as practice partners who can provide useful feedback. Mary described how it was helpful to have one of her

co-workers attend the course with her and later this person was able to provide detailed feedback during practice sessions,

“It is one thing to practice on patients, which is great, but it is very helpful when you do it on someone that knows what they are doing. That is one thing John can tell me “no you don’t have me at end-range”, patients don’t tell you that. They don’t offer that information.”

Another social oriented work environment factor that was frequently (8 participants) cited as playing an important role in their adoption process was having co-workers using LM CPR and LM in their practice. Participants indicated that having co-workers that were already experienced in using these innovations helped them adopt by providing guidance from a relative expert and by providing a model of what to expect when using these innovations on patients. Todd expressed this first concept in his six week phone interview,

“Because I never had felt confident in knowing how to use them and so having him [experienced co-worker already using LM CPR and LM prior to the course] here to always check-off and “Ok I did this one and I didn’t really get the cavitation, or what I wanted out of that, why and what do you think I missed.”

And I might have him sometimes go and do it to the patient, so some collaboration there, or give me some more input, or show me some variations of what you can do...”ok if it didn’t work this way try this way or this way or this way.”

Lilly described in her six week interview how working in an environment where other co-workers are modeling the innovations and having good outcomes facilitates adoption,

“working in that environment where you have therapists who are all kind of utilizing that type of treatment, that it would kind of make you want to do the treatments that they are doing to get the outcomes that they are getting.”

While the outline in Appendix R lists other work environment social oriented factors related to adoption (e.g. consistent with social norms and standards), the last I will present here is the concept of a sharing patients clinic model. Five participants indicated that working in a clinic where co-workers share each other’s patients facilitated their adoption of LMCPR and LM. John explained such a system and why having similar practice behaviors between physical therapist is important in this setting,

“In our clinic it is a little bit different than any other clinic that I have worked at. Our clinic, if a patient has...if a therapist has an appointment slot open, we put any patient there. We share patients at our clinic. So it just helps when you one therapist is doing a manipulation and the next time a patient comes in and they are not wondering why we are not doing a manipulation, or why we are not doing this kind of exercise. It is just nice for us all to be on the same page, so we can describe the same thing to patients, they understand what we are doing.”

Given the importance of maintaining a continuum of care for the patient across various therapists over various visits it is easy to see why being on the “same page” is important.

Another factor that is external (i.e. work environment) to the trainee and seems to facilitate adoption of LMCPR and LM is having success with these tools. During the

course success was defined as getting a patient 50% better with up to one week of LM treatments (i.e. as seen in a 50% reduction in MODI). Not everyone used the MODI to determine this success; however, most seemed to have the expectation that improvement should be quick and significant when used on the appropriate patient. As it turned out, every participant who tried LM on patients reportedly did have “success” when the patient had at least 4 of 5 criteria, and most also reported success with using LM on patients with 3 out of 5 criteria. This supports previous research findings on this topic (Childs et al., 2004; Flynn et al., 2002).

Success with using these tools seemed to lead to increased confidence and motivation. For example, during Mary’s six week phone interview she illustrated how having success motivated her to continue to practice LM,

“Well, I think it is beneficial. The few people I have done it [LM] on I have been successful, and I think that this is definitely a tool I should have in my tool box.... Just seeing the benefits already that will make me want to practice, and that it is a good thing.”

Also, Trisha in her twelve week phone interview stated using LM and having success with a large, technically challenging, patient increased her confidence.

Using these innovations was already pointed out as being a trainee characteristic factor that facilitated adoption, but what was not discussed in that section was the underlying assumption that success likely plays an important role at some point in that trial process. Although I did not have any participants report having a poor outcome with any attempts of LM, it is logical that if someone is trying out a new innovation that is

reported to have good outcomes, and they are not seeing good outcomes, that they would then abandon efforts at adoption. Likewise, if a participant is being told that LM will get their patients better fast, and they try it out and indeed see that it is getting their patients better fast, then they would be more likely to adopt this innovation.

One participant, Susan, suggested that having an opportunity to use LM, and having success, would be key to her adopting. This supports my conjecture that having both the use of the innovation and success with using the innovation as key factors in adoption. She stated in her six week interview,

“I think I would just need to see someone who fits the criteria, who is within the age limits, and has no contraindications, and actually do the technique [LM] on them and then have success, for me to feel like I can truly adopt them [LM] into my treatments.”

Perceived opportunities for using LMCPR and LM are listed in tables 20 and 22 for the 10 case study participants. Perceiving opportunities to use LMCPR seemed to be related to simply getting low back pain evaluations. Whereas perceiving opportunities to use LM was linked to having access to acute low back pain patients (those with pain less than 16 days per the LMCPR criteria) (see table 3). Todd indicated how having opportunities to use LM helped his adoption,

“When we first got back from the course, within the first 1-2 weeks we had one person that was less than 16 days that matched the criteria. That was like, “wow, we just talked about how we never get the acute ones and hey here is an acute

one”. That helped everybody [other co-workers that had also taken the course with Todd]”

So, it is clear that Todd was willing to use LM after the course, granted that he had the opportunity to use this innovation. In this case having an acute low back pain patient provided him this opportunity early on in his adoption process.

One participant, Clay, indicated that he started out the study in a clinic where about 50% of his evaluations were chronic low back pain patients. While having so many LBP evaluations allowed him the opportunity to use LMCPR on a frequent basis, he was only able to qualify two patients for LM over seven weeks after the course. However, he then switched jobs to a clinic that he reported had more opportunities to treat acute low back pain patients, and stated,

“I was more like using the LMCPR on pretty much every LBP patient that came in [at the old job site]. But, I didn’t have as much of a chance to use manipulation as much as I would have liked to because not many people met the criteria and I was still not terribly comfortable with it...I think I only used it on 2 people, but since I have been here [at the new job site] I have been able to use it on 3-4 people in the last 2 weeks.”

One work environment related factor that was reported the most frequently as a facilitator (10 participants) to adoption of LMCPR and LM was making system wide or formal process changes. Some participants described an adoption process where they tried out various measurements of the LMCPR in an informal fashion (e.g. handing out the MODI form during the exam, if they remembered). Others made early efforts to

formally integrate the MODI and FABQ forms into their patient check-in process, and add the LMCPR criteria to their evaluation forms (i.e. creating a checklist).

When looking at the reported behaviors of the MODI and FABQ (see table 15), all of the case study participants (i.e. Trisha, Tim, Jeff, and Keith), except for one (George), that reported routinely performing these measurements by the end of the twelve week study period had made such formal systematic changes. Whereas the participants who had not made these formalized process changes, or who were still working on getting them approved and/or functioning properly, were not using either form routinely (i.e. Susan for the FABQ only, Mary, John, Todd, and Leslie).

With Susan's data, the change in MODI at twelve weeks was due to her moving to a new job where they had a formal process of including the MODI in the check-in process. What is not shown in table 15 is her six week report of using the MODI only 20% of the time at her old job site (i.e. without any formal process change integrating the MODI into her patient check-in process). As soon as she moved to her new job, which had fully integrated the MODI into the patient check-in process, Susan's MODI use went to 100%. This new job did not have a similar systematic process for the FABQ (and her use of the FABQ remained at 0%). Susan explained this influence on her behavior in her six week interview (before moving to her new job),

“Currently if I give it [MODI] out it is me who has to think of it. It doesn't get completed by the patient before they come back for the evaluation. So, I think that is one of the major things [barriers]. Actually, what is going to be happening in the next couple of weeks is I am going to be transitioning to a new clinic where

I know they give that out as one of the pre-evaluation forms [part of the check-in system] that the patient has to fill out so I think that will allow me to increase my frequency.”

Here is Trisha describing that her clinic (which includes her co-worker Tim) made systematic changes to their process,

“...We have already adopted all the paperwork. So when we have the back evaluation we have your form [evaluation form] in there ready, we have the MODI, and the FABQ, we have all of that ready to go.”

Finally, Jeff, in his twelve week interview, is explaining why he thinks his MODI use is up since his baseline twelve weeks earlier (see table 15),

Jeff: “We have actually incorporated that [MODI] into our...here at our business we have the patient re-check with the doctor at least every 2 weeks, so we use it as part of our intake paperwork. And we use it as part of the paperwork before they go back and see the doctor. So, it has made that a lot easier because now we have regular intervals where we can say, ok it is time for this so let’s fill that back out again.”

Jesse: “Ok so you have it worked into your system.”

Jeff: “Yes. I think that is where the increase has come from. Now we have it systematically in place finally.”

The final work environment factor that I will present is about a physical therapy students’ adoption of the LMCPR and LM and the impact having a clinical instructor using LMCPR and/or LM has on this adoption process. Even though my study was

conducted on licensed physical therapists, as I gathered baseline information on their prior training in LM CPR and LM, one clear theme came through, that study participants (John, Jeff, and Lilly) who had learned LM CPR and/or LM in physical therapy school and were able to adopt these innovations into their entry level practice behaviors all had student clinical experiences where their clinical instructors used these innovations and encouraged the student to use these innovations. On the other hand, the study participants (Susan, Leslie, Tim, and Trisha) who learned these innovations in physical therapy school, but then did not have a clinical instructor who used and encouraged the use of these innovations, did not adopt these tools into their entry level practice behaviors.

These findings are consistent with other researchers' recent findings on physical therapy students' use of LM CPR and LM, and the critical role that clinical instructors play on the students' use of these tools during their clinical affiliations (Sharma & Sabus, 2012; Struessel et al., 2012). My findings add to this existing literature since it looks at the impact of not using these tools in the clinical affiliation, and shows that the result of this disuse in not adopting these skills after physical therapy school. Also, it shows the results of using these skills in their clinical affiliation are adoption of these skills upon graduating from physical therapy school. This concept is best illustrated by Jeff's six week interview comments,

“I had a real good clinical instructor in my first true outpatient rotation, who kept up with the research and seeing the research. So, we practiced this stuff daily while I was a student. We were practicing, if not on patients, then at least on each

other, and talking about what the research says and kind of talking about the types of manipulations throughout the entire spine. So, once I got done with that rotation it [LMCPR and LM] just kept following with me.”

This shows what training transfer researchers have known for a while now, that learning something does not mean it will be used. In this case learning LMCPR and LM in physical therapy school is a start, and then this must be followed up with use while on a clinical affiliation. This use will be facilitated by having a clinical instructor who uses it and encourages the student to use it. This clinical experience use will then be more likely to translate into entry level practice use. This points to the importance of getting clinical instructors using LMCPR and LM in order to model that behavior for their students.

**RQ2d.** What difficulties/barriers do participants experience in adopting LMCPR and LM as part of their practice?

**Summary.** There were several key difficulties/barriers that participants experienced while trying to adopt LMCPR and LM. These were categorized as trainee characteristics and work environmental barriers.

As discussed in the prior research sub question on facilitating factors, the barriers to adopting LMCPR and LM were also categorized as trainee characteristic or work environmental barrier. However, unlike the facilitators, there were no barriers to adoption that could be classified as training design related. There were a few barriers to

using some of the training design features (e.g. barriers to using the discussion board, metric tracker, and the blog), but those will be presented in RQ3c.

**Trainee characteristics.** There were a wide variety of barriers to adoption of LMCPR and LM related to the trainee's characteristics. Most were only reported by one or two participants, but a few were reported by many of the participants.

The most widely reported trainee characteristic (12 participants) related barrier was the use of screening criteria (i.e. additional criteria not included in the LMCPR) when using the LMCPR and LM. Such non-LMCPR criteria not only reduced the use of some of the LMCPR criteria, but also reduced the use of LM for those that technically had 3 or more of the LMCPR criteria, and therefore likely would have had success with LM.

The screening process will be explained in more detail later when I present it as an inductively developed theory, but for now a simple explanation is most participants did not simply measure all five LMCPR criteria on every low back pain patient to decide who would need LM. Instead, they used their own screening criteria (based on personal experience and beliefs), to decide who to try out the LMCPR and LM on. If a patient did not meet their personal screening criteria, then parts or all of the LMCPR and/or LM would not be used on the patient. As a result of this screening process, participants felt safer and more comfortable in trying out the innovations, but the secondary impact of this decision was it contributed to early inconsistent and limited use of the tools. This in turn reduced their opportunities to use these innovations, which then became a barrier to adoption.

The most frequent screening criteria used were when the patient was perceived to have a low pain tolerance or in a lot of pain. During the evaluation, if the therapist perceived (based on various biases) that the patient would not tolerate the twisting positions required of the Chicago roll (the manipulation maneuver learned in the course), then some decided to not even consider manipulation as a treatment, even if the patient had enough LM CPR criteria indicating that this treatment was appropriate and would very likely help. Mary stated in her twelve week interview,

“...those patients that come in and if you literally touch them they are in terrible pain, and I have not had a ton of those, I can think of one person in particular that I have seen over the last 6 weeks that I had. No matter what, I still did not do it [manipulation] on them, even if they met 3 or 4 of the [LM CPR] criteria...”

Ironically, the therapist deciding to apply these screening criteria even when the patient qualifies for LM takes away a treatment (i.e. LM) that is arguably most effective for those very same patients that are in a lot of acute pain.

Another screening criterion that participants used was eliminating patients from receiving manipulation based on their perception that the patient had secondary gain issues, in other words they were seeking health care for other reasons than simply to get rid of their pain (e.g. seeking to avoid work or build a law suit to gain financial reward). Manipulation was generally seen as an aggressive treatment, which made some of the therapists feel vulnerable to exploitation when used on patients that were seeking secondary gain or malingering. Tim gave an example in his six week interview,

“...her symptoms were all out of proportion to her description of the injury, and from the doctor’s note that I read, he was more or less thinking the same thing. It seemed she was looking for a lawsuit. For her, I think she probably would have met the criteria, she might have had 3 of the 5, since she really seemed like she had alternative motives I was just going to go with something conservative as possible [i.e. not LM]. I was almost positive she was faking it, so I took that into consideration...”

Some described a preferred hands-off approach to treatment as being used in these situations, such as lumbar stabilization.

Some therapists suggested that performing the Chicago roll manipulation was technically hard to do on large patients (i.e. hard to side bend and rotate them) and/or those with large round abdomens (i.e. hard to get leverage on the appropriate bony landmarks when thrusting). Anticipating this challenge, some would opt for other treatment approaches than manipulation, even if such a large patient qualified for manipulation using the LMCPR.

If the patient presented with distal symptoms (i.e. pain below the knee, with no true indication of radicular symptoms), several of the participants would screen out these patients from receiving manipulation. Since having pain below the knee, without signs of a nerve root impingement, is not an official LMCPR exclusion criterion, this decision to screen out this sub population led to a decrease in opportunities to perform LM. Keith, in his six week phone interview, describes how premature screening can also decrease the opportunities to perform LMCPR measures as well,

“...if the patient... [has]...sciatica [i.e. symptoms below the knee], a lot of times I don't ...I already exclude manipulation out of the equation already from that treatment category. I exclude them from doing the FABQ because I know that most likely I will not do manipulation...”

While screening criteria artificially limited the opportunities to use LM CPR and/or LM, another trainee characteristic focused barrier that also limited the opportunities to use LM CPR and/or LM was when the participants made a decision to only adopt some of the LM CPR criteria in their practice. Ideally, each low back pain evaluation should include all five LM CPR criteria. If this is done every time, then more patients are likely to be found that qualify with at least 3 or more of the 5 LM CPR criteria. If some of the measures are not used (e.g. FABQ), then some patients may be found with only 2 positive criteria, and thus not be offered manipulation. In this scenario, if the criteria not performed would have been positive, then the patient would have qualified for LM (i.e. 3 positive criteria). In this example, a decision to not adopt the FABQ not only takes away from an opportunity to practice the FABQ, but also LM. Only 5 out of the 10 case study participants were using all five criteria routinely by twelve weeks post-course (see table 15).

For some participants the reason for not completing some of the measurements came from short-cuts they presumed they could take based on invalid assumptions they had about FABQ scores and limited trunk motion. Some indicated that they could get a gut feel for a low FABQ score, and thus did not need to officially measure this instrument. One participant indicated that her assessment of general trunk range of

motion could be used in lieu of joint play assessment. No research supports these assumptions, and thus these deviations from the original criteria (in this case measuring the FABQ and lumbar spinal segmental mobility testing) are not recommended (Calley, Jackson, Collins, & George, 2010).

Several participants indicated that performing manipulation was not consistent with their typical treatment approach which involved more talking and demonstrating rather than performing hands-on treatments. As indicated above, some therapists suggested that manipulation was as an aggressive (i.e. rapid significant improvements expected, with perceived increased risks by some therapists (see table 22)) hands-on treatment. So, if a therapists was used to using a conservative (i.e. slower incremental improvements are expected, but with less perceived risk of injury) hands-off treatment philosophy, then manipulation would be inconsistent with their care philosophy.

As mentioned above, manipulation was perceived by some as having increased risks. These risks were manifested in fear of hurting the patient, fear of being sued, and fear of losing credibility. Keith described that the informed consent process of using LM involved telling the patient the odds of success with manipulation given how many criteria they have. When telling a patient they have a 95% chance of success with a treatment, the patient assumes they will have success (i.e. they will not be the 5% that do not have a 50% improvement over several treatments). Keith felt this puts the therapist's credibility at risk if the outcomes do not come out well. He pointed out that when first learning to use manipulation the patient outcomes may not be as good for an inexperienced manipulator as with an experienced manipulator due to not doing the

techniques as well (i.e. getting to end-range). So, initially the risk of losing credibility is likely higher when first trying out manipulation, but this risk would be expected to decrease with increasing experience.

These increased risks were linked by some participants to their level of comfort and confidence in the LM CPR and LM innovations. One final training characteristic oriented barrier to adopting these innovations is having low comfort and low confidence in using these tools. Kelly stated in her six week interview,

“I found the positioning [for performing the LM] to be difficult for me, and I was not physically comfortable. And if I am not physically comfortable then I can’t bring across that confidence to the patient.”

Although she did not state this, her quote also provides a glimpse of where she might be at risk for losing credibility with a patient if she attempted manipulation, but did not appear comfortable doing it.

Susan indicated that her decline in intention to adopt LM over the twelve week period was primarily due to her lack of confidence in performing LM. With a decline in intention to adopt, I found some evidence that the likelihood of adopting goes down. Thus her lack of confidence in performing LM became a barrier to adoption.

Of the 15 participants that responded to at least the six week phone interview, only two gave strong indications at six weeks post-course that they were not adopting LM (Kelly and Susan). Kelly and Susan immediately after the course indicated that they intended to adopt LM, and by six weeks both reported being unsure about their intentions to adopt. Also, during that same time three participants (Kelly, Susan, and Mary) started

with unsure confidence in adopting LM into their practice. By six weeks, Susan and Kelly's confidence had decreased, whereas Mary's confidence had increased. Mary later fully adopted LM into her practice, whereas Susan did not (Kelly did not continue in the study beyond the six week interviews so her final adoption outcomes are not known).

**Work environment.** In addition to training characteristic related barriers, the participants demonstrated several important work environment barriers to adoption of LMCPR and/or LM. The most frequently reported (12 participants) barrier was having limited opportunities to use LMCPR and/or LM in the twelve week study period following the course. During this trial period, some therapists suggested that they had limited low back pain patients, or back patients that simply did not qualify for manipulation. The participants reported the reasons for these limited patients were not having ideal patients (i.e. not acute (i.e. less than 16 days of symptoms), not enough LMCPR criteria present, older than 60, post-surgical), having fewer low back pain evaluations than normal (i.e. due to what they described as normal cycles of diagnoses), and changing work settings. During Clay's six week interview when asked what the biggest barrier to adopting LM was he stated,

“I think it was not having enough people that met the inclusion criteria. I think that was a tough thing. Maybe it was the setting I was in, or who knows, but I didn't use it on that many people, and over the course of six weeks I feel like you just kind of forget it, and I feel like if you don't use it in a week or two it just kind of escapes your mind.”

Here Clay clearly articulates that if not given enough opportunities to use newly learned skills soon after training, then they may be forgotten.

Of the 15 participants interviewed, only 3 (Jen, Jeff, and Leslie) indicated that the majority of their low back pain patients had symptoms for less than 16 days. The other 12 participants all reported less than 25% of their low back pain patients had less than 16 days of symptoms at the time of their evaluation (see table 3 for the 10 case study participants). Since one of the five LM CPR criteria is having pain less than 16 days (and, the short rule LM CPR suggests to do LM if a patient has acute LBP and no symptoms below the knee), not having these patients made it more difficult to qualify patients for LM. Of the two case study participants (i.e. Jeff and Leslie) who had a high level of acute low back pain patients, by the end of the twelve week study they both used LM frequently. John explains the reality of having a limited number of acute LBP patients during his twelve week phone interview, “I am always going with it [LM] if it is less than 16 days and no pain below the knee, I am always doing it then. But, those are really rare cases when they come in ...”

While some therapists described not typically having a lot of acute low back pain patients, six participants indicated that they were going through a temporary decline in the number of low back patients they evaluated during the first six weeks after the course. This was described as a common cycle of varying diagnoses. Leslie indicated this in her six week phone interview, “Yes, everything goes in cycles...right now I am seeing more shoulders and knees and such. Back injuries seem to be down.” This unexpected drop in

low back pain evaluations soon after the course limited some participant's opportunities to use LM CPR and/or LM.

Finally, a few other activities occurred that limited opportunities to evaluate low back pain patients. One was several participants moved to new clinics or jobs during the study. This temporarily decreased their case load, and the number of LBP patients they were seeing. Mary explained the impact of her move,

“Because when we first met and took the class I was working at the down town clinic that was very busy and had tons of LBP. I have recently moved to a new clinic, a place that we have opened..... I have been there for 6 weeks now, and I don't have a full schedule yet. I have had a drop in patients in general...”

In another clinic, a new referring orthopedic surgeon caused most of the evaluation slots to be taken up with post-operative patients, thus limiting the number of LBP patients that could get in to be evaluated. One other therapist started working with a student on a pediatric clinical rotation, and thus changed his schedule to incorporate more pediatric patients, and less LBP patients. So, given all these possible changes, the number of LBP patients available for evaluation fluctuated. If this fluctuation happened to lower participant's opportunities to evaluate LBP patients soon after this course, then this became a barrier to adoption.

Another frequently reported (9 participants) work environment barrier to adopting LM CPR and/or LM was the time constraints of using some of these tools. Although many of the participants already measured 2 or 3 of the 5 LM CPR criteria on a routine

basis (see table 14), pre-course use rate of the FABQ was 0%. So, adopting the LMCPR into their practice meant adding the FABQ to their exam process.

Participants reported the extra time demands of patients completing the FABQ, in addition to all the existing forms that patient's typically complete (note that these same complaints were made for the MODI, but technically the MODI is not a LMCPR criteria), made it hard to justify using the FABQ. Many participants tried to qualify their patients for LM using only 4 of the 5 LMCPR criteria, often leaving out the FABQ. Even those that intended to have their patients complete the FABQ, ran into difficulties when patients showed up for their appointments just on time or late. Jen explained how when patients didn't show up early enough to complete the extra check-in forms (e.g. FABQ and MODI) just prior to her evaluation, then she had to move on without the form,

“When they come in they fill out a past medical history form and a consent form and it can be time consuming when we have the schedule for a certain time, and they show up right on time they still need to fill out their history. And I have someone else coming in 30 minutes, and still another person finishing another treatment, so I don't...I have all kinds of time constraints, I don't use that time [30 minute evaluation time] to fill out a FABQ when we need to be treating and evaluating.”

In other words, Jen is pointing out that when a patient starts eating into her 30 minute evaluation time to complete forms, she makes the decision to forego having the patient complete the forms so she can get the evaluation started. John had the same concern,

and pointed out that many times patients show up late, which only compounds this problem.

Other therapists reported that having the patient complete the extra forms (FABQ and MODI) was just too much time demands on the patient, even if they got them done before the physical therapy evaluation. Todd explained this view point in his six week interview,

“...Because if the patient is filling out three more forms at the front desk, in addition to what they are already doing...we are already giving them 4 sheets of paper in the beginning, so we don't want to give them 5 or 6 papers, nothing more than we have to.”

Some participants reported that patients had difficulty reading and/or understanding the FABQ. This required time from the therapist to explain or read the form to the patient, creating another barrier to using the FABQ LM CPR criteria.

Another time related factor was having time to integrate the new measures into the standard process. Kelly stated in her six week interview,

“...we have not setup the forms yet, we have not done that...”

Jesse: “You mean like the MODI and FABQ?”

Kelly: “Right, we have not done that. So, we have been remiss.”

Jesse: “Ok. Is there a reason why you guys have not set those up?”

Kelly: “No, we are just lazy....we have just not gotten around to it.... We have been talking about doing it, but we just....I don't know where the time goes. The

number one thing is patient treatment, and then the day is gone. That's what's unfortunate; we just haven't gotten around to it.”

This demonstrates the reality that adopting a new skill takes extra time, and integrating something into an existing patient care process can make this even more complex and time intensive initially.

Many of the participants reported that they thought practicing a new technique was a very important step in adopting it, yet most reported minimal practice of manipulation after the first two weeks post-course. Some of the barriers reported to practicing LM were not having someone to practice on, not remembering to practice, and being unable to coordinate time to practice with co-workers (getting free at the same time). Having limited opportunities to practice was a barrier to adoption.

One final frequently mentioned work environment related barrier to adoption was not having LMCPR and/or LM as part of the existing clinic norms/standards, or not having a current co-worker using either innovation. Susan stated in her six week phone interview,

” I would say it is a little bit of a barrier because at this point I am not feeling confident in my skills to do the manipulation, so if something happens, and no one else is using it, in my mind it could be seen as I did something wrong.”

This demonstrates that this barrier can be related to feeling vulnerable to using something outside the clinic norms, moderated by her lack of confidence. Susan did consider manipulation an aggressive treatment that had some increased risks (see table 22).

**RQ2e.** How do participants overcome (or recommend overcoming) reported difficulties/barriers in adopting LMCPR and LM?

**Summary.** The two biggest barriers were having limited opportunities and time to adopt and use LMCPR and/or LM. Participants were, for the most part, able to overcome these barriers.

The most frequently cited work environment related barrier to adopting LMCPR and LM was having perceived limited opportunities to use these innovations. As mentioned in the previous research question answer these limited opportunities were primarily related to having few acute low back pain patients (i.e. not having enough qualifying LMCPR criteria) and having limited low back pain evaluations.

Several therapists made attempts to get more acute LBP referrals by talking to their referring physicians. In one case, Jeff was able to present a case study article (Hoyle, Hollman, & Sharp, 2012) used in the training course with his medical director. This article talked about how the Mayo clinic was using a protocol that involved the LMCPR and getting acute LBP patients with no pain below the knee immediately sent over to physical therapy for evaluation for possible manipulation. Jeff indicated in his six week interview that this did work to increase his acute referrals slightly,

“So, I took the Hoyle article to him and said, “hey look, I know this is a case study, but look at the result here...day one to recheck, in 16 days with all these parameters met, this is something that really improves them. If I can get these...” My big thing at the time was getting them within the 16 days....and so I said if I

can get these guys within that 2 week span, we can do a lot of good for them and very quickly. So, I took it to him and let him read over it.”

Jesse: “So, did anything change as a result of that?”

Jeff: “I got a couple more. We got a couple more LBP referrals pretty quick in nature. He wanted them to get in here and get a look taken at them.”

In all cases, these attempts at increasing acute referrals by talking to referring physicians seemed to have minimal (e.g. Jeff’s case) or no short term impact (as reported by the participants) at increasing the number of acute LBP referrals. However, these efforts may still result in increased acute LBP referrals in the long-term (i.e. beyond the twelve week study period), but this is beyond the bounds of this research study.

It is important to note that the primary physician based LBP guideline does not explicitly recommend that a LBP patient be referred to physical therapy within the first 16 days of symptoms (Chou, et al., 2007). Rather LBP guidelines often recommend a trial of staying active as possible, anti-inflammatory medication, and avoiding aggravating activities as the primary treatment for the first four weeks of symptoms, and then if the patient is not improving, a referral to physical therapy for further evaluation and treatment. Based on this process, by the time a patient goes through the referral process and gets in to a physical therapist it may be another 1-2 weeks. So, the therapist in this scenario would typically get LBP patients with symptoms no earlier than 5 to 6 weeks out from initial onset of symptoms. Asking physicians to send the acute LBP patients right away to physical therapy is asking them to go against these guidelines. Insuring this change in referral patterns may take multiple persuasion efforts by the

physical therapist and take time since the physician is also being asked to essentially adopt the LM CPR paradigm (without having taken the training course).

Some of the participants were able to qualify more patients for LM by modifying the time of symptoms criteria. Several expanded the time frame of this criterion from symptoms less than 16 days, to be symptoms less than 1 month. They felt that this modification allowed them to still identify relatively acute LBP patients that would benefit from LM. Mary stated in her twelve week interview,

“...and I know you have talked about marketing and educating the doctors about how important it is to get patients in to us earlier, but I think the general public are relatively healthy people...I mean I wouldn't even run to the doctor for something I have had for 7-10 days, even as a therapists I would wait a while to see if it would go away. Most people don't run to the doctor for every little thing, so I think you are going to catch people that are coming in later and [one month] is certainly a lot easier to qualify patients with [compared to 16 days]. It [LM] is still working well for people like that...I think you can catch way more people and it is still beneficial like a month or less...”

All of the therapists that had made this type of change, noted that they were having success with performing LM on patients that qualified using the modified criteria and were qualifying more patients for LM.

Regarding overcoming the barrier of having too few LBP evaluations, only one participant indicated that he was taking active steps to get more. He was calling patients from a waiting list to get more LBP patients in for his evaluation. Several other physical

therapists that had reported a drop in their LBP evaluations from recent clinic or job moves, had noticed that they were beginning to see more LBP patients as their general patient load increased to a normal level. Finally, some participants indicated that they were starting to see a swing in the common cycle of varying diagnoses so that they were starting to receive more LBP patients.

The other major work environment barrier to adopting LMCPR and LM was reported as having limited time to perform the new measures during their evaluation, and to take the steps necessary to facilitate their adoption (e.g. practice more, set up systematic check-in/evaluation process changes). One solution that seemed to be used by several participants for this barrier was taking short cuts whenever possible.

The LMCPR suggests that if a patient has no pain below the knee and symptoms less than 16 days, they are very likely (85%) to have success with LM (see Appendix H). So, in some cases if a patient was being qualified with these two criteria, the other criteria were simply not assessed, thus saving time. Leslie explained this short cut during her twelve week phone interview,

“Because of the algorithm finding that those 2 criteria, duration of symptoms and no pain below the knees, those two together, I always screen for those, always, always , and sometimes I will be honest and I just stop right there [if they are positive]. I am confident enough that the manipulation will help then I don’t continue to assess the hip internal rotation.”

She further explained that her lack of use of the FABQ was also a “time issue”. Since she had such a high percentage of acute low back pain patients (see table 3), she could

qualify many of her patients with just the two LM CPR criteria explained above, and having the FABQ as another qualifying criteria was not worth the time to get this completed. In this situation, the two rule LM CPR worked well for her, but also decreased her perceived need to fully adopt the five rule LM CPR.

Mary explained that with her modified criteria (i.e. using one month as the qualifier for days of symptoms), she was also qualifying more patients for LM. She was feeling that she could now possibly do without the FABQ, thus increasing her efficiency in qualifying patients for LM. She stated in her twelve week phone interview,

“...The ones that have qualified the most are no symptoms distal to the knee is a big one, hip internal rotation is a big one, so is hypomobility ...so those 4 [the 4<sup>th</sup> being symptoms less than 1 month] seem to be enough for me...like I said I can usually qualify patients with 3 or 4 of those criteria anyway without the FABQ, so I guess that’s why I have not been more diligent about getting the [FABQ] paperwork part of it done...”

So, while these modification or adaptations of the LM CPR helped them overcome the barrier of not qualifying patients for LM, it seemed to make it less likely that they would ultimately adopt the original five rule LM CPR.

Other therapists who did not seem to have time to practice LM, and also did not have a lot of patients qualifying for LM, started placing some of their LBP patients into the manipulation set-up position without performing the thrust. They considered this position an effective stretch for appropriate patients, but this also provided them an efficient opportunity to practice (i.e. they did not have to coordinate with co-workers to

find a time to practice) the LM set-up, which they felt was enough to make up for their lack of practice and actual use of LM. George stated in his twelve week phone interview,

“...I have worked with her a couple times putting her in the position for manipulation just to provide her a low back stretch. This has been enough to keep me familiar with the placement...the positioning of the patient...That was my way of making sure I didn't forget how to position the patient [for LM] since I didn't have other patients to come in [that were qualifying for LM].”

One frequently seen trainee characteristic based barrier was the decision to use screening criteria in addition to LM CPR criteria when deciding if a patient was appropriate for LM. A common theme in overcoming this barrier was building confidence and experience in using LM. Some participants indicated that they felt like their early use of screening criteria was lessening over time, as explained by Mary in her twelve week phone interview,

“...I don't think I have been biased in any other way, in terms of age, or any of that. Probably just that real significant pain, winding them up...even though I feel like I am better at it I will say. I feel like I am faster at it, it is a little easier for me just to get them in those positions fairly quickly for their comfort level as well. That is one person [with high pain if you touch them that] I still did not do it on, but other than that I feel like most of those [screening criteria] are kinda going away.”

As Mary mentions above, working with patients with a low pain tolerance, or high pain levels, was seen as a screening criteria that would disqualify the patient for LM, even if they qualified with 3 or more LM CPR criteria. Some therapists were able to overcome this barrier by first working with the patient to lower their symptoms with other more tolerable (as perceived by the therapist) treatments (e.g. massage, “soft tissue work”, stretching, and/or modalities). Once this was accomplished, then the patient would be considered for LM.

Three therapists overcame their screening criteria of not using LM on any patient with symptoms below the knee. They did this by trying out LM on a patient with symptoms below the knee, and that qualified for LM with 4 other criteria. They had success, so this strengthened their confidence that this screening criterion was not needed.

Finally, the barrier of treating large patients with this technique was overcome by gaining physical assistance from co-workers, and trying various hand hold positions. Tim and Trisha were able to assist each other on several occasions with larger patients, with one doing the positioning (wind-up) and the other performing the thrust maneuver. With this partnership they were able to have success with a reduction in the patient’s symptoms. Another therapist tried a different hand holding technique, weaving her arm through the patient’s arms for improved leverage. This solution was shared in the blog. She indicated that this technique helped.

**RQ2f.** What do participants report as reasons for failing to overcome reported difficulties/barriers in adopting LM CPR and LM?

**Summary.** Enough of the barriers were overcome so that adoption rates of LMCPR and LM were very high (80% and 90% respectively) for the case study participants. Some specific barriers were not overcome and included opportunities to use the innovations remaining limited for some participants, practicing LMCPR/LM not being a clinic norm in some clinics, and a continued lack of integration into standard patient care process.

Despite a high adoption rate of LMCPR and LM among case study participants (see table 5), some participants did not adopt specific elements of LMCPR. Also, some could not overcome the barriers of having limited opportunities to use the innovations, practicing LMCPR/LM not being a clinic norm in some clinics, and a continued lack of integration into standard patient care processes.

As discussed in the research question 2e above, the efforts of several therapists to get more acute referrals, did not seem to make a big difference, per participant reports, in increasing the number of patients they were evaluating with less than 16 days of low back pain. Had it done so, this would have increased the opportunities to use the LM, since having acute symptoms is the strongest weighted criterion that indicates LM should be used as the initial primary treatment in care.

The main issue in getting more appropriate (acute) patients for LMCPR and LM, is getting referral patterns changed on the physicians' side. In other words, getting referring physicians to identify low back pain patients with symptoms not below the knee, and with acute onset of symptoms, and get them over to physical therapy for

evaluation. The participants made it clear that this was not the norm for them as most received chronic low back pain referrals. While it was still possible to qualify some of these chronic LBP patients for LM, it was more difficult, particularly if the participant had not fully adopted all five LM CPR criteria (e.g. not using the FABQ). In the short run (12 weeks study period), it was just not realistic for this referral pattern change to happen. However, given continued efforts, some referral patterns may change in the future.

One barrier that was not overcome for Susan and Clay were their clinics (i.e. co-workers) having the standard (i.e. clinic norm or culture) of evaluating LBP patients using the LM CPR (including the FABQ), and treatments including the LM when indicated. Neither Susan, nor Clay, had their co-workers attend the training with them, and none had co-workers that were using either innovation. Both Susan and Clay indicated that they were new to their job settings and did not want to use measures (e.g. FABQ), and in Susan's case, treatments (LM), that were not currently being used by their co-workers as a clinic standard.

They suggested that as new employees they wanted to fit in, and not create disruptions in normal practices. However, both indicated that in the future once they felt more comfortable talking to their co-workers about the innovations, they would approach the subject of their use. Clay described his work situation as,

“...It is one of those things where I don't want to swim against the current too much with this guy's [new boss] method. It has been a little tricky like trying to throw in my own little treatment methods without kinda of stepping on his toes.

As the rotation [as a traveling therapist] goes on I will feel a little bit more comfortable, like throwing in an outcome measure and feeling more relaxed about using LM and some of my own treatment tools...”

Notice that with Clay, he felt comfortable enough to use the parts of the LMCPR and LM. However, he was not using the MODI and FABQ, and he was not fully at ease in being the only physical therapist at his new job setting using LM.

On the other hand, Susan did not use the FABQ, nor LM at all due to her perception that these measures and treatments were not the norm at her new job. She stated in her twelve week interview,

“...now I am coming in new, and they [co-workers] don’t know what my training is, and that I have done this course. I don’t want to raise any flags at this point, I just want to kind of observe what everyone else does, and then present that information at a later point.”

Later she went on to explain that she did plan to try to overcome this barrier of LMCPR and LM not being the clinic norm by talking to her co-workers,

“I think they [co-workers] also do inservices where they will bring up a case...so in that setting, maybe in the next few months, maybe at the end bring it up...that I have taken this course and I have learned this information and is this something that is possible to adopt ...”

Notice that her description of this future conversation is still very passive, where she is almost asking for permission to include the LMCPR measures (including the FABQ) and LM in her practice. In other words, she is asking if it would be acceptable for her to

deviate from clinic norms. However, she felt more time needed to pass before she would be comfortable enough to have that conversation with her new co-workers.

The last large barrier that was not overcome by some participants was the barrier of a lack of integration of LM CPR and LM into standard processes. This was explored in previous research questions as being a barrier when the participant is trying to just remember to use the new tools, and as a facilitator of adoption when they integrate new tools into existing processes (e.g. forms and check-in processes). In this case, John and Todd, who worked together, were still waiting on approval to fully integrate form changes. This approval was being delayed at a senior level of management due to other priorities being addressed first.

This lack of integration had minimal impact on John's full adoption of the long rule LM CPR, because he was already measuring all of the measures, except the FABQ and MODI, prior to the course and used the short rule LM CPR as a decision tool 100% of the time. It did, however, lead to him not adopting the FABQ or the MODI, as he was holding off on using that measure until the integrated forms were approved. John stated in his twelve week interview,

“Right now we really haven't got the FABQ or the other questionnaire [MODI] in quite yet because we are changing our scheduling system. We really haven't had time for our director or our CEO to look at our paperwork to see if we can change it and get that approved yet. So we really haven't had opportunities to use the questionnaires.”

When asked had he tried to just use the forms on his own, without them being integrated and he said,

“We [John and his patient] are half-way through the evaluation before I even think of it [using the FABQ], and sometimes I don’t even think of it because I am so used to doing stuff my traditional way.”

This supports the concept that relying on remembering to try a new skill out can be prone to memory lapse, and integration into normal processes will help solve the problem.

However, in this case, integration into practice was being hampered by the barrier of a bureaucracy, or a top level approval process.

Todd, on the other hand, had not been using LM CPR as a decision tool before the course. The impact of this lack of integration (e.g. the exam form modifications that he submitted, which included a reminder to measure all the five LM CPR criteria, and then decide if LM is indicated, still had not been approved for use) led to Todd’s partial adoption of the LM CPR as a decision tool. He indicated in his twelve week interview that the primary reason why he was only using LM CPR as a decision making tool about 30% of the time was he was “still getting into the routine of using it” and was not always remembering to use it as a decision tool (see table 15). He had indicated earlier that integrating the decision rule into his evaluation form would help him be more consistent in using the LM CPR tool.

**RQ #3.** What are participants’ evaluations of the training program?

**RQ3a.** What are the participants’ perceptions and reactions to the training program?

**Summary.** The training program was perceived as evidence based, easy to understand, and repetitive with multiple components providing continuous reminders of the LMCPR and LM topics. Reactions to the program were favorable by all course attendees.

The training program was based on a pragmatic training transfer (PraTT) model that was designed to provide pre-training (or pre-course), training (or course), and post-training (or post-course) activities commonly recommended as helpful in facilitating adoption. What made this model unique is the focus on pragmatic solutions that I felt could be implemented easily by any training company with minimal cost or logistic requirements. For example, the post-course training activities were focused on providing post-course support via a blog and discussion board, both of which were simple, inexpensive, and easily available solutions.

This training program was fully explained in Chapter two of this dissertation, but a quick summary includes all the activities listed in table 23. These include pre-course activities such as reviewing online support website, blog, and discussion board, reading the APTA white paper on manipulation, and making an introductory post to the blog. Course activities included a three hour hands-on lab and a five hour lecture, which included case studies, reviewing job aides, and a training transfer lecture and group discussion/interaction at the end of the course day. Post-course activities included participants completing serial questionnaires (note this was a planned activity as part of the PraTT model, and also a research method), using job aides (CPR algorithm, outcome

measurement tools, evaluation forms), receiving weekly blog emails, having access to an online post-training support system which included posted course documents, blog and discussion board dedicated to the topic of LM CPR and LM, and using a metric tracker tool.

I will explore each of these training program components in the next research sub question below. For now, I will focus on the general perception of the training program. Overall the training program was perceived as evidence based, easy to understand, and repetitive with multiple components providing continuous reminders of the LM CPR and LM topics. The participants that indicated the course was repetitive explained that this was a positive characteristic. Leslie indicated,

“I liked that a limited amount of information was presented with a lot of repetition on the main objective. It allowed me to focus on the information and explore it in-depth and practicing skills. I feel I have a good grasp of this information”

This is consistent with other participants who indicated in prior courses they have learned so much material that they were overwhelmed after the course in terms of where to focus their adoption efforts. Mary stated in her six week interview,

“...again I have taken one [course on manipulation] before and it was a little more [compared to the study course]. It was 2 days and covered most of the body, so in that regard I thought it was a little too intense, we learned too many things, and too many stuff...”

This study training program did limit the content of the information to three CPRs, and just the low back. The intent was to keep things simple, repetitive, but interesting enough to keep the attendees interest.

Attendees reaction to the training program was assessed by asking them to rate the overall program on a scale of 0 to 10, with 10 is outstanding, and 0 is poor (see table 6). Only the study participants were asked to rate the program over time at six weeks and twelve weeks post-course, and only the case study participants completed the final twelve week rating (see table 7). For the most part, ratings were highly favorable, and remained so over the six and twelve week post-course periods. Of the 48 total course attendees only 4 rated the program as a 7, still favorable (based on their questionnaire open ended comments). All of the other 44 attendees rated the program at least an eight out of 10, and most rated the program a 10 (mode of 10 as rated by 23 attendees).

Three participants that lowered their initial post-course rating (all three had rated the course 10 at baseline, and 2 rated it a 9 at six weeks, and the 3<sup>rd</sup> rated it an 8 at six weeks) indicated that this was due to being in a positive state of mind immediately after the course, and suggested that their six week rating was more realistic. Only one participant, Rebecca raised their baseline rating from 8 to 9 by six weeks post-course. Rebecca stated in her six week phone interview that this was due to,

“...I appreciate the fact that you are trying to get people to have a certain level of standard when evaluating a LBP patient and using current research, what the APTA is always saying – evidenced based...”

**RQ3b.** How were particular features of the training program perceived as helpful or not helpful in the adoption process?

**Summary.** Many of the training program features were perceived as helpful. Pre-course features reportedly decreased fears of using manipulation, course features helped in building confidence that the new skills could be used in their clinical practice, and post-course features helped by reminding participants to use the new skills.

The training program had pre-course, course, and post-course features that were used by most of the case study participants (see table 23). Overall these features were seen as helpful in the adoption process (see table 24). The only features that were not seen as helpful by the case study participants were the metric tracker and discussion board, and this will be explained below.

The pre-course training features (reviewing online support website/blog/discussion board, reading the APTA white paper on manipulation, and posting an introductory message on the blog), assigned one week prior to the course, were designed to accomplish several goals. First, having the attendee's review the online support website, blog, and discussion board prior to the course was designed to get them familiar with the online support system which I was hoping would increase their understanding of course discussions on these topics and increase post-course use of these systems by being more familiar with the system. Although table 23 shows that case study participants did review the online support website, blog, and discussion board before the course, table 24 shows that only one (Keith) of the ten case study participants indicated

that this was helpful. Keith indicated that reviewing the online support system before the course, "...gave me an idea prior to taking the course so that I could listen and ask questions. This allows me to absorb the [course] information." So, this feature of the training program did impact his course understanding, but he did not specifically report that it increased his post-course use of the system. However, he did report after the course, consistently reading the post-course weekly blog postings.

The pre-course assigned reading (APTA white paper) was designed to provide the course attendees with background knowledge of manipulation, give them perspective of the issues surrounding physical therapists use of manipulation, and provide a realistic picture of the risks associated with using manipulation. Table 23 shows that a high percentage of the case study participants read the white paper before the course. Table 24 shows that 6 out of the 8 that read it found it helpful in their adoption process. The open-ended questionnaire responses at six and twelve week post-course on how this feature played a role in the adoption of LMCPR and LM included:

Leslie: "it helped alleviate fears of adverse effects... gave me assurance of the safety of manipulation."

Mary: "helped me to understand what it was we were going to be discussing/learning on the day of the course, as well as validated the importance of PTs adopting these evaluation and treatment techniques... good to know that the profession feels PTs should and can be performing TJMs [LM] safely, effectively, and that it is within our scope of practice, made me really think I should be doing this and learning more about it to better help my patients."

Todd: "helped provide rationale for what we were going to cover"

Tim: "it gave me a better idea of how the physical therapy community as a whole views lumbopelvic manipulations...it gave me peace of mind about the dangers of performing a manipulation"

Overall this feature seemed to lessen the fear of using manipulation, and provided a credible (i.e. national association) perspective of how manipulation should fit into the physical therapy practice.

The final pre-course activity was having the attendees make an introductory blog posting. This was designed to provide an initial experience in blogging, and also help create a feel of an online community with future and post course attendees. Table 23 shows that no participants completed a pre-course blog posting. There were no comments on this activity. This pre-course lack of blog posting activity is consistent with the post-course lack of blog or discussion board posting activity by the participants, as will be described below.

The course training was comprised of three hours of hands-on lab activities, and five hours of classroom activities which included traditional lectures, case activities, reviewing job aides/reference material, and 15 minute training transfer lecture and group discussion/interaction at the end of the day. Since all participants were in the class all day for all these activities, 100% of the participants used these activities (as shown in table 23).

First, the hands-on lab was designed to provide the attendees an opportunity to practice the LM CPR measurements and LM, and develop introductory psychomotor

skills. The lab included the course instructors providing verbal and tactile feedback on participants' performance of the skills. Nearly all of the 10 case study participants indicated that the hands-on lab was helpful in the adoption process (see table 24), and 12 of the 22 study participants indicated that the lab was the most helpful feature of the training program (making it the most frequently mentioned helpful feature of the training program). The open-ended questionnaire responses at six and twelve weeks post-course on how this feature played a role in the adoption of LMCPR and LM primarily indicated it built confidence by providing experience using the new skills. For example, Tim indicated, "Always good to get hands on experience to give you confidence in your ability to perform manipulation safely and effectively."

Another course feature was the traditional course lectures, which were designed to provide information on the topic of LMCPR and LM (as well as information on the lumbar stabilization CPR and the directional specific exercise CPR). Table 24 shows that many case study participants found the lectures helpful. One study participant indicated that the lectures stimulated her interest in the topic of CPRs, where she previously had no interest in the topic. Kendra indicated, "Excellent presentation - previously not interested in CPRs, but now willing to try."

Trisha focused more on how the interaction with the instructors, rather than the actual content of the lecture, had an impact. She stated, the "...ability [of instructors] to relate to clinical practice and answer questions thoroughly...backed up with research..." was valued.

Rebecca and Leslie indicated that the repetition in the lectures was helpful. The lecture started with theory, and then provided a broad overview of the three CPRs, and how the algorithm is used to apply the three CPRs to decide how a patient should be categorized and then treated. Throughout the remainder of the course, each CPR (e.g. LMCPR), along with its related treatment (e.g. LM), was described in detail and then it was tied back into the overall algorithm. By returning to the algorithm frequently throughout the day themes of the lecture seemed to repeat.

Next, case activities were used throughout the course lectures to provide realistic opportunities to apply the algorithm and CPRs based on patient case information. The hope was this activity would increase the likelihood of using the algorithm as a job aide once the attendee returned to their work setting. Although one participant, who was already an experienced user of LMCPR and LM, reported the case studies were too easy, table 24 indicates that 60% of the case study participants found these cases helpful in their adoption process. The participants indicated how the cases helped with the following open-ended questionnaire responses at six and twelve weeks post-course:

Trisha: “relates it to real life”

Tim: “it was beneficial to put the algorithm to the test and problem solve based on real patient scenarios”

Leslie: “helped me with ability to process subjective info more efficiently.”

Keith: “helps me to put all the information together into practice”

Mary: “these are always helpful in a course to really put the new ideas, concepts, and critical thinking in to play on an actual case you could have Monday morning”

As designed, the case studies were perceived as providing an opportunity to practice using the CPR algorithm as decision making tools. There was no evidence for or against that the cases had an impact on the post-course use of the CPR algorithm. However, post-course use of the CPR algorithm was 100% (see table 23).

In the course I also had students review the job aide and reference material (e.g. CPR algorithm, MODI, FABQ and evaluation form). This was also found helpful (see table 24). In class review of the post-course reference materials was designed to familiarize the student with these documents and increase the likelihood of post-course use. Rebecca indicated this course component had the desired effect by indicating, “[in class review of reference material] helped increase awareness of CPR tools.” Many comments indicated that this review helped make the algorithm very clear, and Susan explained that understanding the algorithm was critical to her adoption, “having complete understanding of the algorithm is the most important aspect of carryover of the CPR into practice”

The final course activity was the training transfer lecture and group discussion/interaction at the end of the day. This brief activity (approximately 15 minutes) started with a short lecture on the training transfer problem and common general facilitators and barriers to adoption following training. This was designed to facilitate learner metacognition and reflection throughout the adoption process. It was also designed to facilitate a follow-on short group activity. This activity required that course attendees got in small (2-3 people) groups with their co-workers (or if no co-workers were present, then anyone the attendee felt comfortable with) and discussed the specific

barriers and implementation steps that they would need to work on in order to adopt the course information (e.g. LMCPR and LM). This group activity was designed to facilitate the creation of a social community of adopters so that they would be more likely to interact online creating an eCoP on the blog and/or discussion board, give attendees an opportunity to start a post-course implementation plan, and create a sense of accountability to co-workers on the implementation plan discussed.

The training transfer course activity was viewed favorably, as table 24 shows that 80% of the study participants found this activity helpful in their adoption of LMCPR and LM. Rebecca indicated that one of the most helpful features of the training program she thought was, “discussing implementation with fellow co-workers”. Tim indicated that for him the training transfer activity helped set his expectations, since this was his first CEU course after graduating from physical therapy school, on how hard he would have to work to succeed in adopting LMCPR and LM into his practice. He indicated,

“It was helpful for me knowing from the beginning that most people end up not using the material they learn at the continuing ed courses. This made me realize how I would have to make a big effort to adopt the algorithm and concept of manipulation to benefit my patients in the future.”

Mary indicated in her six week phone interview that this activity helped, and stated,

“we even went back Monday morning and talked about it [implementation plan] again. People get into their comfortable little ruts and that is just...they may go to a continuing education course try it a couple of times and forget about it ...so for

me anyway, talking about it with my co-workers, putting a plan into place about how we were going to do it, and then reading your blog and reminding me, it was just a constant reminder that I should practice and become more comfortable and skilled, and that it is something worthwhile for patients, that is how I go about adopting things.”

This statement demonstrates some reflection on the process of training transfer. It also shows that she and her co-workers (John and Todd) were able to continue working as a community of adopters after the course, not online, but in person.

Some of the other common themes in comments regarding this training transfer activity include it served as a motivator to adopt, it confirmed their personal experience with failed adoption in the past with other CEU courses (so the concept of a training transfer problem was validated in their own personal experience), and it allowed participants to create an implementation plan. As an interesting side note, no participant indicated that they had participated in a training transfer type activity in prior training courses. So perhaps this is a novel physical therapy course activity.

The training transfer activity did not seem to impact the lack of interaction and course attendee postings on the blog and/or discussion board. Also, while some participants demonstrated metacognitive thinking at different periods post-course, a link was not clearly drawn back to the training transfer lecture as a contributor to this type of thinking on adoption.

Finally, several participants indicated that they felt accountable to their co-workers to adopt LMCPR and LM. Furthermore, while they did not state that this feeling

of accountability was due to the training transfer lecture, they did suggest that having attended the course together, and having made the informal decision as a clinic to adopt the LMCPR and LM during their group discussion (i.e. as part of the training transfer activity) that this created the sense of accountability to each other to stick to this plan. So it appears the training transfer group activity did play some role in creating a sense of accountability to adopt.

The post-course training activities were comprised of serial post-course questionnaires, job aides, access to online resources, and other online components (i.e. weekly blog email, blog, discussion board, and the metric tracker).

The first post-course feature that I will discuss is the post-course serial questionnaires (done immediately after the course, six week post-course, and twelve weeks post-course). This was originally part of my PraTT training program, designed to promote learner feedback, serving as a post-training reminder, providing opportunities for reflection, and fostering metacognition of a learner's own adoption behavior (and from a research standpoint serving as a data collection tool). As the study progressed, and based on the participants responses, I realized that the impact of the serial questionnaires, and my other data collection tools, the phone interviews and the act of participating in a research study, all were intertwined in the participants responses.

So, in this post-training activity analysis, I will consider all three parts (questionnaires, phone interviews, and the attendee's awareness of participating in a study) as related to one component. This purpose of this component is essentially to follow-up with the course attendee after training to see how their adoption is going (via

questionnaires and phone interviews), and letting them know that what they report is being used as valuable feedback to improve the training program (i.e. letting them know they are participating in a form of research). This combining of these elements is reflected in table 24.

The positive adoption influence of this “following-up” component (all three parts), which I will discuss shortly, support the inclusion of all three of these components as an intervention in the future PraTT training program, rather than just the questionnaire as the intervention. This is an Evaluation: local impact study finding, based on treating this dissertation as a single DBR cycle based on the ILDF model.

In order for this expanded “following up” intervention to be pragmatic, some modifications would need to be made such as conducting less extensive phone interviews (e.g. one or two questions by phone, such as “how is your adoption going?”, “what is going well, or what areas are you having problems with?”), less extensive questionnaires (one questionnaire done at various points after the course), and to replicate the feeling of participating in a study, letting the attendee know that they are providing valuable feedback that will be used to improve future training programs. These features could conceivably be carried out by any CEU training company without too much additional cost and time, thus remaining a pragmatic solution.

Regarding the participants’ perceptions of this “following up” training program feature, 90% of the case study participants stated it was helpful in the adoption process (see table 24). Generally the participants indicated that the questionnaires, interviews, and participating in my study served as a reminder (about concepts of LMCPR and LM,

and about the adoption process), increased their reflection about LMCPR, LM, and the adoption process, and led to an increased effort in trying out the newly learned tools (i.e. feeling accountable to the researcher). Mary indicates the benefit of the “following-up” intervention,

“Being involved in the study as probably in an subconscious way, made me try harder to implement the CPR and TJM [LM] in to my practice, knowing someone will be checking up on me, and providing support if needed has been beneficial.”

This “following up” feature also provided participants opportunities to learn, clarify concepts, and ask questions of the instructor up to 12 weeks after the course.

Keith indicated the phone interviews were particularly “good to generate ideas and clarification.” Several other participants made changes to their adoption process after the phone interviews based on conversations with the instructor/researcher.

The next post-course training feature was having job aides. These job aides (CPR algorithm, outcome measurement tools, and the evaluation form) were all presented in the course, and were located in the resources section of the post-training website. The purpose of these job aides was to provide memory aides that could be used on the job. Research indicates that using such enabling factors facilitates the adoption process (Davis et al., 1999). These job aides, especially the CPR algorithm, were rated as helpful by some participants (see table 24).

The participants indicated that the algorithm (see Appendix H) was easy to use, and very helpful in reminding them of all the detailed information about the LMCPR (e.g. criteria and the likelihood of success given various criteria scenarios). For example,

Susan indicated, “I have referred back to the algorithm a few times to remind myself what needs to be completed during the initial evaluation to place the patient in the most effective category”

All case study participants indicated that they used the CPR algorithm (see table 23), as designed. They made frequent reference to carrying around the algorithm, or having it next to their computer for quick reference. Mary indicated the overall impact of using the algorithm as, “I would be less likely to use the TJMs [LM] if it wasn't for the CPR, it provides reasons for or against the TJMs [LMs] that I feel make it safe and appropriate to use or not use.”

The other job aides (i.e. outcome measurement tools, evaluation/criteria forms) were less frequently used by the case study participants (see table 23). They were designed into the training program in order to facilitate data collection consistent with the LMCPR. For example, Trisha and Tim were able to integrate the outcome and measurement tools into their practice right away. They indicated that integrating these forms into their standardized patient care processes was “great as a reminder” to use the LMCPR. This was particularly important in their setting since they did not have a lot of opportunities to perform LBP evaluations during the twelve week study period. Thus, making it more likely that with infrequent use, LMCPR procedures would be forgotten without these job aides.

The last post-course features (access to online resources, weekly blog email, weekly blog, discussion board, and metric tracker) were all part of the online post-training support system. This component of the PraTT training program was designed to

serve as an eCoP. The idea was essentially to provide an online location where like-minded course attendees could access information, and interact with each other as they all endeavor to adopt LMCPR and LM into their practices. This eCoP would not only motivate people to change (due to a feeling of community accountability and support), but also provide a means of continuing learning beyond the course and access to resources.

Having access to online resources was designed to facilitate one-stop shopping within the eCoP, thus creating a draw to the site where community members can all access common tools, papers, and presentations all related to LMCPR and LM.

The weekly blog email was designed to provide every participant a quick reminder of the weekly blog posting (and after several months into the study it also contained the actual blog posting to facilitate ease of reading the blog. This change will be discussed later in this chapter and is related to a DBR based feedback loop concept).

The weekly blog and discussion board were both provided as tools to facilitate online interaction. This interaction, not the tool, has been described as the key to a thriving eCoP (Wenger et al., 2002). The weekly blog was more focused on the community coordinator/blog master/instructor posting weekly blog content related to LMCPR and LM, and in so doing continuing the learning process for the blog readers, and hopefully stimulating online interaction on targeted topics. Whereas, the discussion board was designed to be more course attendee led, where any past course attendee could start a discussion or post a question for community support.

Finally, the metric tracker was designed as a goal tool, where attendees could keep track of their progress on several metrics related to the overall goal of adopting LMCPR and LM into their practice. These metrics included practicing LM daily, measuring all five LMCPR criteria in each evaluation, and using the MODI. The concept is that if a person is keeping track and progressing on these metrics, this would make goal attainment more concrete and directed in small steps. This was designed to be used as an individual feedback and tracking tool, as well as it could be shared with others in the adoption community.

So, how were features of this online support system perceived as helpful or not in the adoption process? First, all features were used by the case study participants to some degree except for the discussion board and the metric tracker (note that one of the 22 study participants, Kendra, did make one discussion board posting, and one of the 22 study participants, Rebecca, did try out the metric tracker, but neither of these study participants were a case study participant so this does not show up on table 23).

Next, nearly all of the case study participants reported that the weekly blog email and blog were helpful features in their adoption process (see table 24). Also, having access to online resources was reported as helpful, but by fewer case study participants. Finally, the discussion board and the metric tracker were not seen as helpful by any of the study participants.

Based on the lack of interaction on the blog (see Appendix S) and discussion board (see Appendix Q) clearly the online post-training support system component of the training program was not used as an eCoP. In other words, I saw no evidence of past

course attendees working together to solve problems, share stories, or support each other in their shared endeavor of LMCPR and LM adoption. For example only one participant posted a question on the discussion board, and after one week no-one had responded, so I responded.

Also, only two participants made postings on the blog, one to report his success in using LM on a patient, and the other to answer one of the many questions I had posted throughout the September 2012 – March 2013 period (see Appendix S). While these two blog postings do suggest the start of an eCoP interactivity, it was all directed to me, the blog master/community coordinator, and not to fellow community members (past course attendees), and no other community members responded to their postings. This demonstrates a lack of peer (fellow course attendees) support and interaction on the discussion board and blog.

Since the online post-training support system never achieved the status of an eCoP, it did not achieve some of the benefits expected of such a system, for example establishing peer community accountability and support. Co-worker accountability was achieved, but this was not due to online interaction, but rather face-to-face interaction in the work setting. However, participants did report that certain features of the online post-training were still helpful.

First, half of the case study participants indicated that having access to online resources was helpful in their adoption process (see table 24). Specifically, they indicated being able to download the outcome measurement forms (MODI and FABQ) saved them from having to find them on their own, and one participant was able to down

load slides from the lectures and use them as a handout for a patient. Todd stated, having the online references was an, "...easy way to find necessary tools to implement." This suggests the convenience of having important reference materials easily accessible via the web. Keith stated in his twelve week phone interview, "...they [resources] are easily accessible from the work computer and home computer. I am not holding a packet and carrying my notes all around."

Their comments suggested that having these components online did draw them to the site as designed, but no evidence was presented that this then led to increase use of the blog and discussion board as was hoped. Keith's comment also suggests that having the resources online may be preferred, at least by Keith, to having training reference binders, which are traditionally provided after physical therapy CEU courses, and which we did not provide in this training program. The advantage being that the online resources could be accessed from any computer, and the reference binder would have to be carried around for convenient access.

Next, 80% of the case study participants indicated that they felt the weekly blog email was helpful in their adoption process. Once again, this was designed to remind all course attendees of the weekly blog posting with the hope that this would increase blog and discussion board community interaction. Later, this also was designed to provide an alternative access to the full blog posting, since some participants had technical difficulties accessing the blog directly while at work, while others simply preferred the efficiency of reading the blog posting directly on the weekly email reminder, rather than having to access the blog separately to read the blog posting.

While there was no evidence that the weekly blog reminder email increased blog and/or discussion board interaction, it did seem to play an important role in the adoption process, and did seem to lead to increased reading of my weekly blog postings for some participants. Many of the participants reported that the weekly blog email served as a reminder. Not only reminding them to read the blog, but more frequently reported it served as a general reminder to keep trying to adopt and test out the skills learned in the course. Mary stated, “this [weekly blog email] just serves as a constant reminder to continue to use the CPRs and TJMs [LM] and to not give up on them.”

The blog was another key and highly used feature of the online post-training support component of the training program (see table 23). While only two participants posted to the blog (see Appendix S), most study participants (and all the case study participants) reported having read at least some of the blog postings. As indicated above, some of the study participants reported they preferred to read the blog posting directly in the weekly blog email reminder. They stated this saved them time and was more convenient than taking the extra steps to click on the attached link to access the blog. Having the blog posting included in the weekly email also facilitated reading on participant’s smart phones, and scrolling down to past postings (since each weekly email sent was forwarded from the previous weekly email).

Once again, the blog was designed to provide a forum for community interaction, and to continue learning on the topic from weekly postings from the instructor/blog master. As suggested above, the blog was not used as a forum for direct community interaction. However, many participants reported they learned new information on the

topics of LMCPR and LM after the course from reading the blog postings. Also, that this new material, or clarification of course topics, helped their adoption process. In addition, they reported that the actual blog postings served as a reminder to adopt, and also kept previously learned material current in their minds.

The blog also served as a forum for the researcher to take interview content (feedback) and include it in the weekly blog postings. This feedback loop, not only allowed the instructor/blog master to target blog posting content to facilitate adoption (i.e. based on feedback of common barriers and facilitators participants were experiencing in real time), but also served as a platform for sharing stories from the community. In other words, since the community members were not making postings, at least the instructor/blog master/community coordinator/researcher could do so. Leslie stated in her twelve week interview that this helpful, “I think it is helpful to hear what other people are struggling with, and it is helpful.”

Another interesting benefit of the blog system was one participant indicated that it increased the credibility of the instructors. This may lead to more credibility of the overall course topic, which may influence adoption.

The discussion board was another online post-training support system feature, but was not used by any case study participant, and only one study participant (out of 22) made one posting. The design of this discussion board was to serve as the primary forum for the eCoP interaction. Where the blog is centered on the blog master’s postings, the discussion board is centered on the users. The hope was that this more user centered forum would be more likely to facilitate direct interaction between users. In reality, only

a few case study participants read the discussion board postings and none made any postings (compared to 100% reading at least one blog posting) (see table 23). One participant who visited the discussion board stated that the posted discussion was not helpful to him since it did not relate to his questions. Another indicated that the forum was not helpful because the topic was fairly straight forward and did not require a lot of interaction. Finally, a third participant indicated that she did not use the discussion board system because she felt it was more opinion based (since it was more centered around course attendees), and she felt the blog provided more credibility since it was being led by the primary course instructor. Note that the comment about the complexity of the topic suggests that perhaps this forum would have been used more if the topic were more complex and attendees felt they had a lot of areas to discuss with fellow course attendees.

Finally, the metric tracker was also a feature of the online post-training support system that was not used by any case study participants, and was only used by one study participant (see table 23). This study participant tried out the tracking system for two weeks, but she found she lacked the time to keep it updated, lacked supervisor support in using it (i.e. she was not encouraged to use it), and was not sure if it was adding any value in her adoption process, so she stopped. She did state that it did provide a means of refocusing her on her practice behaviors, but she indicated that many of the post-training tools provided also helped her refocus on adoption.

**RQ3c.** Why do participants use or not use particular features of the training program?

**Summary.** Nearly all of the components of the PraTT based training program were used by the case study participants. Generally they were used because they were seen as helpful in the adoption process. The main features that were not used were the discussion board and metric tracker and time was the primary reason given for not using them.

The case study participants used nearly all of the training program components (see table 23). Of the pre-course components, all were used except no one made a pre-course introductory blog posting as requested in the pre-course instructions. All of the course components were used, as would be expected of a captive audience during the course. Of the post-course components, all were used except no case study participants posted to the discussion board, and none used the metric tracker (see table 23).

It is not completely clear why some of the participants used the pre-course features, while others did not. Some mentioned being too busy to complete these pre-course activities and one non-case study participant mentioned never receiving the pre-course assignment email one week prior to the course. It is also possible that they felt no sense of obligation to complete these activities since before the course they had no knowledge of the study, and thus felt no accountability to the researcher. Those that chose to complete the pre-course activities did not indicate why they chose to do so, but this may have been due to curiosity, and/or being compliant with the requests of the course instructor (who at that time was not seen as a researcher).

Nearly all of the post-course training program components were tried out by the case study participants (see table 23). The main reason given for using these components was a feeling of accountability to try out these features for the researcher, their co-workers, their patients, and themselves. The main reason for continuing to use a feature after it was tried out was it seemed helpful in the adoption process. The main reason for not trying out a post-course training program feature was a lack of time. The main reason for not continuing to use a post-course training program feature after it was tried was not seeing enough value to justify the time/effort in using the feature, or feeling like it did not apply to their situation.

The discussion board had very few reported visits, and only one participant posting (no case study participant posting). The discussion board was barely used due to four reasons: a lack of online activity, feeling like the single discussion posted did not apply to the participant's situation, being too busy, and feeling like it would be less credible than the blog (due to the postings being made by course attendees rather than primarily by the course instructor, as was the case with the blog). No participant reported that they experienced value when viewing the discussion board. However, two speculated that if the discussion board was being used by a lot of people, and the course topic was more complex, then they would see value on going online to have various discussions about such a topic with a community of physical therapists that had taken the same training.

Finally, the metric tracker was tried by only one study participant, and no case study participants. The one study participant that tried out the tool for two weeks made

the decision that for the time it took to use, she did not see enough value to justify its continued use. Some participants stated they did not use the system because they simply forgot about it, however, most stated they just did not have time. One additional participant did take a look at it, but decided against using it since he did not feel it would change his behavior by tracking his metrics. He also indicated that if he had too many things to try and adopt or use, that he might not do any of them. So, he chose to focus on only the main features he felt would help him adopt (i.e. the blog, algorithm, and accessing some of the online resources (e.g. pictures, course lecture)).

### **General Discussion**

In this section I will discuss the adoption process, as well as implications for three fields of study (physical therapy, instructional systems design, and design based research). These three fields of study represent my occupation (physical therapy), and my doctorate concentration (design based research) and specialization (instructional systems design).

**Adoption process.** Rogers (2003) describes the “innovation-decision process” (p. 170) as one in which the individual first gains knowledge of the innovation (knowledge stage), then forms an attitude about the innovation (persuasion stage), then makes a decision to adopt or not adopt usually based on a trial period (decision stage), then implements the adoption decision (implementation stage), and finally confirms this decision to adopt or not adopt (confirmation stage). While many other factors play a role at various stages, this is a simplistic description of this process model.

In this study, the process my participants went through essentially followed this process model. Here is a general description of their processes using Rogers' (2003) innovation-decision process as a frame work, with the understanding that the individual cases described the complexities of the adoption process in more detail.

Some participants gained knowledge of the innovations, were persuaded, made a decision to adopt the innovations into their practice, and even made an implementation plan (during the training transfer activity) all while at the course. The time following the course was less of a trial period, and more of a quick implementation stage (e.g. evaluation forms were changed the first day after the course, and the entire clinic culture had come to accept the innovations as the new standard) followed by a continuous confirmation (based on patient outcomes) stage over the remainder of the twelve week study period. In this scenario the lack of opportunities to use the innovations did not impact the adoption. This was the case for Tim and Trisha.

Another participant gained knowledge and fluctuated between the persuasion and knowledge stages, as she gathered more information, and carried out mental trials figuring out how the innovation would fit into her practice. This person never even got to the decision stage where she was physically trying out the innovation (i.e. manipulation) on patients and making a decision to adopt or not adopt. This was the case for Susan.

Still, four of the ten case study participants seemed to gain knowledge from the pre-course, course, and post-course activities, were persuaded to have a favorable attitude towards the innovations, and then entered into the decision stage for the first few weeks after the course. During this period they tried out the innovation on co-workers and

patients. If the person had lots of opportunities to try out the innovations, then the person made a fairly quick decision to adopt the innovations, and moved on to the implementation and confirmation stages for the remainder of the twelve week study period. This was the case for Jeff, Mary, Keith, and Leslie.

Finally, the remaining participants (John, Todd, and George) followed the same path as the above scenario (i.e. as Jeff, Mary, Keith, and Leslie) with the decision stage (trial period) during the first few weeks after the course. However, they did not have that many opportunities, or their opportunities declined over time (see table 22), to use the innovations, and it appeared their trial period lasted far into the twelve week study period (perhaps to provide more experiences in using the innovations based on the fewer trials available) after the training course. For John and George they were able to make the decision to fully adopt both innovations during the latter part of the study period, and moved on to the implementation and confirmation stages. For Todd, he also made the decision to adopt manipulation in the latter stages of the study period, but by the end of the study he was still in the decision stage on adopting the LMCPR, more so based on his actions (inconsistent use the LMCPR as a decision tool) than his words.

As mentioned above, these are general descriptions and how their adoption experiences fit within Rogers' frame. However, the detailed descriptions of each of these participants' (e.g. how their perceptions of the innovations varied over time) adoption journey is certainly not linear, and is highly complex and multi-faceted. While my case study write ups and research questions explored the detailed aspects of this adoption process, one pattern stood out that took place during the trial period of many participants

that I have not fully explained yet in this work. This is the concept of screening criteria or biases.

In the cases I described how many of the participants early in their trial periods employed extra criteria beyond the LM CPR criteria, or screening criteria, based on their personal biases, to decide which patients they could safely try out the innovations on. Safe in terms of not hurting a patient, not feeling embarrassed in front of the patient by being a fumbling novice with a newly learned skill, safe from being sued, and increasing their perceived likelihood that they will have a positive outcome with the patient. They understood intellectually that the LM CPR criteria were evidence based and should be enough to decide who should receive manipulation and who should not. However, initially in the trial period, this was not enough to overcome their personal biases of who they felt safe trying out the innovation on. For example, if a patient came across that they had secondary gain issues, looked frail, were too big, or had low pain tolerance, and then the participant would not even consider them for LM, and thus may not even measure the LM CPR criteria. Or, they may measure the LM CPR criteria during their exam, but regardless of the number of positive criteria (even if all five were present), the participant would still screen them out as not a good person to try the manipulation on. In an environment with lots of opportunities to use the innovations, as the therapist gained experience, the screening criteria decreased, and the participant seemed to rely more on just the LM CPR criteria to select patients.

While the screening criteria seemed to be a protection mechanism for the participant, it artificially lowered the opportunities to use both innovations by ruling out

patients for manipulation (or use of the LMCPR) when it would have been appropriate. In an environment where the true opportunities to use the innovations are low (e.g. not many LBP evaluations, or not many acute low back pain patients), and/or the participant is not able or willing to practice on a regular basis, this could create a barrier to adoption I call the screening loop.

Since using the innovations was described as a common facilitator to adoption, relying too heavily or for too long on the screening criteria would hamper the participant in gaining the real experience of using the innovations, thus delaying or jeopardizing their adoption of the innovations. In this screening loop, if the participant perceived that they did not have opportunities to apply the innovations on their patients (unknowingly due to their self-inflicted strong use of screening criteria), then they would start to question whether or not the innovations were applicable enough to adopt into their practice. This then led to a drop in motivation to invest time and energy into the adoption process, for example not being willing to practice using the innovation to build confidence. With a lack of building of confidence through use (on patients and practice), then the participant continued to rely on the screening criteria, thus creating a loop bolstering the continued use of the screening criteria.

This screening loop was interrupted once the participant began to have successes with using the innovations on patients. With successes confidence increased, and with increased confidence came decreased use of screening criteria. With decreased use of screening criteria came increased opportunities to use the innovations, and increased motivation to adopt. At this point adoption of the innovations was nearly certain.

Some participants demonstrated that them being aware of their use of screening criteria (metacognitive about the adoption process), may be enough to get them started out of the screening loop. Once they are aware they are artificially limiting their opportunities by using screening criteria, they seemed to become motivated to practice and use the innovations more to build confidence. This then actually resulted in them using less screening criteria, and they could proceed forward with a more objective use of the innovations as they were intended.

While this screening loop theory describes a cycle where various factors or events are influencing or leading to others events (e.g. building confidence lowers use of screening criteria), it is certainly possible the direction of the chain of events could be reversed or redrawn (e.g. lowering screening criteria builds confidence). However, based on the detailed descriptions from my participant interviews and questionnaires, and member checks, my theory of screening loop seem to resonate with them as an accurate description of what was happening. As mentioned above, this is only a snap shot of one chain of events that were influencing progression through the trial period. At the same time many other factors were also impacting this process to include training design, trainee characteristics, and work environmental factors as described extensively earlier in this chapter in the answers to the research questions.

**Implications for increasing adoption of LM CPR and LM.** In this section, I will present a summary of lessons learned that could help future researchers, educators, trainers, and clinicians maximize adoption of LM CPR and LM among physical therapists. Detailed descriptions of the below points are found in this dissertation.

First, our physical therapy profession (educators, clinicians, and administrators) should be aware that training often does not translate into adoption. The adoption process can be influenced by training design features, trainee characteristics, and work environment factors (Baldwin & Ford, 1988). Furthermore, it is likely that adoption of LMCPR and LM can be positively influenced by leveraging the facilitators to adoption found in this work, and minimizing the barriers.

Regarding training design features, research shows that a multi-component training program and serial training over an extended period of time increases the chance of adoption (Beaudry, 1989; Brennan et al., 2006; Davis et al., 1999; Marinopoulos et al., 2007). In addition to a standard CEU training lecture and hands-on lab, my research shows that participants also found other pre-course, course, and post-course training components helpful in the adoption process of LMCPR and LM. Other researchers have found that post-training support of physical therapists after training in similar topics is important in improving patient outcomes (presumably by increasing trainee adoption of the newly learned tools) (Cleland et al., 2009).

The pre-course activity that was perceived as the most helpful was reading the APTA white paper on manipulation. This is downloadable for free and can easily be found using any internet search engine.

Several non-traditional course activities were considered helpful (as were the traditional activities of lecture and lab) to include practicing using a CPR algorithm job aide with case studies, and participating in a training transfer lecture and group discussion/interaction at the end of the day. This former activity is described elsewhere

in this study, but it is important to raise trainee awareness of the training transfer problem and the screening loop (see adoption process section above).

Finally, post-course training components that were perceived as helpful were having access to online course resources (e.g. course lecture), job aides (e.g. CPR algorithm, evaluation forms), receiving weekly emailed instructor blog postings on the topic of LMCPR and LM, completing periodic questionnaires/phone interviews directed at following their adoption process, and participating in a “study” (and then sharing these findings (e.g. common barriers, facilitating factors, successes) in the weekly blog postings).

All of these training features could be fairly easily and inexpensively added to any existing CEU training program on the topic of LMCPR and LM, with the questionnaire/phone interview and participating in “study” components pragmatically requiring slight modifications. For example, this last component may be simulated by following-up with the course attendees after the course at a short-term time frame (1-6 weeks when most of the initial trial period is ongoing), and long-term time frame (1-12 months, when research suggests initial adopted behaviors might be lost) (Saks & Belcourt, 2006). This follow-up could be completed with a simple email questionnaire, a brief 1-2 question phone interview, and letting them know you are using their input to improve the training program (and then including trainee feedback in the weekly blog content). Although my questionnaires, interviews, and research study were more extensive for purposes of my research process, it is my conjecture (and this certainly needs more study) that using this abbreviated format would still provide some of the

benefits (e.g. reminder, opportunity to interact with and ask questions of the course instructor after the course, generate a sense of accountability to the instructor for adopting or at least trying out the newly learned tools) that were reported from my participants on these components.

In addition to training design factors, trainee characteristics and work environment factors can impact adoption. Here is an example of how the trainee characteristics (i.e. the decision to only partially use of the innovation) and work environment (i.e. not having many acute low back pain patients) can impact adoption. I then turn my points to what can be done to address these barriers, fully realizing that this is only an example of solutions to two barriers, and in this dissertation I have identified many barrier (which need overcoming) and many facilitators (which need leveraging) as other solutions to the adoption problem.

The two most frequent barriers cited by my participants to qualifying patients for manipulation using the LM CPR (assuming they are not using screening criteria) are therapists inconsistently (if at all) using the FABQ (and thus not having a FABQ score as a criteria), and infrequently (mean 16% of LBP evaluations) getting acute low back pain patients (i.e. patients with less than 16 days of LBP) (see table 3 and 15). Thus, infrequently (mean 21% of the time) would a patient have 4 of 5 criteria positive, which would strongly indicate (95% chance of success) that manipulation would be effective as a primary treatment early in the treatment plan (Flynn et al., 2002).

On the other hand, a lot more patients (mean 56% of the time) were reported by my participants as having 3 of the LM CPR criteria positive (i.e. most typically hip

internal rotation, hypomobility, and no pain below the knee). Other researchers have found that a patient with 3 of 5 LMCPR criteria present are still 68% likely to have a 50% reduction in MODI with up to several treatments over one week (Flynn et al., 2002). This is still a pretty good prediction level of success, given that the lumbar stabilization CPR indicates only a 67% chance of success with lumbar stabilization treatment when 3 of 4 criteria are present (Hicks, Fritz, Delitto, & McGill, 2005).

Some researchers have pushed the short rule LMCPR, qualifying patients for LM if their patients have the two heaviest weighted LMCPR criteria of no symptoms below the knee and pain less than 16 days (85% chance of success) (Fritz, Childs, & Flynn, 2005). This strategy makes sense, in terms of increasing efficiency, assuming the therapist is in a work setting where they get a lot of patients with less than 16 days of symptoms at the time of evaluation. However, if the therapist does not get these acute LBP patients very often, then they will not qualify very many patients for LM using the two criteria rule. If they do not qualify many patients, then their opportunities to use LM will be low and they will be less likely to adopt this tool.

I am recommending, in order to overcome the previously mentioned barriers, for those physical therapists that do not evaluate very many acute LBP patients that they use LM if they get 3 of 5 criteria present. Assuming they are unlikely to use the FABQ, and unlikely to have a patient with less than 16 days, then most frequently they will be using LM on patients who have no symptoms below the knee, hypomobility of at least one segment of the lumbar spine with spinal segmental testing, and passive prone hip internal rotation > 35 degrees in at least one hip. Fortunately, for my participants, these three

measures were something most of them were doing already before training in LMCPR; they were just not considering them as a rule. So, adopting using them as a decision rule would require little additional effort.

While I agree that a more efficient solution is the 2 rule CPR, it is likely that in order to increase the acute referrals to physical therapists (making the 2 rule CPR more broadly useable) a major shift in physician referral patterns needs to take place at a national level. This may be happening now, as the 2007 American Medical Association (AMA) LBP guidelines do indicate that LM is recommended on patients with less than 4 weeks of LBP (Chou et al., 2007). However, a referral between weeks 2-4 would still not make the 2 rule cut point.

In addition, given this guideline also recommends a trial of self-care options (e.g. encouraging a patient to remain active as tolerated) before physical therapy (i.e. “for patients that do not improve with self-care options, clinicians should consider the addition of nonpharmacologic therapy with proven benefits [which would include physical therapy referral and manipulation]” (Chou et al, 2007, p. 486)), it is unrealistic that a patient will be evaluated by a physician, fail a trial of self-care, be re-evaluated by the physician, then be referred to physical therapy, and then be actually evaluated by a physical therapists all within 16 days of LBP symptom onset. In order for the 2 rule CPR to work, the 16 day cut point needs to be clearly indicated in CPGs. This may take the work of the APTA working with AMA to advocate for such a change.

The question and challenge is, if these referral patterns changed, and physical therapists started receiving the acute low back pain patients with no symptoms distal to

the knee, as is done in the Mayo clinic system (Hoyle et al., 2012), would we be ready to treat them with manipulation? In other words, do outpatient physical therapists have manipulation in their tool kits confidently ready to use at any time, and on patients that are presenting in acute state of pain? I think not, as suggested by the historical low use of manipulation by physical therapists (Jette & Delitto, 1997; Mikhail et al., 2005; Willett et al., 2011).

Researchers are stating that efforts to educate physical therapy students and licensed physical therapists on LMCPR and LM are increasing (Sharma & Sabus, 2012; Struessel et al., 2012). Research is also suggesting that adoption is less than expected (as training transfer researchers would have predicted) (Sharma & Sabus, 2012; Struessel et al., 2012). My participants also demonstrated this lack of adoption of LMCPR and LM with prior training (see table 13 and 16). So what is the solution?

As recommend above, a multi-component training program is helpful. This dissertation also presents trainee characteristics (e.g. fostering a sense of accountability to change) and work environmental (e.g. attending training with a co-worker) facilitators that need to be leveraged in order to increase the adoption of LMCPR and LM after training of licensed physical therapists.

My research supports the findings that physical therapy students that have clinical instructors that do not use LM, are less likely to use LM (Fritz, 2012; Sharma & Sabus, 2012; Struessel et al., 2012). My participants consistently showed that if they were trained in LMCPR and/or LM in physical therapy school, and did have a clinical instructor that used LMCPR and/or LM, then they adopted these tools into their practice

out of school. While, those that did not have a clinical instructor that used LM CPR and/or LM, did not adopt LM CPR and/or LM out of school. So, it appears one solution to getting more entry level physical therapists practicing using LM CPR and LM is to make sure their clinical instructors are using these tools and encouraging their students to do the same. In other words, use clinical instructors as influential change agents. In order to achieve this, we must then look back at my prior discussions above on ways to get more licensed physical therapist to adopt LM CPR and LM after training, targeting clinical instructors particularly.

**Implications for instructional systems design.** My use of a blog system as an intervention in this study has implications for the field of instructional systems design. One of the post-course interventions in my study was an online post-training support system. This system was comprised of a blog, online course resources, and a discussion board. It was designed to create a forum for an eCoP, where trainees (who now shared the domain of LM CPR and LM) could continue to interact as an online community after the course primarily using the blog and discussion board. Through their online interaction the community members were expected to improve their practice together by supporting each other in their individual adoption efforts.

Online community interaction has been described as the key ingredient to a successful and thriving electronic community of practice (eCoP). The impact of participating in an eCoP after a training course is still being investigated, but some findings suggest that participation in such a community may lead to more training transfer (Barwick et al., 2009; Fung-Kee-Fung et al., 2008; Ranmuthugala et al., 2011;

Tax et al., 2012). However, no prior study that I am aware of has used this tool to facilitate physical therapists adoption of a newly learned skill.

The case study participant's use of the blog and discussion board (reading and posting) is listed in table 23. What I found is that none of the ten case study participants, and only one of the twenty two study participants posted to the discussion board, and very few even visited the discussion board. The reasons for this lack of use of the discussion board are described earlier in this chapter (see RQ3c). On the other hand, most of the participants (and all of the case study participants) read at least one of the blog postings. However, like the discussion board, very few (two) participants posted a comment on the board, with no peer responses. Thus, no interaction between course attendees occurred in either the discussion board or blog. So, clearly an eCoP was not established online.

Despite not serving as an eCoP, many participants did value the blog as a post-course tool that facilitated adoption (see table 24). So, what I will now describe is how the blog was used by the instructor, and a brief summary of how it was perceived as helping the participants in their adoption process (this is described in more detail in RQ#2c earlier in this chapter).

The blog was used by the instructor to post weekly commentaries on the topics covered in the course (e.g. LMCPR and LM). The instructor started in September 2012 with his initial postings for the first study cohort, and continued with one posting per week until the end of the study period in March 2013. The topics varied and included sharing new research that was published after the courses on the topic of LMCPR and

LM, as well as addressing adoption concerns and ideas from course study participants (gathered during the post-course questionnaires and phone interviews), posting questions (which no one answered throughout the study), and answering common questions that came up during various courses throughout the six month blog use period.

The instructor/researcher found the blog to be an important feedback loop tool. Throughout the dissertation study six month period, the instructor/researcher conducted post-course follow-up questionnaires and interviews. Information gained that could possibly help others in their adoption process was then shared by the instructor/researcher via his weekly blog posting. Thus creating a loop where trainee study participant feedback was made available to all other past trainees, allowing the information to be put to immediate use by peers.

One example of this feedback loop is when one of the participants indicated to the researcher during the six week phone interview that she was having physical challenges with performing the manipulation on larger built patients. The instructor/researcher/blog master then addressed that issue on his next weekly blog posting, indicating that one of the course attendees was having problems manipulating larger patients and then presented several solutions. On future interviews with other course participants, several commented that they had the same problem, and the blog posting about maneuvers to use for larger patients was helpful to them when working with such patients. In a way, the blog and interviews combined allowed the blog master to indirectly keep the connection and sharing between the participants ongoing in lieu of the absence of their direct interaction on the blog.

Using a blog as a simple tool for the instructor to continue to post current information, or start dialogues about a topic after a training course is not a novel concept, even in physical therapy where, according to my participants, in recent years they have noticed a few CEU/CME training providers have started offering such services. However, what was reported as novel by my participants was combining post-course serial questionnaires and interviews with course attendees, and then sharing that feedback in blog posts, or the feedback loop.

Also, they reported that other post-course blogs required them visiting the site to read postings. This required that they remember to do that on their own, something that often was forgotten. In this study, the weekly blog posting was emailed to their work address. The participants reported this was much preferred as it not only reminded them about the blog, but also about the adoption process. It also saved them time and increased the likelihood that they would read the blog content (some reported if they had to access the blog in addition to the email reminder that this would be enough of a barrier that they would not access the blog). They stated having the blog content in the email allowed them to quickly read it on their smart phone in between patients.

Finally, the blog was perceived as helpful to the participants in their adoption process in a variety of ways. First, the blog content was reported as increasing their knowledge on the topic (a form of serial post-course learning). Secondly, the blog email and blog posting both served as a reminder to continue to try to use the new tools in practice, as well as a reminder of the learned content. One participant reported it was helpful to her to hear about the adoption perspective of her fellow course attendees and

find out what they were struggling with via the feedback loop mechanism described above. Finally, one participant reported that he felt the blog postings increased the credibility of the instructor, long after the course was completed.

In summary, while my research was not able to investigate the impact of using an eCoP as a form of post-course support on adoption, it did show that using a blog as a post-course support tool was valued by study participants. The value was enhanced by combining the blog and post-course interviews and questionnaires as tools to create a simple feedback loop.

**Implications for field of design based research.** One of the concepts of design based research is gathering data on the design process as it proceeds, similar to having an overarching view of the design process. This perspective is leveraged to not only have a better understanding of the elements of the design system being studied, leading to improved iterations, but also to gather lessons learned or design principles that can then be shared with the design community. Thus, in this light, I have two areas to report on. The first is what I learned about the PraTT model components and what changes should be made based on this dissertation's findings (what I consider an evaluation: local impact DBR cycle). The second is a design principle that I observed throughout this study process, and something that I think can be leveraged by future design based researchers to improve the impact of their design interventions.

First, the PraTT model was studied extensively in this dissertation study. This was not the main purpose of the study, but to study the adoption process of LMCPR and LM some realistic intervention had to be used. So, I designed a realistic intervention, and

added in some non-traditional components (e.g. blog, discussion board, metric tracker, and training transfer lecture), grounded in training transfer research, to see what impact they would have on the adoption process. I will not discuss here the details of the participant feedback on the training program features since this was described earlier in RQ#3b. However, I will briefly summarize the changes that were made to the PraTT model prior to the start of this dissertation local impact DBR cycle, and based on the findings of this dissertation, what changes I will now make to the PraTT model.

The components that were added to the PraTT model just prior to this evaluation: local impact cycle were having a longer study period (12 weeks vs. 6 weeks in prior pilot cycles), adding a weekly blog email reminder, adding the discussion board (in hopes of stimulating more online interaction), adding a pre-course introductory blog posting activity, and adding a discussion group activity in the training transfer lecture (before it was just a lecture in earlier pilot cycles).

Based on the findings of this dissertation there will be many adjustments to the current PraTTv5 model (prior to any future DBR cycles). Among the pre-course activities I am planning only one change, to eliminate the newly added pre-course introductory blog posting activity due to the lack of use. There is strong justification from participant's feedback to retain the other pre-course activities (i.e. pre-course reading APTA white paper on manipulation, and reviewing the online resources and blog before the course).

Next, for the course activities, the only change I am now planning is to include in the training transfer lecture a warning of the screening loop theory (explained earlier in

the chapter under adoption process). There was strong evidence to retain all other course activities as currently designed.

Finally, most of the planned changes are related to the post-course training components. I plan to eliminate the metric tracker and discussion board at this time due to lack of use, and lack of perceived value. I will retain all other components. I will also add the following modifications to existing components based on findings from this dissertation: add pragmatic “follow-up” component (brief 1 page questionnaire completed at 6 weeks and 6 months, brief phone interview with 2-3 questions completed at 6 weeks and 6 months, and emphasis on following up to get feedback for training program improvement, rather than research), the weekly blog should be fully contained in the weekly email, the blog content should leverage the feedback loop as described above, and finally, the focus should be to leverage the feedback loop to transition to direct interaction between course attendees on the blog in hopes that an eCoP could be established.

This next cycle (DBR cycle 6) should be another evaluation: local impact using the PraTT v6 model based on these planned changes. Ideally this would be a randomized control trial comparing this PraTT based intervention training program versus a traditional training program (lecture/lab only) with emphasis on measuring knowledge, reaction, behavior, and patient outcome changes, as well as collecting qualitative feedback on the program features.

Regarding design principles, in this study I became aware of one design principle that I think can be leveraged as an intervention as well as a data collection method. This

principle is to use the design based research process as an intervention to change behavior. The Hawthorne effect has been widely researched, and is essentially the change in behavior that happens when someone believes they are being studied (McCarney et al., 2007). Typical reactions are for the person being studied to act in ways that they think the researcher wants them to behave, rather than their normal behavior. This is an internal validity threat for researchers because it does not give them an accurate depiction of what a subject would normally do in a given situation. Historically, researchers have been taught to guard against this threat by using control groups.

Some researchers are coming to the conclusion that rather than guard against the Hawthorne effect, we should embrace the effect and put it to use (McCarney et al., 2007). In my dissertation I did just that, I considered my data collection instruments (questionnaires and interviews) as interventions as well as researcher tools. Practically speaking this did not change the way I used my data collection tools as my research progressed. However, acknowledging that my research efforts (i.e. design based research focus on understanding the impact of my intervention and iterating changes, and my separate research focus on the process that physical therapists go through as they adopt LMCPR and LM into their practice after training on that topic) were likely having an impact on the participant's behavior led me to simultaneously study this effect, as a training program component, by including such questions in my questionnaire (see Appendix E) and the phone interview.

What I found was most of the participants felt the research tools (i.e. post-course questionnaires and interviews) served as a reminder for them to adopt LMCPR and LM,

provided opportunities for them to interact with the course instructor (who was also the researcher) and clarify topics learned in the training course, and gave them a sense of accountability to the instructor/researcher for adopting the innovations learned. Since the main focus of the iterative design process is to refine my intervention design so that it achieves the desired result (i.e. adoption of LM CPR and LM), the research tools did have that impact. Given this outcome, I have decided that my research data supports the inclusion of the research tools (questionnaire and interviews) in my training intervention.

The only caveat is that my dissertation process was extensive and required a lot more (frequency and length) questionnaires and interviews than what is practical for the standard use of my studied intervention (i.e. a CEU training program). So, on future design based research cycles, I will shorten the use of questionnaires and interviews to match what could be pragmatically used in my intervention in standard use conditions. If participants continue to report positive adoption influences from the minimal research tool use (and subsequently less instructor/researcher post-course interaction), then this intervention component will be retained.

One final thought on this design principle of using research as an intervention. My above description focused on the impact of using the research tools. The other factor is the participant knowing that they are participating in a formal research study (design based research cycle). This is obvious to them when they sign the informed consent, and are asked to complete questionnaires and interviews by a “researcher”. However, what happens when the training program is being used in standard conditions, and no informed consent is obtained, and the course attendee is not really a study participant, but more of a

trainee (user) that is providing feedback on training (user feedback) to the trainer? For example, a person attends a course, and then the course instructor, as part of the training program “follows-up” (i.e. asks how adoption is going) with the trainee 6 weeks after the course with a questionnaire, or a short phone interview. Given the lack of informed consent, and the lack of participation in a formal study, as was being done during the design based research cycles, the trainee may not feel the same level of accountability to adopt the innovations from this informal instructor follow up. So, the design based research conditions that justified using “research” as an intervention, are now different in the standard use conditions.

I bring up this last point to suggest that efforts should be made by the instructor to replicate the feeling or perception of the trainee participating in a research study, even when a research study is not being conducted, but rather the intervention is being used in standard conditions. Obviously this cannot be done in a way that is deceitful. So how can this be done ethically? In this case I propose that the instructor make an effort to let the trainee know that their feedback will be used to improve the training program, or in other words user feedback will be used, and should be used (e.g. see feedback loop in the instructional systems design section above for a description of how such feedback can be incorporated into the blog content as part of the intervention). The hope being that this would then create a sense of participation in research (albeit informal) or qualify improvement, rather than just having the instructor following-up with the user to see how things are going (which by itself is also a valuable influence). This may result in a

similar perception as participating as a formal study participant, or may not. Of course, this would need to be studied.

### **Validity Threats**

As with any study, my study had factors that when inspected closely could make my conclusions and findings suspect to revision. Many of these validity threats were identified before the study (see chapter 3, table 1), and mitigation plans were made accordingly. Now that the study is completed, I have relooked at the validity threat matrix and thought carefully about my conclusions and how what I am saying could be wrong. The biggest threats I identified were my operational definition of adoption or not adopting LMCPR and LM, the limited study period, using self-reported behavior change (rather than observed behavior change), indicating that something changed without doing statistical significance testing, and the generalizability of my findings.

The biggest validity threat to my final conclusion about how many participants adopted LMCPR and LM after my training program is based on the operational definitions of what constituted full use, partial use, or no use of LMCPR and LM (see table 5 in chapter 4). These definitions certainly can be challenged. For example, I categorized George as fully using LM in his practice twelve weeks after the course. He qualified as full use of LM (i.e. FM), even with only performing LM on one patient a few times over this twelve week period, because he only had one LBP patient in that twelve week period that was strongly indicated for LM (i.e. the patient had 4 of 5 LMCPR criteria present), and he performed LM on her. This exactly meets the operational definition of FM (see table 5 in chapter 4).

Some critics might suggest that performing LM on one patient over a twelve week period weakly proves that he has adopted LM into his practice. I would agree he might be less likely to continue to use LM in his practice in the future if he continues to have such limited opportunities to perform LM versus a therapist that has many opportunities to perform LM. However, as it stands at the twelve week point, he not only used LM when indicated, based on his overall interviews and questionnaire responses he gives many other indications (e.g. see table 22 columns A, B, H, and I, and see his case study in chapter 5) that despite seeing few LBP patients that he is committed to continuing to use LM whenever strongly indicated. I think this validates the operational definition as appropriate for use on physical therapists that are adopting LM, even in low use conditions.

I also feel the process I used to establish these operational definitions mitigates the validity threat. I used a multi-step process to determine how to categorize participants as having adopted or not having adopted LMCPR and LM. I first compared my general sense of adoption of LMCPR and LM from the interviews (i.e. getting an overall sense of the participant's practice behaviors) to their reported questionnaire and interview data. I then categorized the participant as having adopted or not adopted LMCPR and LM. I then came up with a tentative operational definition that I felt had face validity and was supported by the data, and then tested it on every case study to insure that a match occurred between this operational definition and my previously determined general sense of adoption from the questionnaire and interview data. When the definition did not work 100% of the time, I relooked if I made a mistake in

categorizing the participant or in defining the operational definition. Once adjustments were made and the operational definition fully categorized all participants consistently, I then did a final member check to see if the case participant agreed with my overall assessment of their before and after study description of their use of LMCPR and LM. All participants agreed with my categorization. I feel this further validates that my operational definitions were accurate.

Also, my conclusions on behavior changes are only valid for the twelve week period. It is entirely possible and likely (according to training transfer research) that self-reported adoption levels at twelve weeks will continue to change up to one year after training (Saks & Belcourt, 2006). Furthermore, adoption over the first twelve weeks may reflect more of the trial rate of LMCPR and LM, rather than a permanent adoption rate. However, with that said, for most of the participants that trial period seemed to take place during the first six weeks of the post-course period.

Another important validity threat is that self-reported behavior change may not be accurate. However, Curry and Purkis (1986) concluded that “the self-report procedure is sufficiently valid to be recommended as a routine evaluation mechanism in CME courses” (p 583). Other researchers have also used similar techniques, for example surveys used to measure self-reported behavior change after a CE on lumbopelvic manipulation CPR and manipulation (Willett et al., 2011).

In addition, Wergin et al. (1988) stated, “telephone interviews appear to be an effective means of evaluating these impacts, for three reasons. First, telephone interviews are open-ended, and allow for a thorough explanation of reasons for change. Second,

interviews are capable of collecting a great deal of information in a relatively short time. Third, while interview appointments can be difficult to arrange, course attendees are generally receptive to the approach. The technique should, however, be reserved for measures of change in attitude, clinical decision criteria, behavioral intent, and qualitative perceptions of course impacts.” (p. 156). Also, other researchers in physical therapy have used phone interviews for self-reported practice patterns with respect to manipulation (Mikhail et al., 2005).

Most importantly, I used multiple sources to cross-check reported behavior and perception changes such as asking follow-up interview questions about how and why changes occurred when reported on questionnaires. This allowed the participant an opportunity to further reflect on their earlier responses. In some cases this interview probing led to the identification of disagreements between questionnaire and interview responses on the same question (see table 25), in which case the participant was able to explain this discrepancy and data was adjusted (and documented in Appendix P) when factual errors were clearly made.

Another source of cross-verification came from the study having multiple co-worker participants (see table 3). For example, some of the questionnaire items were regarding co-workers behaviors (see table 3). In all but one case, participant’s responses and co-workers descriptions of co-workers behaviors matched up. The exception was clarified during a follow-up phone interview, where the co-worker then indicated that the participant’s self-reported behavior was accurate, and their perception of the co-workers behavior was not accurate.

Some would argue that since I did not perform statistical significance analysis on apparent changes over time (e.g. knowledge test score changes, and changes in reported behavior and perceptions) that I cannot make any conclusions about the validity of these changes. Here it is important to note that many statisticians have pointed out that statistical significance testing cannot determine if the differences found are real, as opposed to the result of sampling error. Rather, it can only provide the probability that any difference found could have been due to random sampling error if there really were no difference in the population sampled (Cohen, 1990). While I chose to not conduct such testing based on the focus of my dissertation on exploring cases, I did make statements throughout the study about how behavior or perceptions had increased or decreased. It is important to point out that these statements about changes were made more based on rich descriptions of clinical behavior and perceptions, and what participants reported as meaningful changes from their perspectives, rather than just apparent differences in quantitative data.

The last validity threat is an external validity threat which is to question whether or not my findings are generalizable to other physical therapists. The quick answer is no, and some would then ask the follow-on question, how can the findings be reliably applied to others? The answer is the findings and cases must be thought of in terms of the reader asking themselves, does this accurately apply to my situation. If enough similarities are present between what a case study is describing and the conditions in which a reader is working with (e.g. someone who is teaching a CEU course and is trying to get their students to increase the adoption of LMCP and LM), then the findings may be

transferable, or applicable, to the readers situation. So, it is up to the readers to ultimately decide how relevant the findings of this research study are, and what can be used in a valid fashion (Shenton, 2004).

### **Implications for Research**

While my research study did describe the process of adoption of LMCPR and LM, and identify various facilitating factors and barriers specific to this process, it also raised some new questions that need further exploring. For example, how to best increase the percentage of acute low back pain referrals to physical therapy, and how would that impact the use rate of LMCPR and LM among physical therapists. Also, can targeting clinical instructors as change agents lead to wider spread adoption of LMCPR and LM among our graduating physical therapy students as they become newly licensed physical therapists?

In addition, more cycles of design based research need to be completed on my PraTT based intervention. This includes further exploration of the screening loop theory (e.g. looking at the impact of discussing this theory with course attendees during the training transfer lecture), and the other changes (e.g. shortening the “follow-up” research tools to make them more pragmatic) that I recommend making to the PraTT model based on this dissertation local impact cycle. Ultimately, the PraTT model based multi-component training program needs to be tested in a RCT against the traditional CEU model (lecture and lab with no pre/post course follow-up).

A final area that needs further exploration is the effect of using an eCoP as part of a post-training support system on physical therapists’ training transfer behavior. Some of

the participants indicated that even though they did not use the online support system as an eCoP to help their adoption, they see potential in such a system helping others given certain conditions (e.g. complex topics that likely stimulate more discussion, joining an already active community with “consistent comments and replies”).

## Appendix A: Knowledge of LMCPR and LM Questionnaire

### Course Knowledge Test

Name:

Today's Date:

#### Scenario:

A 25 year old male complains of low back pain and right posterior thigh pain x 2weeks insidious onset. Patient states he has never had LBP, has had no trauma, no diagnostic imaging, and no treatment to date. He completes a MODI and FABQ in the waiting room. Prior to bringing him back for the exam, you take 2 minutes to score these instruments and note his MODI as 30%, FABQW = 15, and FABQP = 15. As the patient walks back for the exam, you notice he has a normal gait. During the exam you notice no aberrant motions with standing forward flexion or any other observed transition movements. Your clinical exam shows no improvement in symptoms location or magnitude with repeated movement testing, except a moderate increased LBP with repeated prone extension testing. He has a mild increase in localized LBP w/ manual pelvic traction. He has a negative bilateral SLR, and SLR PROM limited to 70 degrees bilaterally, negative prone instability test, hypomobile Lumbar 1- Lumbar 5 CPA, and bilateral hip prone internal rotation of 30 degrees. No red flags signs/symptoms were present.

#### Answer the questions #1-4 below using the above scenario:

- 1) What Lumbar CPR treatment subgroup is most appropriate as a starting point and most likely to have the biggest reduction in this patient's MODI score?
  - a) Directional Specific Exercise
  - b) Lumbopelvic Manipulation
  - c) Lumbar Stabilization
  
- 2) Based on the Lumbar CPRs what should be the most indicated initial treatment you would try with the above patient?
  - a) Pelvic Traction
  - b) Ultrasound
  - c) electrical stimulation
  - d) flexion based lumbar stretches
  - e) lumbar stabilization
  - f) lumbopelvic manipulation
  - g) prone press ups

- 3) What would be the expected likelihood of success of using the intervention in #2 above?  
a) 68% b) 50% c) 95% d) 25% e) 33%
- 4) What % change of the MODI score should you expect to see with the intervention in #2 above?  
a) 25% b) 100% c) 10% d) 50% e) 75%

**General questions (not related to the above scenario):**

- 5) When performing the lumbopelvic manipulation to the patients' right lumbopelvic region, where do you stand and how is the patient positioned?  
a) stand on patients' left, and position the patients' trunk into left sidebend and right rotation  
b) stand on patients' right, and position the patients' trunk into right sidebend and left rotation  
c) stand on patients' right, and position the patients' trunk into right sidebend and right rotation  
d) stand on patients' left, and position the patients' trunk into right sidebend and left rotation  
e) stand on patients' right, and position the patients' trunk into left sidebend and right rotation
- 6) Which of the following is a lumbopelvic Manipulation CPR criteria that supports the use of lumbopelvic manipulation?  
a) prone hip IR > 25 b) lumbar pain below the knee c) positive prone instability test d) Lumbar hypomobility with CPA spring testing
- 7) Which of the following is not a contraindication to performing a lumbopelvic manipulation?  
a) lumbar pain with associated leg pain below the knee b) osteoporosis c) lumbar fracture d) red flag signs (e.g. bowel/bladder changes, or saddle anesthesia)
- 8) If 3 out of 5 of the lumbopelvic manipulation CPR criteria are present for a patient, what is the expected likelihood of success using lumbopelvic manipulation?  
a) 68% b) 50% c) 95% d) 25% e) 33%

Answers (not included on test given to participants): 1b, 2f, 3c, 4d, 5d, 6d, 7a, 8a

## **Appendix B: Baseline Demographics, Perception and Intention of LMCPR & LM, and Adoption Questionnaire**

Post-Course Baseline

Name:

Today's Date:

**Purpose:** The purpose of this questionnaire is to determine your perception of, intention to use, and use of the lumbopelvic manipulation Clinical Prediction Rule (CPR) and its related components (e.g. measuring Modified Oswestry Disability Index (MODI), Fear Avoidance Belief Questionnaire (FABQ), and performing a lumbopelvic manipulation).

The term mechanical low back pain (MLBP) in this questionnaire refers to anyone with mechanical non-specific low back pain with or without associated lower extremity pain (without neurological findings such as myotomal weakness, diminished reflexes, dermatomal altered sensation, or red flags such as ataxic gait, changes in bowel/bladder, or saddle anesthesia).

For this questionnaire, the term "lumbopelvic manipulation" is defined as any high velocity, low amplitude therapeutic movement at end range of motion directed to the lumbar spine and/or SI joints. This is also commonly known as spinal manipulation, or a grade V mobilization.

1. Prior to this course, have you ever been trained on using the lumbopelvic manipulation CPR? (if Yes, please explain when, how, and the number of hours of training)  
\_\_\_ YES: \_\_\_\_\_  
\_\_\_ NO
2. Prior to this course, have you ever been trained on performing a lumbopelvic manipulation of any kind? (if YES, please explain when, how, and the number of hours of training)  
\_\_\_ YES: \_\_\_\_\_  
\_\_\_ NO:

3. How many outpatient visits (i.e., evaluations, treatments, follow-up) do you currently have per week with patients with mechanical low back pain?  
\_\_\_\_\_
4. How many times per week do you currently perform a lumbopelvic manipulation to patients with mechanical low back pain?\_\_\_\_\_
5. Did you attend today's course with any co-workers? (if so, please provide the name of your co-worker):\_\_\_\_\_  YES  NO
6. How frequently do your current co-workers use the lumbopelvic manipulation clinical prediction rule when evaluating MLBP patients (circle one)?  
Never(1) Rarely(2) Sometimes(3) Frequently (4) All the time (5)
7. How frequently do your current co-workers use lumbopelvic manipulations as a treatment for MLBP patients (circle one)?  
Never(1) Rarely(2) Sometimes(3) Frequently (4) All the time (5)
8. What % of the time do you currently do the following with your mechanical low back pain patients: (put a **% of the time** that you do this next to each item below. For example, if you measure and score MODI for mechanical low back pain patients only half the time, then put a "50%" next to "MODI measured and scored at each initial evaluation and follow-up visit" below):
  - a. \_\_\_MODI measured and scored at each initial evaluation and follow-up visit
  - b. \_\_\_FABQ Work measured and scored at the initial evaluation
  - c. \_\_\_Bilateral prone hip internal rotation is measured at the initial evaluation
  - d. \_\_\_Lumbar spinal segments are classified as hyper or hypomobile at the initial evaluation
  - e. \_\_\_Pain is determined as above or below the knee at the initial evaluation
  - f. \_\_\_Number of days of current low back pain episode is determined at the initial evaluation
  - g. \_\_\_Determine how many of the five CPR criteria are present at the initial evaluation
  - h. \_\_\_Determine if any contraindications to lumbopelvic manipulation are present
  - i. \_\_\_Lumbopelvic manipulation is performed if 3 or more of the 5 CPR criteria are present
  - j. \_\_\_Lumbopelvic manipulation is performed if 4 or more of the 5 CPR criteria are present

9. Indicate your agreement with the following statements regarding the lumbopelvic manipulation CPR (circle your answer):

a. I intend to use the lumbopelvic manipulation CPR in my practice.

1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

b. I am confident in my ability to use the lumbopelvic manipulation CPR.

1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

c. I have opportunities to use the lumbopelvic manipulation CPR on my patients.

1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

d. I feel using the lumbopelvic manipulation CPR provides advantages over my current clinical decision making.

1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

e. I feel using the lumbopelvic manipulation CPR is compatible with my current clinical decision making methods and beliefs.

1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

f. I feel the lumbopelvic manipulation CPR is complex and difficult to use.

1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

g. I feel I can easily try out using the lumbopelvic manipulation CPR with my MLBP patients.

1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

10. Indicate your agreement with the following statements regarding lumbopelvic manipulations (circle your answer):

a. I intend to use lumbopelvic manipulations as a treatment in my practice.

1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

b. I am confident in my ability to use lumbopelvic manipulations.

1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

c. The risk of me injuring a patient while using a lumbopelvic manipulation is low.

1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

- d. The risk of me being sued for using a lumbopelvic manipulation is higher than other treatments I typically use.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)
- e. I have opportunities to use lumbopelvic manipulations on my patients.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)
- f. I feel using lumbopelvic manipulations provide advantages over my current treatment methods.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)
- g. I feel using lumbopelvic manipulations are compatible with my current treatment methods and beliefs.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)
- h. I feel lumbopelvic manipulations are complex and difficult to use.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)
- i. I feel I can easily try out using lumbopelvic manipulations on my MLBP patients.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

11. What did you learn from this course that you will use directly in your practice?  
Please indicate why: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

12. What did you learn from this course that you will NOT use in your practice?  
Please indicate why: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

13. Demographics/Background (write in answer):

- a. Age: \_\_\_\_\_
- b. Gender: \_\_\_\_\_
- c. Year graduated from Physical Therapy school: \_\_\_\_\_
- d. Highest level of Physical Therapy education (circle one): Bachelors, Masters (MPT), Doctorate (DPT), tDPT
- e. Highest academic degree obtained (e.g. MPT, PhD,): \_\_\_\_\_
- f. List any specialty certifications (e.g. OCS, CSCS, Cert MDT, COMT, etc.):  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- g. Did you graduate from a physical therapy Residency or Fellowship program (if so, please indicate which one and the year graduated)?  
\_\_\_\_\_  
\_\_\_\_\_
- h. In the last year have you been a clinical instructor? \_\_\_\_ YES \_\_\_\_ NO
- i. How many years of outpatient orthopedic based physical therapy experience do you have? \_\_\_\_\_

## Appendix C: Follow-Up Perception, Intention of LMCPR & LM, Adoption, and Process Questionnaire

Post-Course follow-up

Name:

Today's Date:

**Purpose:** The purpose of this questionnaire is to determine your perception of, intention to use, and use of the lumbopelvic manipulation Clinical Prediction Rule (CPR) and its related components (e.g. measuring Modified Oswestry Disability Index (MODI), Fear Avoidance Belief Questionnaire (FABQ), and performing a lumbopelvic manipulation).

The term mechanical low back pain (MLBP) in this questionnaire refers to anyone with mechanical non-specific low back pain with or without associated lower extremity pain (without neurological findings such as myotomal weakness, diminished reflexes, dermatomal altered sensation, or red flags such as ataxic gait, changes in bowel/bladder, or saddle anesthesia).

For this questionnaire, the term "lumbopelvic manipulation" is defined as any high velocity, low amplitude therapeutic movement at end range of motion directed to the lumbar spine and/or SI joints. This is also commonly known as spinal manipulation, or a grade V mobilization.

1. How many outpatient visits (i.e., evaluations, treatments, follow-up) do you currently have per week with patients with mechanical low back pain?

\_\_\_\_\_

2. How many times per week do you currently perform a lumbopelvic manipulation to patients with mechanical low back pain? \_\_\_\_\_

3. How frequently do your current co-workers use the lumbopelvic manipulation clinical prediction rule when evaluating MLBP patients (bold type answer below)?

Never(1)    Rarely(2)    Sometimes(3)    Frequently (4)    All the time (5)

4. How frequently do your current co-workers use lumbopelvic manipulations as a treatment for MLBP patients (bold type answer below)?  
Never(1) Rarely(2) Sometimes(3) Frequently (4) All the time (5)

5. What % of the time do you currently do the following with your mechanical low back pain patients: (put a % of the time that you do this next to each item below. For example, if you measure and score MODI for mechanical low back pain patients only half the time, then put a “50%” next to “MODI measured and scored at each initial evaluation and follow-up visit” below):

- a. \_\_\_MODI measured and scored at each initial evaluation and follow-up visit
- b. \_\_\_FABQ Work measured and scored at the initial evaluation
- c. \_\_\_Bilateral prone hip internal rotation is measured at the initial evaluation
- d. \_\_\_Lumbar spinal segments are classified as hyper or hypomobile at the initial evaluation
- e. \_\_\_Pain is determined as above or below the knee at the initial evaluation
- f. \_\_\_Number of days of current low back pain episode is determined at the initial evaluation
- g. \_\_\_Determine how many of the five CPR criteria are present at the initial evaluation
- h. \_\_\_Determine if any contraindications to lumbopelvic manipulation are present
- i. \_\_\_Lumbopelvic manipulation is performed if 3 or more of the 5 CPR criteria are present
- j. \_\_\_Lumbopelvic manipulation is performed if 4 or more of the 5 CPR criteria are present

6. Indicate your agreement with the following statements regarding the lumbopelvic manipulation CPR (bold type each answer below):

a. I intend to use the lumbopelvic manipulation CPR in my practice.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

b. I am confident in my ability to use the lumbopelvic manipulation CPR.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

c. I have opportunities to use the lumbopelvic manipulation CPR on my patients.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

d. I feel using the lumbopelvic manipulation CPR provides advantages over my current clinical decision making.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

e. I feel using the lumbopelvic manipulation CPR is compatible with my current clinical decision making methods and beliefs.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

f. I feel the lumbopelvic manipulation CPR is complex and difficult to use.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

g. I feel I can easily try out using the lumbopelvic manipulation CPR with my MLBP patients.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

7. Indicate your agreement with the following statements regarding lumbopelvic manipulations (bold type each answer below):

a. I intend to use lumbopelvic manipulations as a treatment in my practice.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

b. I am confident in my ability to use lumbopelvic manipulations.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

c. The risk of me injuring a patient while using a lumbopelvic manipulation is low.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

d. The risk of me being sued for using a lumbopelvic manipulation is higher than other treatments I typically use.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

e. I have opportunities to use lumbopelvic manipulations on my patients.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

f. I feel using lumbopelvic manipulations provide advantages over my current treatment methods.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

g. I feel using lumbopelvic manipulations are compatible with my current treatment methods and beliefs.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

h. I feel lumbopelvic manipulations are complex and difficult to use.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

i. I feel I can easily try out using lumbopelvic manipulations on my MLBP patients.  
1 (strongly disagree) 2 (disagree) 3 (unsure) 4 (Agree) 5 (strongly agree)

8. What factors seemed to help you in the process of adopting the lumbopelvic manipulation CPR into your practice?

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9. What factors seemed to help you in the process of adopting lumbopelvic manipulations into your practice?

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10. What difficulties/barriers did you experience in the process of adopting the lumbopelvic manipulation CPR into your practice?

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11. What difficulties/barriers did you experience in the process of adopting lumbopelvic manipulations into your practice?

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## Appendix D: Baseline Reaction and Perception of Program Questionnaire

### Course Evaluation

Name:

Today's Date:

1) Overall program rating (0-10, where 10 is Outstanding and 0 is poor):

0    1    2    3    4    5    6    7    8    9    10

2) Please state what features of this training program you found most helpful and why:

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3) Please state what features of this training program you found least helpful and why:

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4) Please check which of the below pre-training (before the course) activities you completed:

- Reviewing post-course activities site and contents
- Reading the APTA White paper on spinal manipulation
- Participating in the online blog/discussion board introduction activity

## Appendix E: Follow-Up Reaction and Perception of Program Questionnaire

Course Evaluation Follow-up

Name:

Today's Date:

1) Overall program rating (0-10, where 10 is Outstanding and 0 is poor):

0 1 2 3 4 5 6 7 8 9 10

2) Please state what features of this training program you found most helpful and why:

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---

3) Please state what features of this training program you found least helpful and why:

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4) Please check if any of the below pre-training (before the course) activities played a role in your adoption of the lumbopelvic manipulation CPR and/or lumbopelvic manipulations? (if so, please explain below)

Reviewing post-course activities site and contents

Reading the APTA White paper on spinal manipulation

Participating in the online blog/discussion board introduction activity

Explain: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

5) Please check if any of the below face-to-face course activities played a role in your adoption of the lumbopelvic manipulation CPR and/or lumbopelvic manipulations? (if so, please explain next to each checked item):

\_\_\_ lectures: \_\_\_\_\_  
\_\_\_ labs: \_\_\_\_\_  
\_\_\_ Case studies: \_\_\_\_\_  
\_\_\_ Reviewing reference materials (e.g. algorithm): \_\_\_\_\_  
\_\_\_ Maximizing Training Transfer Discussion \_\_\_\_\_  
\_\_\_ Visiting online post-training support system in class: \_\_\_\_\_  
\_\_\_ Other: \_\_\_\_\_

6) Please check if any of the below post-course training activities/tools played a role in your adoption of the lumbopelvic manipulation CPR and/or lumbopelvic manipulations? (if so, please explain next to each checked item):

\_\_\_ Blog: \_\_\_\_\_  
\_\_\_ Metric Tracker: \_\_\_\_\_  
\_\_\_ CPR Algorithm: \_\_\_\_\_  
\_\_\_ Posted course lecture: \_\_\_\_\_  
\_\_\_ APTA White paper: \_\_\_\_\_  
\_\_\_ Evaluation form: \_\_\_\_\_  
\_\_\_ Addendum form: \_\_\_\_\_  
\_\_\_ Posted MODI/FABQ forms: \_\_\_\_\_  
\_\_\_ Weekly blog/discussion board reminder email: \_\_\_\_\_  
\_\_\_ Discussion board: \_\_\_\_\_  
\_\_\_ Questionnaires: \_\_\_\_\_  
\_\_\_ Phone interviews: \_\_\_\_\_  
\_\_\_ Other: \_\_\_\_\_

## Appendix F: LMCPR and LM Competency Checklist

Lumbopelvic Manipulation Clinical Prediction Rule and Lumbopelvic Manipulation Competency checklist

Name:

Date:

Key: GO=competent (performs correctly) and NO GO = not competent (performs incorrectly)

Item	Go/No Go
LMCPR: measure prone hip internal rotation	
LMCPR: perform CPA Spring testing to lumbar spine and classify as hyper, normal, or hypomobile	
LMCPR: score the FABQWork	
LM: Position mock patient correctly for manipulation	
LM: Move patient to end range while maintaining setup position	
LM: Perform end-range thrust maneuver to lumbopelvic region using appropriate force	
LM: Return patient to pre-LM neutral position	
LM: Instruct mock patient in supine hooklying pelvic tilts and monitors for 5 repetitions	

\_\_\_\_\_  
Name of instructor observing the above skills

\_\_\_\_\_  
Date of Observation

## Appendix G: Interview Guide

Phone Interview Guide (semi-structured interview): conducted at six and twelve week post-course immediately after getting results of six and twelve week questionnaires

1. Questionnaire questions:
  - a. “How long did it take for you to complete the Adoption Questionnaire?”
  - b. “Were there any parts to the Questionnaire that were confusing or could be made clearer?”
2. Confirm/validate Answers:
  - a. “Based on your self-reported LM CPR/LM behavior change on the questionnaire I am concluding the following has changed \_\_\_\_\_? Are these accurate conclusions?”
  - b. “Based on your response to “how many LBP visits per week, and how many times per week you perform LM?” I calculate you perform LM during X% of your LBP visits, do you think this % accurately reflects your LM use?” [Also, I will follow-up if any changes in reporting on the number of LBP visits per week reported at baseline to 6wks to 12 wks and ask why (note that this number should remain the same if the participant is reliable and nothing unusual has occurred in their job setting)]
  - c. Follow-up on any other open-ended questionnaire responses that needs clarifying, or any question that was not answered on the questionnaire, if not appropriate to fit elsewhere with any other related question on this interview guide.
3. Focus on LM CPR/LM:
  - a. What is your perception of LM CPR and LM?
  - b. Follow-up on any seemingly large changes (i.e., “Baseline demographics, perception and intention of LM CPR & LM, and adoption” questionnaire #7, #8, #9, #10, and “Follow-up perception, intention of LM CPR & LM, adoption, and process” questionnaire #3, #4, #5, #6) and ask why it changed?
  - c. If any of the above Likert questions are answered “disagree” or “strongly disagree” (or “agree or “strongly agree” for baseline questions #10d, 10k, 10L or follow-up questions #6d, 6k, 6L) ask why?

4. Focus on Adoption and Process:
  - a. “Can you please describe the process you went through as you tried to adopt LMCPR?”
  - b. “What about LM?”
  - c. Refer to “Follow-up perception, intention of LMCPR & LM, adoption, and process” questionnaire responses to #7, #8, #9, and #10 for additional probing questions for the below subquestions. Each response will be followed up with “why” or “how” as appropriate)
    - i. “What factors were most related? “
    - ii. “What were the most important facilitators?”
    - iii. “What were the biggest difficulties/barriers?”
    - iv. “How did you overcome (or recommend overcoming) these difficulties/barriers?”
    - v. “Why do you think you failed to overcome these difficulties/barriers?”
  - d. Follow-up with “Baseline demographics, perception and intention of LMCPR & LM, and adoption” question #6, and ask their perception of their co-workers adoption of LMCPR and LM? Ask why they feel their co-worker adopted or did not adopt. If the co-worker is also a participant then I will compare this answer to the co-workers’ “Follow-up perception, intention of LMCPR & LM, adoption, and process” questionnaire answer #10p-r, and adoption process interview answers for triangulation.
  - e. Follow-up on answers to “Baseline demographics, perception and intention of LMCPR & LM, and adoption” questions #11 and #12. Interested in seeing if they used/did not use as anticipated, and why.
5. Focus on Training Program:
  - a. “Are there any activities of this training program that you found played a role in your adoption process of LMCPR or LM?” (probe, initially only mentioning each of the three major sequenced events of the training program: pre-training activities, course activities, and post-training activities, and then probe further using the participant’s answers #4, #5, and #6 from the “follow-up reaction and perception of program” questionnaire). Follow-up answers with “why” and “how”.
  - b. “You suggested on the course evaluation that \_(answer #2/#3\_on ” Baseline reaction and perception of program” questionnaire) \_\_ features of this training program were helpful /not helpful. Can you please explain in what way it was helpful/not helpful? “ Also, follow-up with “why”

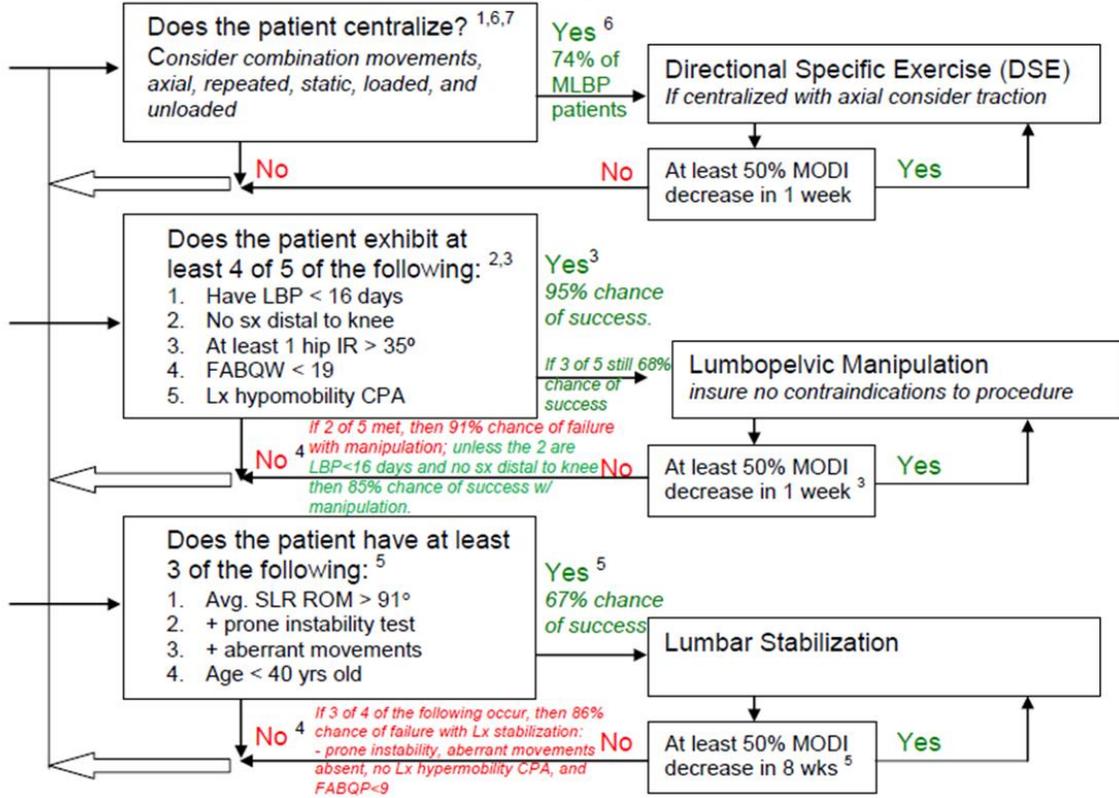
questions if answers to #2 and #3 changed from baseline to 6wks to 12 wks questionnaires.

- c. “Why did you use/or not use particular features of the training program (probe as needed specifically for pre-training reading and online activities, and post-training online activities)?”
  - d. “Do you currently or have you ever used social networking (e.g. blogging or discussion boards)? “
    - i. “If so, how do you use them?”
6. Accountability:
- a. “Did you feel accountable to anyone to adopt LM CPR or LM? Why?”
7. “Anything else you want to tell me that I did not ask?”

## Appendix H: CPR Algorithm

### Mechanical Low Back Pain Clinical Practice Guideline Algorithm\*\*

Initial evaluation to include: MODI, FABQ Work and Physical, repeated lumbar movements, LX CPA mobs (hyper vs. hypo), prone Hip IR PROM, SLR PROM, assessment of Aberrant Movement with Sagittal plane trunk motion, Prone Instability Test, and Neuro exam as indicated.



\*\* Algorithm is only supported by research for patients with MLBP with or without distal LE sx, ages 18-60, and with no indications of nerve root impingement (positive SLR <45 deg, or diminished lower extremity strength, sensation, or reflexes), no prior lumbar surgeries, no spondylolisthesis, no lumbar fracture, no osteoporosis, and no red flag signs/symptoms.  
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## **Appendix I: Informed Consent**

### **INFORMED CONSENT FORM: Mixed methods study of physical therapists' process of adoption of the lumbopelvic manipulation clinical prediction rule and lumbopelvic manipulation following a multi-component training program**

#### **RESEARCH PROCEDURES**

This research is being conducted to look at what happens after you attend a continuing education course. If you agree to participate, you will be asked to complete questionnaires (pre-course, immediately post-course, six weeks post-course, and twelve weeks post-course). Each questionnaire takes approximately five-ten minutes to complete. In addition, you will participate in two phone interviews that will be conducted at six and twelve weeks after the course. Each interview will likely take 45 minutes. Finally, I will observe any use (i.e. your postings) of our online blog and discussion board. In total this study will require approximately three hours of your time over a twelve week period.

#### **RISKS**

There are no foreseeable risks for participating in this research.

#### **BENEFITS**

There are no benefits to you as a participant.

#### **CONFIDENTIALITY**

The data in this study will be confidential and will be attributed only to a pseudonym (fake name), and never your real name. I will audio tape any interviews. I may use some of your words when I write the report, but once again only a pseudonym will be used. Once the study is complete, the audio files will be deleted.

#### **PARTICIPATION**

Participants in this study must be licensed physical therapists who currently evaluate and treat low back pain patients on a weekly basis. Your participation is voluntary, and you may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which you are otherwise entitled. A token gift of appreciation (\$5 gift card) will be sent with a reminder letter at the 5<sup>th</sup> and 11<sup>th</sup> week post-course to those participants that are still involved in the study at that time. There are no costs to you or any other party.

**CONTACT**

This research is being conducted by Jesse Ortel, College of Education and Human Development at George Mason University. I may be reached at 703-704-xxxx for questions or to report a research-related problem. You can also email my teacher, Dr. Brenda Bannan, a Professor at George Mason University, at xxxxx@gmu.edu.

You may contact the George Mason University Office of Research Subject Protections at 703-993-4121 if you have questions or comments regarding your rights as a participant in the research.

This research has been reviewed according to George Mason University procedures governing your participation in this research.

**CONSENT**

\_\_\_\_\_ *I agree to audio taping phone interviews.*

\_\_\_\_\_ *I do not agree to audio taping phone interviews.*

I have read this form and agree to participate in this study.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date of Signature

## **Appendix J: Pre-notification Letter 5<sup>th</sup> Week**

October 26, 2012  
John Doe  
111 S Street  
Alexandria, VA 22308

Dear John,

It has now been nearly six weeks from the time you attended the “Treatment Strategies for Low Back Pain Utilizing CPRs” course on 22 September. Thanks again for volunteering to be a participant in my study. As previously mentioned, at six and twelve weeks after the course I will ask you to complete email questionnaires and a phone interview.

This letter is to notify you to expect an email from me in the next few days with two questionnaires attached. After you complete the questionnaires and email them back to me, I will then follow-up with you to schedule a 45 minute phone interview. This will complete the six week post-course data collection period. This process (i.e. email questionnaires and phone interview) will repeat at twelve weeks post-course, at which time the study will be complete.

The information you provide is vital to helping our profession better understand why physical therapists adopt or do not adopt lumbopelvic CPRs and lumbopelvic manipulation after a course on these topics. This in turn, may provide insights into improving adoption of evidence based medicine following training, ultimately improving patient care. As a small token of appreciation for completing the upcoming questionnaires and interview, please enjoy the enclosed \$5 gift card.

Many thanks,

Jesse Ortel, PT, DPT, OCS, CSCS, Cert MDT  
George Mason PhD student

## **Appendix K: Email Questionnaire Invitation 6<sup>th</sup> Week**

Hi John,

I hope that you received and read my letter regarding this email. Just in case you have not, I am kicking off my six week post-course data collection period. Thanks again for agreeing to participate in my study.

Please complete the attached two questionnaires. Each questionnaire has areas for you to type in your answers. Some questions state to “bold type the answer below”. This means you will highlight the answer with your mouse and then bold type the font. Be sure to save your changes you make to the questionnaire document and then email back to me when complete.

I will then email you back to setup a phone interview time that is convenient for you. My goal is to get this all accomplished over the next week if at all possible. Once our phone interview is complete, I will likely follow-up later to show you your interview transcripts and have you comment as you see fit on the accuracy of any conclusions or statements I make based on your interview. This final step is designed to improve the validity of my conclusions.

Thanks and I look forward to receiving your questionnaires and talking to you soon for our interview.

Sincerely,

Jesse Ortel, PT, DPT, OCS, CSCS, Cert MDT  
George Mason PhD student

## **Appendix L: Reminder Email for Questionnaire Email**

Dear John,

I am sending this email reminder in the hopes that you still intend to participate in my study, but have simply gotten too busy to address my recently sent questionnaires. I can imagine there is never a good time to get this extra work done, but I want you to know that your efforts are truly appreciated as my study will not succeed without the ongoing generous participation of physical therapists such as yourself.

If you have any questions on my study or the questionnaires, please do not hesitate to email or call me (703-704-xxxx). Thanks, and I look forward to your responses soon.

Sincerely,

Jesse Ortel, PT, DPT, OCS, CSCS, Cert MDT  
George Mason PhD student

## **Appendix M: Final Letter Reminder**

October 26, 2012  
John Doe  
111 S Street  
Alexandria, VA 22308

Dear John,

I am sending this final reminder letter in the hopes that you still intend to participate in my study, but have simply gotten too busy to address my recently sent questionnaires or have not received my emails. I can imagine there is never a good time to get this extra work done, but I want you to know that your efforts are truly appreciated as my study will not succeed without the ongoing generous participation of physical therapists such as yourself.

If you have any questions on my study, or have not received my emails please call me asap (703-704-xxxx). Thanks again, and I look forward to your responses soon.

Sincerely,

Jesse Ortel, PT, DPT, OCS, CSCS, Cert MDT  
George Mason PhD student

## **Appendix N: Pre-notification Letter 11th Week**

December 7, 2012  
John Doe  
111 S Street  
Alexandria, VA 22308

Dear John,

It has now been nearly twelve weeks from the time you attended the “Treatment Strategies for Low Back Pain Utilizing CPRs” course on 22 September. I truly appreciate your participation in my study so far, and hope that you are willing to complete this final round of data collection.

This letter is to notify you to expect an email from me in the next few days with three questionnaires attached (the same completed at six weeks post-course, plus the knowledge test you completed immediately after the course). After you complete the questionnaires and email them back to me, I will then follow-up with you to schedule a final 45 minute phone interview. This will complete your participation in the entire study.

Once again, I could not have done this study without your generous contributions to research in our profession. As a final small token of appreciation for completing this study please enjoy the enclosed \$5 gift card.

Many thanks,

Jesse Ortel, PT, DPT, OCS, CSCS, Cert MDT  
George Mason PhD student

## **Appendix O: Email Questionnaire Invitation 12th Week**

Hi John,

As my recent notification letter indicated, I am now starting my final data collection period (i.e. twelve weeks post-course). I truly appreciate your commitment to completing this study over the entire twelve week period.

Please complete the attached three questionnaires. The same procedures apply to completing these questionnaires as were done for the six week post-course questionnaires. Just as a review, each questionnaire has areas for you to type in your answers. Some questions state to “bold type the answer below”. This means you will highlight the answer with your mouse and then bold type the font. Be sure to save your changes you make to the questionnaire document and then email back to me when complete.

I will then email you back to setup a final phone interview time that is convenient for you. My goal is to get this all accomplished over the next week if at all possible. Once this phone interview is concluded, your formal participation in this study is complete. Although, I will likely follow-up later to show you your interview transcripts and have you comment on the accuracy of any conclusions or statements I make based on your interview. This final step is designed to improve the validity of my conclusions.

Thanks again for all that you have done to help me with my research. I look forward to receiving your final questionnaires and talking to you soon for our final interview.  
Sincerely,

Jesse Ortel, PT, DPT, OCS, CSCS, Cert MDT  
George Mason PhD student

## Appendix P: Discrepancies between Questionnaire Data and Interview Data

### A. Prior LM CPR training: (total of 1 data point change out of 15 data points = change rate of 6.7%)

Jeff (6wks): “That [LM CPR] is the way I was taught in school.” Jesse: “In PT school?” Jeff: “in PT school, yes.” On the baseline questionnaire Jeff had indicated NO to the question of prior LM CPR training. On the six week interview he indicated that he did have prior training on LM CPR in PT school. So, **Factual Discrepancy**. I changed his baseline report of prior LM CPR training from NO, to a YES.

### B. Co-workers use of LM CPR and LM: (total of 8 data point changes out of 72 data points = change rate of 11.1%)

Jesse (Jeff 6wks): “Right after the course you put that your co-workers frequently used the CPR and LM, but at six weeks you put that they sometimes use it...was that a real change? And if so, why?” Jeff: “I don’t know if it was a real change, or if I just clicked the wrong box. I know Lilly, and another individual who uses a lot of the same techniques that were taught at the course, he didn’t attend the course, but he uses quite a bit of lumbopelvic manipulations, the sidelying and Chicago . So, I think I just checked the wrong box on that one.” Jesse: “OK, so it is still “frequently?”” Jeff: “Yes, it is still frequently”. **Factual Discrepancy** of “clicking wrong box” so changed six week score of LM CPR and LM from a 3 (sometimes) back to a 4 (frequently).

Jesse (Leslie 6wks): “You put down your co-workers...one of the questions was how often do your co-workers use LM CPR and LM, you put down [at baseline] frequently for both...this time [six weeks post-course] you put “solo practitioner”. Did something change at all?” Leslie: “I think I was getting that from being in the course with my co-workers and seeing that they answered yes to that question [questions on using LM CPR and LM].” Jesse: “Ok, so you were still a solo practitioner before too.” Leslie: “That has not changed. I guess I am inconsistently answering your questions I guess.” **Factual Discrepancy**. So, I changed her baseline “co-workers use of LM CPR” and “LM” rating from a 4

(frequently) to “na solo practitioner” which matches her six week response. This more accurately reflects reality of her experience of not having any co-workers which she interacts with at work or related to work.

Jesse (Keith 6wks): “Before you put that one of your co-workers was using the LMCPR and LM frequently, but at six weeks you put the co-worker never uses LMCPR and LM, did something change?” Keith: “No, she is the same. She does not really discuss the LMCPR rules that much. She does LM, but she does not discuss the LMCPR rule.” Jesse: “How does she make a decision on who to do LM on? Does she use other criteria?” Keith: “I don’t know.” Jesse: “Ok, it sounds like your impression of what she does changed.” Keith: “Yes.” Jesse: “Because initially you put down that she frequently used LMCPR and LM, but later on your impression changed and you put down she never does either.” Keith: “I think I am uncertain if she does it.” Jesse: “So, you are uncertain about the LMCPR, but what about LM?” Keith: “I know she does LM, but I don’t know if she uses an algorithm or her thinking process.” Jesse: “Ok, so you are not so sure about the LMCPR, but the LM you are sure she uses some.” Keith: “Yes. You might want to change the initial response to she does LM, but the CPR may not be used.” Jesse: “She is still doing the same thing now. You are not sure about the LMCPR, but she still does LM.” Keith: “Yes.” Jesse: “Does she do it frequently or sometimes, do you have a sense of that?” Keith: “I think it is sometimes, depending on her patients’ preference and her preference.” Jesse: “So, you would be, you think this would more accurately reflect that question if for both baseline and six –week responses for the LMCPR the answer is “unsure” and for LM it is “sometimes”.” Keith: “Yes, yes.” **Factual Discrepancy.** So baseline for LMCPR and LM was a 4, and six weeks response for LMCPR and LM was a 1. I changed baseline and six week LMCPR to “unsure” and baseline and six weeks LM to 3 (sometimes).

**C. Number of MLBP pain visits seen per week: (total of 4 data point changes out of 39 data points = change rate of 10.3%)**

John (6 wks): “Yes. It is just one of those things. You will see 10 shoulders all of a sudden and then you’ll see 10 necks and 10 backs. I guess when I put down the 40 I added necks with that. In my head, necks and back are pretty much the same.” Jesse: “Ok. How many of those would you say are just backs?” John: “Yes, probably half of that.” **Factual Discrepancy.** So I changed 40 down to 20 (“half”) for the 6 wk response.

Jesse (Jeff 6wks): "I noticed you are seeing fewer LBP per week at six weeks versus at baseline. At baseline you put 35 weekly visits, and at six weeks you put 6.5. Is that a real change?" Jeff: "So, I went from 35 to 6.5?" Jesse: "Yes." Jeff: "Oh wow. OK, it drops, but not that much. November, December, and January is kind of our slow time of the year. Wow, it did not drop that much. I would say maybe 35 to 25 or 20. Just because slower time of year, more people inside, fewer people getting injured, so I just don't have as many opportunities." **Factual Discrepancy.** I changed # of visits at 6wks to 28 (average of 35 and 20).

Jesse (Kelly 6wks): "Before at baseline, right after the course, you put you had about 2-3 LBP visits a week. This most recent questionnaire you put down you see about 9 per week. Do you have a sense of why that changed?" Kelly: "Ok. Let's see. What I might have been saying was that...I may have misunderstood...I may have as many as 2 new LBP patients per week, and probably visit wise they average about 2 per week. So if I have 4 LBP patients, 2 being brand new, I would have 8 visits per week." Jesse: "Ok, so you just looked at the question a little bit differently before." Kelly: "That's what it sounds like to me." Jesse: "From your perspective nothing has really changed." Kelly: "No." **Factual Discrepancy.** At baseline she put 2-3 per week, but this only represented the number of evaluations per week (incorrect interpretation of the question). At the six week interview she put 9, which included total visits per week (the correct interpretation of the question). Since she said "nothing has changed", I changed the baseline data point to match the six week data point, 9.

Jesse (Trisha 12 wks): "Were you able to work on a technician at all? Tim had mentioned that some of the technicians had had some pain." Trisha: "Yes, I actually worked on her and manipulated her twice. The first time Jack helped me, and then I did it by myself. It wasn't too long ago. It was actually after I filled out my paperwork. She actually felt better. Not immediately after I manipulated her, but later that night, and when she came back to work the next day she said she did not have any pain and she felt better." Jesse: "What were her criteria that she had, do you remember?" Trisha: "Let's see, it was she had only been hurting for a few days, no pain below the knee, and her hip internal rotation was greater than 35 degrees, she had a lot of internal rotation." Jesse: "So she had the 2 big ones, less than 16 days, and no sx below the knee." Trisha: "Right." **Factual discrepancy.** After the questionnaire was sent in she did evaluate a co-worker and saw her twice, so a total of 2 visits over 6 weeks, for an average of .33 MLBP visits per week. So, I adjusted her 12 week reported number from 0 to .33.

**D. # of times per week that the therapist performs a lumbopelvic manipulation: (total of 6 data point changes out of 39 data points = change rate of 15.4%)**

Leslie (6 wks): “Well, when I say manipulations I am thinking more of a muscle-energy, I am calling that manipulation, where I probably shouldn’t be.” Jesse: “So in other words you did a lot of manual therapy...” Leslie: “Right, I did a lot of manual therapy. So I may have misspoken about doing manipulation [before the course]. I kind of see that as...now that we are talking...” Jesse: “Right, now that we are talking about it. Before the course how often would you use the short amplitude, high velocity, thrust, trying to get a cavitation?” Leslie: “Rarely...using the manipulations, high velocity, low amplitude thrust rarely.” Then I followed up on the 12 wk interview on what “rarely” meant and she clarified further that she was not using LM at all prior the course. Jesse (Leslie 12 wks): “Ok. I just want to go back to that word “rarely”. Three months before the course how often would you say you actually used LM?” Leslie: “Before the course, not at all.” **Factual Discrepancy.** She put 4 at baseline, but when clarified during the 12 wk interview, LM was not used prior to the course. So, I changed the 4 to a 0.

Jesse (George 6 wks): “Ok, so you got her in position, and had her breath in and out, and then attempted the manipulation...did you get a cavitation at all?” George: “Yes.” **Factual Discrepancy.** During the interview it became clear that George did perform one manipulation on one patient during the first six week study period. So, I changed his six week answer (1) to 1/6, representing a rate of 1 manipulation over six weeks.

Jesse (Jen 6 wks): “...I know you are using LM heavily both before the course and now, and from the questionnaire I get a sense it is about the same use rate, is that right?” Jen: “Yes, I have stayed about the same.” **Factual Discrepancy.** Jen answered the six week questionnaire as a % (80-100% of the time per visit she will do LM), rather than a frequency per week. I converted her six week mean reported % (90%) to a frequency of 2.3 given her reported # of weekly LBP visits (2.5). I figure 90% is “about the same” as her baseline reported use rate of 100%.

Jesse (Todd 12 wks): “Over the last six weeks have you been able to do any TJMs [LMs] to anyone?” Todd: “Over the last six weeks maybe twice.” **Factual Discrepancy.** On the six week questionnaire he indicated use of LM was 0. I changed 0 to 2 to reflect his above statement that he performed LM “maybe twice” over the last six weeks.

Jesse (Trisha 12 wks): “Were you able to work on a technician at all? Tim had mentioned that some of the technicians had had some pain.”

Trisha: “Yes, I actually worked on her and manipulated her twice.”

**Factual Discrepancy.** After the questionnaire was sent in she did evaluate a co-worker and manipulated her twice, so a total of 2 LM over 6 weeks, for an average of .33 LM per week. So, I adjusted her 12 week reported number from 0 to .33.

Jesse (Jeff 12 wks): “I see a huge change in the reported number of times you are doing LM per week, from 4.5 before, to now 22.5, did it change that much?” Jeff: “It might have changed a little bit, but I don’t think it changed that drastically.” Jesse: “Ok, I was wondering when you wrote that in if you were thinking it might be the number of ...” Jeff: “visits.” Jesse: “Yes, per week. Jeff: It very well could be.” Jesse: “Well how many times per week do you think you do LM?” Jeff: “I would say on average probably 10-14 per week.” Jesse: “That is the actual number of times you manipulate someone.” Jeff:” Yes.” **Factual Discrepancy:** Jeff indicates that he does 12 LM per week, not 22.5. So I changed his 12 wk response to 12.

**E. % of time using MODI at initial evaluation and follow-up visit:  
(total of 3 data point changes out of 39 data points = change rate of  
7.7%, total of 1 conceptual validity concerns out of 39 data points  
= 2.6%, so total discrepancy rate of 4/39 =10.3%)**

Jesse (Todd 6 wks): “You put down before you were doing the MODI 10% and now you are doing it 5%. Is that a real difference?” Todd: “It is just an estimate, so about the same.” **Conceptual/perception, so no change in data.**

Jesse (Tim 6wks): “I noticed that for the MODI, at the baseline you said you use it about 60% of the time, and now you put you are using it about 50% of the time. Theoretically it went down about 10%. Was that a real change, or were you just trying to put down what you put last time and you were just trying to get it the same?” Tim: “I was probably not exactly sure...we use it for every initial evaluation. For regular daily visits, we might not use it...the way our billing is setup we have to do one...we do daily notes and weekly notes. So the weekly notes is where you would assess all your objective measures...so on the days when we do the daily note, I might not always do it [MODI] for time purposes. So you have one initial evaluation, and then you might see them 3 times a week for that, but only do the MODI on them maybe once out of those 3 times that week. If we had just done the manipulation, then I am sure we would give it to them the next time they came in.” Jesse (Tim 12 wks): “You mentioned

that you were using the MODI about 50% of the time. What do you mean when you say 50% of the time?” Tim: “We use it on all initial evaluations to the back, but we don’t use it on every daily visit when they come in. Especially since we haven’t done the manipulations on patients all that much. Once a week we have to do a weekly note and reassess all our goals and stuff like that. So, if it is a LBP patient we will have a MODI goal set for them since they fill it out on the 1st day anyways.” Jesse: “So it is basically the same since the last time I talked to you.” Tim: “Right. Jesse: “From my stand point if I consider the goal doing the MODI at initial evaluation and a follow-up visit, not necessarily at the next visit, but at a periodic point so you guys can reassess...it sounds like you guys are doing it all the time.” Tim: “Yes. We are doing it at least once a week along with the initial evaluation.” **Factual Discrepancy.** Based on his description of measuring the MODI at both 6 weeks and 12 weeks post-course, he is doing it every time at initial evaluation and once a week (this would be considered a follow-up visit). So he is technically doing the MODI 100% of the time. So, I changed his answer from six and twelve weeks (50%) to 100%.

Jesse (Jen 6wks): “Of the back patients that you have seen and maybe the one you evaluated, have you done the MODI or the FABQ?” Jen: “No, I didn’t do those. Maybe that wasn’t an accurate statement on my part.” **Factual Discrepancy.** She reported 50% use of MODI at six weeks, but on the six week interview she stated she did not use the MODI on the back patients she had seen, and admitted that her prior statement of MODI use was not accurate. I changed her 50% rating at six weeks to 0%.

**F: % of time using FABQ at initial evaluation: (total of 1 data point change out of 39 data points = change rate of 2.6%, total of 1 conceptual validity concern out of 39 data points = 2.6%, so total discrepancy rate of 2/39 =5.1%)**

Jesse (Jen 6wks): “Of the back patients that you have seen and maybe the one you evaluated, have you done the MODI or the FABQ?” Jen: “No, I didn’t do those. Maybe that wasn’t an accurate statement on my part.” **Factual Discrepancy.** She reported 50% use of FABQ at six weeks, but on the six week interview she stated she did not use the FABQ on the back patients she had seen, and admitted that her prior statement of FABQ use was not accurate. I changed her 50% six week rating to 0%.

Jesse (Keith 6 wks): “In terms of the MODI, at baseline you put down that you used the MODI about 90% of the time at baseline at initial evaluation and f/u visits, and at six weeks you put 85%, so why did this go down, or

is it about the same?” Keith: “It is about the same.”

**Conceptual/perception, so no change in data.**

**G: % of time measuring Hip internal rotation at initial evaluation: (total of 1 conceptual validity concern out of 39 data points = 2.6%)**

Jesse (Jen 6wks): “Right. In terms of the hip internal rotation, you put down that initially you were measuring that about 95% of the time, and at six weeks you put 75% of the time. Did that go down or is that kind of the same. And, if it went down, why did it go down?” Jen: “It is the same. I check it on the majority of my people.” **Conceptual/perception, so no change in data.**

**H: % of time spinal mobility classified as hyper or hypomobile at initial evaluation: (total of 3 data point changes out of 39 data points = change rate of 7.7%, total of 2 conceptual validity concern out of 39 data points = 5.1%, so total discrepancy rate of 5/39 =12.8%)**

Jesse (Jen 6wks): “Ok, and what about the lumbar CPAs, before you put 95% and this time you put 90%. Is that about the same, or did it go down?” Jen: “No, it is about the same.” **Conceptual/perception, so no change in data.**

Jesse (Kelly 6wks): “Oh good. How did you adopt the... increasing the frequency in which you do the hypomobility testing? How did you accomplish that? Because you went from 30%, to now almost all the time. How did you manage that change?”

Kelly: “I did not know what I reported before. I could not tell you what I reported before. I always do spring testing and always check their range of motion.”

Jesse: “Would you say that that is a change then, or would you say that that is the same? Would you say you have actually increased the frequency in which you do hypomobility testing, or would you say it is about the same as before the course?”

Kelly: “I would say it is about the same. It is something that I do all the time.”

Jesse: “Ok. So you were doing the same amount of hypomobility testing before the course as you are now.” Kelly: “Right.” Jesse: “So, even though you put 30% before, the reality is the two numbers are the same. The number that you reported originally and the number that you are reporting now should be the same.” Kelly: “Right, right.”

Jesse: “And would you say they are closer to the 100%?” Kelly: “I would say closer to the 100% since that is something I do with regularity.” Jesse: “Did you always classify it in terms of hypomobile, hypermobile, or

normal?” Kelly: “No, no.” Jesse: “Are you doing that now?” Kelly: “No, I would usually classify it as pain...” **Factual Discrepancy.** Kelly is reporting doing spring testing for pain, not doing spring testing to assess hyper or hypomobility. Therefore, her answer at baseline and 6 weeks should be 0%. I changed her baseline (30%) and six week (100%) to 0%.

Jesse (Todd 6 wks): “Also you had a slight increase in the CPAs, 75 to 80, is that about the same too?” Todd: “Yes, that is about the same.”

**Conceptual/perception, so no change in data.**

Jesse (Keith 6wks): “At baseline you put you were doing your CPA’s about 50% of the time, and now you are doing it about 75% of the time on evaluations. I just want to clarify to make sure, before were you actually categorizing when you did that as hypo or hypermobile, or were you just using it before as pain provocation?” Keith: “Pain provocation.” Jesse: “Ok, so before you did not use it at all for categorizing it as hypo or hypermobile?” Keith: “Correct.” Jesse: “But now are you doing it as a categorization of hypo or hypermobile?” Keith: Yes, I do it on an almost consistent basis.” **Factual Discrepancy.** Changed his baseline response of 50%, to 0% since prior to the course he admits that he never assessed mobility with CPA, only pain provocation.

**I: % of time pain is determined as above or below the knee at initial evaluation: (total of 1 conceptual validity concern out of 39 data points = 2.6%)**

Jesse (Todd 6wks): “And pain 100% before to 90% now, is that about the same too?”

Todd: “Yes, that is about the same”.

Jesse (Todd 12 wks): “Ok, the pain, assessing the pain, in terms of location below the knee or not, went down from 100% to 90%...”

Todd: “Again it is about the same. I do it pretty consistently, I do it almost always, but to be realistic I don’t think it do it 100% of the time.”

**Conceptual/perception, so no change in data.**

**J. % of time # of CPR criteria present are determined: (total of 1 data point change out of 39 data points = 2.6%)**

Jesse (Leslie 12 wks): “Excellent. In terms of you mentioned you were using the LMCPR a “very small amount” before our course, and I asked if it was since it was on the business template, and you said yes. What does that mean? Does that mean you were actually measuring some criteria and you were thinking it through and going “oh that person qualifies for LM”?” Leslie: “Again I was thinking more of MET, so I really didn’t

answer the question correctly. “ Jesse: “So technically before the course you weren’t really...you were measuring some of those criteria, but you were not measuring them to add them all up and go, oh based on this, I should do this manipulation?” Leslie: “Right.” **Factual Discrepancy.** Changed her baseline reporting of 10% to 0% to match the reality that she did not determine the number of CPR criteria present in her evaluations prior to the course.

**K. % of time contraindications for LM are determined: (total of 1 conceptual validity concern out of 39 data points = 2.6%)**

Jesse (Susan 12 wks): “Ok, and the contraindication went down from 100 to 75%. Why did that happen?” Susan: “Oh, I think that might be a mistake.” Susan: “No, it should be the same.” **Conceptual/perception, so no change in data**

**L. % of time LM is performed if 3 of 5 LM CPR criteria are present: (total of 1 conceptual validity concern out of 39 data points = 2.6%)**

Jesse (Lilly 6wks): “On the questionnaire you put if the person has 3 out of the 5, or 4 criteria, you would do LM 75% of the time, that was for the baseline, and at six weeks you put 80%. Is that basically the same, or did that increase a little bit?” Lilly: “I think it is probably about the same.” **Conceptual/perception, so no change in data.**

**M. % of time LM is performed if 4 of 5 LM CPR criteria are present: (total of 1 data point change out of 39 data points = change rate of 2.6%)**

Jesse (Leslie 12 wks): “Ok, that clarifies that. Once again at baseline you had put using LM manipulation if 4 or more criteria are present 75% of the time was that MET then?” Leslie: “Yes.” Jesse: “So that was not LM before the course?” Leslie: “Right, before the course no.” **Factual Discrepancy.** In order to reflect the reality that she was not using LM before the course I changed her baseline rating of 75% to 0%.

**N. I am confident in my ability to use LM CPR: (total of 1 conceptual validity concern change out of 39 data points = 2.6%)**

Jesse (Jeff 6wks): “Before the course you agreed you are confident using LM CPR, now strongly agree, is that the same or did that change?” Jeff: “I think that is the same. It is kind of semantics between strongly agree and agree.” **Conceptual/perception, so no change in data.**

**O. I have opportunities to use LMCPR: (total of 1 data point change out of 39 data points = change rate of 2.6%)**

Jesse (John 12 wks): “Great. You put the opportunities to use the LMCPR went from strongly agree (5) at six weeks to now disagree (2), why did that change?” John: “I need to change that. What I meant was to put I disagree under TJM [LM], because we have not had a lot of patients come in with that. But the CPR, I guess I use that about the same, I use it all the time with our back patients.” Jesse: “So you have the same opportunities to use LMCPR, just not LM?” John: “Yes, I meant to change those two, I probably read it wrong.” **Factual Discrepancy.** So changed 2 (disagree) twelve week response to a 5 (strongly agree) to match prior baseline and six week ratings.

**P. I feel using the LMCPR provides advantages over my current decision making: (total of 4 conceptual validity concerns out of 39 data points = 10.3%)**

Jesse (Mary 6wks): “What about the relative advantage? I think initially you agreed...”

Mary: “No, I think the relative advantage of using it is still the same.”

Jesse: “Ok so you still see the relative advantage of the TJM CPR [LMCPR] and TJM [LM] as having an advantage?” Mary: “I do, yes.”

**Conceptual/perception, so no change in data.**

Jesse (George 6wks): “You put down your perception of the relative advantage of the LMCPR and LM, before you strongly agreed with the statement, but on the six week questionnaire you just agreed. Is there a reason why that changed?” George: “To tell you the truth I don’t really think that there is a change about the advantages of the CPR.”

**Conceptual/perception, so no change in data.**

Jesse (Jeff 6 wks): “Before the course you agreed you are confident using LMCPR, now strongly agree, is that the same or did that change?” Jeff: “I think that is the same. It is kind of semantics between strongly agree and agree.” Jesse: “Before the course you strongly agreed that LMCPR provided a relative advantage over current decision making, now you agree?” Jeff: “Same kind of thing”. Also Jeff (12 wks): “I don’t feel like there is a difference. I probably just circled the wrong one...”

**Conceptual/perception, so no change in data.**

Jesse (Jen 6wks): “Ok, got it. Before the course you strongly agreed that LMCPR provided a relative advantage over current decision making, now you agree, why did this change?” Jen: “I strongly agree and now I

agree...I would say I probably strongly agree now as well..."

**Conceptual/perception, so no change in data.**

**Q. I feel using the LMCPR is compatible with my current clinical decision making methods and beliefs: (total of 2 conceptual validity concerns out of 39 data points = 5.1%)**

Jesse (John 6 wks): "What about compatibility. Before you said you strongly agree, and now you are saying that you agree using the TJM CPR is compatible with your beliefs in what you do." John: "Yes, I guess I really strongly agree with that. Because I have used it, but just in a modified way throughout my career." Jesse (John 12 wks): In terms of the compatibility of LMCPR before you put that you strongly agree and this time you put that you agree with that statement, is there a reason why that changed?" John: "Not really, I still agree with it. I don't know why I put it like that." Jesse: "Do you agree a little less now?" John: "I don't know. I do strongly agree with that, I might have just checked it wrong." Jesse: "So it is about the same now?" John: "Yes, it really hasn't changed since we last spoke." **Conceptual/perception, so no change in data.**

Jesse (Jen 6wks): "Before the course you strongly agreed that LMCPR was compatible with my current clinical decision making methods and beliefs, now you agree, why did this change?" Jen: "I still strongly agree, that has not changed." **Conceptual/perception, so no change in data.**

**R. I feel the LMCPR is complex and difficult to use: (total of 2 conceptual validity concerns out of 39 data points = change rate of 5.1%)**

Jesse (Tim 6wks): "To the statement of the LMCPR is complex, before you strongly disagreed, and now you just disagree, is there a reason why this changed?" Tim: "I don't think so, I was probably trying to mark about the same." **Conceptual/perception, so no change in data.**

Jesse (Jeff 6 wks): "Before the course you strongly disagreed that LMCPR was complex, now you disagree, did that change?" Jeff: "No, the same." Jesse (Jeff 12 wks): "Your perception of the complexity of using the LMCPR changed from a 1 to 2, why?" Jeff: "No change on that one" **Conceptual/perception, so no change in data.**

**S. I feel I can easily try out using the LMCPR with my MLBP patients: (total of 2 conceptual validity concerns out of 39 data points = 5.1%)**

Jesse (Susan 6wks): "OK. You put down [on the 6 week questionnaire] that you did not think the CPR was easily triable [at baseline she rated that she agreed it was triable], are there parts of the CPR that you do not think are easily triable?" Susan: "Maybe I miss read that question actually." Jesse: "Ok, so do you feel like there are parts that are hard to try out or do not feel there are parts that are hard to try out?" Susan: "Well, no I think as long as you are including the FABQ and MODI and getting the information, then it is easy to try and use." **Conceptual/perception, so no change in data.**

Jesse (Jeff 6 wks): "Ok. Before the course you strongly agreed that LMCPR was triable, now you agree, is that the same?" Jeff: "Same, yes." Jesse (Jeff 12 wks): "Ok. On trialability your perception of the trialability of using LMCPR changed from 5 to 4, why?" Jeff: "That one is no change as well." **Conceptual/perception, so no change in data.**

**T. I intend to use LM as a treatment in my practice: (total of 1 conceptual validity concern out of 39 data points = 2.6%)**

Jesse (Jen 6 wks): "Before the course you strongly agreed with the statement that you intended to use LM in your practice, now you agree, why did this change?" Jen: "That did not change, I am still manipulating just as many people." **Conceptual/perception, so no change in data.**

**U. The risk of me being sued for using LM is higher than other treatments I typically use: (total of 3 conceptual validity concerns out of 39 data points = 7.7%)**

Jesse (Trisha 6wks): "The risk of suing is high. Before you put you disagreed, and now you put you are unsure. Why?" Trisha: "I don't know. I guess it is just the type of patients I have right now. You know you go through phases, right now I it is all they talk about...it is kind of right there on my mind, because I have so many patients right now that are like, "I slipped at work and I have a lawyer", you know and that's all I hear a lot of. To be honest I would pretty much disagree with it just because of the relationship I would have with the patient and just getting their approval before we do it. The only thing that could improve that is, I would hate to get them to sign an informed consent before doing it since that would scare them off, but I don't know how to fix that. I don't know, each patient is different I guess." Jesse: "So, the bottom line is that answer is about the same as last time then." Trisha: "It is, it really is." **Conceptual/perception, so no change in data.**

Jesse (Lilly 6wks): “Before the course you disagreed that the risk of being sued for using LM is higher than other treatments, now strongly disagree, is that a true change and if so, why did this change?” Lilly: “I think it is still pretty much the same. I still feel pretty confident in doing the manipulations. Doing my tDPT now, I was reading the statistics that you are more likely to have an adverse reaction to taking aspirin or Tylenol than you are to having manipulation.” Jesse: “Ok, so it is still pretty much “disagree”. Lilly: “Yes.” **Conceptual/perception, so no change in data.**

Jesse (Leslie 12 wks): “I notice that the risk of being sued is higher for using LM, before you put disagree, but this time you put agree, why did that change?” Leslie: “I don’t know that I actually changed. I guess I don’t feel like I have actually changed in that. It is a risk...people are funny, and people’s perceptions are funny, and maybe my perception of people has changed more so than my perception of LM.” Jesse: “So do you feel, compared to six weeks ago, that your impression is you are a little bit more likely to be sued?” Leslie: “I don’t think that perception has changed. Again I work with a unique set of people who are not very educated, and some of it is a workman’s comp situation and some of them are very litigious. Maybe it is more of a reflection of my patients than it is of manipulation.” Jesse: “Ok. You would agree with that statement though, that you are at a higher risk of being sued if using LM?” Leslie: “Slightly, yes.” **Conceptual/perception, so no change in data.**

**V. I feel using LM provides advantages over my current treatment methods: (total of 3 conceptual validity concerns out of 39 data points = 7.7%)**

Jesse (Mary 6 wks): “What about the relative advantage? I think initially you agreed...”

Mary: “No, I think the relative advantage of using it is still the same.”

Jesse: “Ok so you still see the relative advantage of the TJM CPR [LMCPR] and TJM [LM] as having an advantage?” Mary: “I do, yes.”

**Conceptual/perception, so no change in data.**

Jesse (George 6wks): “You put down your perception of the relative advantage of the LMCPR and LM, before you strongly agreed with the statement, but on the six week questionnaire you just agreed. Is there a reason why that changed?” George: “To tell you the truth I don’t really think that there is a change about the advantages of the CPR.”

**Conceptual/perception, so no change in data.**

Jesse (Jen 6 wks): “Before the course you strongly agreed that LM provided a relative advantage over current treatment methods, now you agree, why did this change?”

Jen: “It is still the same.” **Conceptual/perception, so no change in data.**

**W. I feel using LM is compatible with my current treatment methods and beliefs: (total of 2 conceptual validity concerns out of 39 data points = 5.1%)**

Jesse (Tim 6 wks): “Compatibility. You put for LM that initially you strongly agreed that it was compatible to you, and now you agree. Is that a real difference, and if so why?” Tim: “I don’t think that was a real difference. I might not have been clear on exactly sure what it meant by compatible.” Jesse: How does it match up with your personal beliefs and theories about how to treat people?” Tim: “I would say I probably answered that one incorrectly. It is probably more compatible now than it was.” Jesse: “Ok, got it. So maybe it was a 4 before and now it is a 5.” Tim: “Yeah, something like that.” **Conceptual/perception, so no change in data.**

Jesse (George 6 wks): “The last one, what about compatibility. Before for LM you said you strongly agree that it was compatible, and now you are saying you agree. Is that a real change, or what are your thoughts about why that changed?” George: “I would say it was not a change. I still feel that it is compatible with everything that we are doing here.” **Conceptual/perception, so no change in data.**

**Y. I feel I can easily try out using LM on my MLBP patients: (total of 2 conceptual validity concerns out of 39 data points = 5.1%)**

Jesse (Jeff 6 wks): “Before the course you strongly agreed that LM was triable, now you agree...” Jeff: “I think that was the same.” **Conceptual/perception, so no change in data.**

Jesse (Leslie 6wks): “Before the course you strongly agreed that LM was triable, and now you agree, so why did that change?” Leslie: “I don’t know why I answered that differently.” Jesse: “Is that about the same?” Leslie: “Yes, it is about the same.” **Conceptual/perception, so no change in data.**

I will now report the findings for the “**Baseline and follow-up reaction and perception of program questionnaires**”:

**A2. Course rating: (total of 4 conceptual validity concerns out of 39 data points = 10.3%)**

Jesse (Todd 6wks): “OK, cool. Thanks so much for your time. Now I noticed you put the course down as a 10 initially, and then a 9 for the second time [6 week questionnaire]. Is that about the same, or a memory thing, or did it actually go down.” Todd: “No, it is about the same.”

**Conceptual/perception, so no change in data.**

Jesse (Lilly 6 wks): “Alright. Your rating of the course was a 10 at baseline, and at 6wks you put it down as a 9. Was there a reason why that changed?” Lilly: “No, I don’t think...it probably should have been the same, it should have stayed at the 10.”

**Conceptual/perception, so no change in data.**

Jesse (Susan 12 wks): “You put down that your course rating was initially a 9, and then it went down at 6 weeks to an 8, and now it is back up to a 9 [at 12 wks], is that all the same thing, or did it go down for a particular reason and then did it go back up for a particular reason?” Susan: “I think it is probably all the same”.

**Conceptual/perception, so no change in data.**

## Appendix Q: Discussion Board Postings

These are the study participant postings on the discussion board during the entire dissertation study period starting 17 September 2012 and ending 3 March 2013. Note that only 1 study participant (Kendra) made 1 posting on the discussion board during the entire period.

Use of MODI/FABQ with worker's comp patients  
Posted by Kendra on **November 6, 2012**, 1:11 pm  
65.248.81.x

Does anyone place the MODI and FABQ in a patient's permanent record??? I am wondering with a majority of my patients being Worker's comp, at least 1/2 have lawyer's, if I should only include test results. Then keep the actual test forms in a soft file until the patient is discharged

Re: Use of MODI/FABQ with worker's comp patients  
Posted by Jesse on **November 12, 2012**, 9:14 pm, in reply to "Use of MODI/FABQ with worker's comp patients"  
108.56.234.x

Good question Kendra. I would recommend starting with not including the MODI and FABQ in the permanent record while you are figuring out if this will work for you. Once you decide to fully implement these tools into your normal process, I would certainly include it in your normal evaluation documentation. The MODI is recommended as the standard of care by the JOSPT 2012 CPG. This is a valid and reliable instrument, so it should stand up to any lawyer scrutiny.

## **Appendix R: Table of Codes/Themes**

Organization of codes/themes (interview (15 subjects and 25 interviews – see Appendix U) and open ended questionnaire responses (22 subjects for baseline questionnaires, 15 subjects for six weeks post-course questionnaires, and 10 for 12 week post-course questionnaires)) are organized around Baldwin and Ford's training transfer process training input categories (training design, trainee, and work environment). The # in parentheses is the number of different participants that made a statement related to a particular code.

- I. Process of Adoption:
  - a. Trainee Characteristics (internal control/learner characteristics/perceptions/trainee centered)
    - i. Excited about training topic (4)
    - ii. Screening criteria (12)
      - 1. Overall
      - 2. Makes it easier to try out
      - 3. Phasing out of screening criteria
    - iii. Confidence/use/perceived opportunities link (4)
    - iv. Abandonment of training (4)

- b. Work environment:
  - i. Social process (6)
  - ii. Integration into practice (3)

II. Barriers to LMCPR/LM adoption:

- a. Trainee Characteristics (internal control/learner characteristics/perceptions/trainee centered)
  - i. Using Screening criteria (12)
    - 1. Pain tolerance (low)
    - 2. Perceived secondary gain/odd behaviors
    - 3. Physical therapist's perception that patient will not tolerate treatment well
    - 4. Size/shape of patient
    - 5. Patient with distal symptoms
    - 6. Physical therapist's perception that patient would do better with another treatment
    - 7. Patient may be too critical of therapist
  - ii. Partial use of innovation (6)
  - iii. Inconsistent with care philosophy (4)
    - 1. Aggressive (hands-on care) vs. Conservative (hands-off care)
    - 2. LM should not be done by physical therapists

- iv. Low confidence (3)
    - 1. Reducing intension to adopt
    - 2. Increased perception of risk of using LM
  - v. Criteria construct not understood/or felt not applicable (2)
  - vi. Low comfort (2)
  - vii. Fear of hurting patient (2)
  - viii. Perception of not fully adopted by industry (1)
  - ix. Not Feeling accountable to change (1)
  - x. Low interest in changing practice patterns (1)
  - xi. Feeling that other techniques can be used to qualify a patient for LM (1)
  - xii. Fear of being sued (1)
  - xiii. Fear of losing credibility (1)
- b. Work Environment (external control)
- i. Opportunities to use are limited (12)
    - 1. Not having ideal patients
      - a. Limited acute care
      - b. Not enough criteria present
      - c. Age (too old >60)
      - d. Chronic (LBP for too long)
      - e. Post-surgical

2. Cycles of LBP patients
  3. Changes in work setting
  4. Limited LBP
  5. Adjusting schedule to influence amount of LBP patients
- ii. Limited time (9)
  - iii. Lack of integration into practice (9)
    1. Not involving/having support staff (check-in process)
    2. Not remembering to use new tool (not integrated into system/evaluation process)
    3. Not having tool readily available
    4. Not taking time to implement into process
  - iv. If physical therapy student, No clinical instructor using innovations (6)
  - v. Not enough practice (5)
    1. Not having someone to practice on
    2. Unable to coordinate time to practice
  - vi. Not clinic norm/standards/ No co-workers using (3)
  - vii. Bureaucracy (3)
  - viii. Reading ability of patients (1)
  - ix. Not having proper equipment (1)

III. Facilitators to LM CPR /LM adoption:

a. Training Design

- i. Post-training support (weekly blog reminder/blog) (13)
  1. Reminder
  2. Increase knowledge
  3. Other
- ii. Hands-on Lab (12)
- iii. Post-training follow-up from instructor/researcher  
(questionnaires/interviews)/being part of research (11)
- iv. Algorithm (job aide) (10)
- v. Training transfer discussion (10)
- vi. Reviewing reference material in class (8)
- vii. Lectures (focus on evidence supporting innovation) (8)
- viii. Case studies (8)
- ix. Pre-course reading APTA white paper (6)
- x. Post-course access to online resources (5)
- xi. Post-course online resources (MODI/FABQ/evaluation) (3)
- xii. Pre-course reviewing online support  
website/blog/discussion board (1)

- b. Trainee Characteristics (internal control/learner characteristics/perceptions/trainee centered)
  - i. Using it/practice (12)
    - 1. Builds Confidence
      - a. Overall
      - b. Lowers perceived risk of injury
      - c. Lowers screening criteria
    - 2. Builds Comfort
    - 3. Using LM CPR facilitates LM use
    - 4. Using other manipulations
    - 5. Other
  - ii. Feeling accountable to adopt/use innovations (8)
  - iii. Consistent with personal current practice (5)
  - iv. Perceived added value (4)
  - v. Favorable belief about manipulation and PT's role in using LM (3)
  - vi. Prior experience using LM CPR criteria (2)
  - vii. Eliminating screening criteria (2)
  - viii. Having a goal/vision of adoption end-state (1)
  - ix. Understanding constructs of innovation (1)
  - x. Being a Novice therapist (1)
  - xi. Perceived acceptance of LM by patient (1)

- c. Work Environment (external control)
  - i. System/formal process change (10)
  - ii. Attending training with at least one co-worker (8)
    - 1. Peer influence to change
    - 2. Practice partner
    - 3. Same knowledge base
    - 4. Co-worker support in using LM
    - 5. Reminder
    - 6. Easier to change forms if more people are trained and in synch
  - iii. Co-workers using or trying to adopt innovations (8)
  - iv. Success with trial (8)
  - v. If physical therapy student, Clinical Instructor using innovations (7)
  - vi. Opportunities to use (6)
  - vii. Supervisor involved in adoption process/management support (6)
  - viii. Consistent with clinic norms/standards (5)
  - ix. Share patients' clinic model (5)
  - x. Teaching others (3)
  - xi. Having a physical therapy student (1)

IV. Why adoption of LMCPR and LM fail – conjecture of participants

- a. Trainee Characteristics (internal control/learner characteristics/perceptions/trainee centered)
  - i. No (or minimal) training/awareness (5)
  - ii. Not comfortable using LM/manual therapy (4)
  - iii. Afraid of using LM (4)
  - iv. Not consistent with current treatment paradigm (4)
  - v. Still new to physical therapist (3)
  - vi. Tendency to not change (2)
  - vii. Have not experienced outcomes of LM (1)
  - viii. Difficulty remembering the LMCPR criteria (1)
  
- b. Work Environment
  - i. No co-workers using it/no-coworkers (3)
  - ii. Not taking the training with co-workers (2)
  - iii. No Clinical Instructors using it (1)
  - iv. Not seeing acute LBP patients (1)
  - v. Work setting does not support (1)

## Appendix S: Blog Postings

These are the study participant postings on the blog during the entire dissertation study period starting September 2012 and ending March 2013. Note that only 2 study participants (Todd and George) made postings on the blog during the entire period. Todd could not make his own blog posting due to technical issues, so he asked that I make a post for him.

**Jesse**

10/29/2012 11:22

At one of our courses someone indicated that they had problems finding patients that "were positive on the lumbopelvic CPR". By positive they meant the person had at least 4 of the 5 CPR criteria. When I asked if they were measuring all 5 criteria each time, the answer was no. They were not using the FABQ. Also, most of their patients had pain for much longer than 16 days.

Given this scenario it is easy to see why they would not have many patients qualify with at least 4 criteria present (i.e. no FABQ score and not having acute LBP patients eliminate 2 criteria from the start). I recommended the following solution:

- 1) Lower their qualifying threshold to manipulate a patient with at least 3 CPR criteria (68% likelihood of success), rather than 4 or more.
- 2) Rather than doing the FABQ on everyone (I understand the tradeoff with asking patients to fill out more forms at check-in), if the patient has only 2 CPR criteria (pain not below the knee, hypomobility with CPA, or hip IR PROM >35 deg), then do the FABQ to see if you can get a positive on a third criteria.
- 3) Long term, work with providers to increase referrals of acute LBP patients...show them the Hohl case study and suggest a CPG like the Mayo clinic uses (described in the Hohl case study - which is posted on our resources page).
- 4) Finally, if a patient is >60 yrs old, it does not mean they are inappropriate for manipulation. Rather, the manipulation CPR may or may not apply to them since they are outside the derivation study population, so generalization is suspect. However, if they have acute LBP, pain not below the knee, and are generally stiff, there is still face validity that would suggest they would likely still benefit from manipulation....make sure

to clear for contraindications and get informed consent, and then provide the treatment. Many people over 60 can still benefit from manipulation.

Good luck,  
Jesse

Reply

**George**

10/29/2012 15:18

I haven't been able to put what I learned to use yet. I will make sure to use the FABQ when I get an LBP pt.

**Jesse**

11/13/2012 11:56

This is a blog message from **Todd**. He was not able to get onto the blog, so I am posting this for him. This is in regards to my question on how close is the Spanish MODI I posted online to the English version. Bottom line, close, except for question #10:

"The one you have posted is the same one I found online and use, but it is not exactly the same. From what I can tell questions 1-9 are all correct and the same, but question 10 is different. Question 10 asks about Changes in level of pain (improving rapidly, improving but fluctuating, etc.) instead of the Employment/Homemaking question."

Note the lack of the employment/homemaking question in the MODI Spanish version I have posted makes its reliability/validity questionable, but 9 out of 10 is still pretty good.

Thanks Todd for your posting.  
Jesse

**George**

11/24/2012 17:04

I have been able to get one patient in since I took the course in October who had symptoms present for less than 16 days. My patient was running late for her second treatment and I forgot to give her the MODI to fill out again. Her pain rating decreased from 9-10/10 upon eval and lumbopelvic manipulation to 5/10 upon next visit.

Reply

Jesse

11/26/2012 12:36

Thanks for this posting George.

This posting represents what others have suggested are barriers to using manipulation and the manipulation CPR:

1) Not getting many acute (less than 16 days of LBP) patients.

Possible Solution: work with referring providers (use the Hoyle article as reference) to get earlier referrals.

2) Patients running late to appointments and not completing MODI.

Possible Solution: work the MODI into your check-in process. If this is standard for every LBP patient, then it is more likely to be done consistently, and not forgotten.

Finally, it looks like you achieved minimally significant changes in pain scores (researchers say 1-2 point change in 0-10 numeric pain scale is significant). Hopefully with this success, you will be motivated to continue practicing using manipulation, and try to qualify as many patients as possible using any 3 of the 5 criteria.

Thanks and good luck,  
Jesse

Reply

## Appendix T: Design Based Research Plan

Round of DBR	<b>Cycle I</b> (May 2011-Jun 2011)	<b>Cycle II</b> (July 2011 - May 2012)	<b>Cycle III</b> (1 Mar 2012-14 June 2012)	<b>Cycle IV</b> (5 May 2012-20 June 2012)	<b>Cycle V</b> (Sept 2012-Mar 2013)
ILDF phase	<ul style="list-style-type: none"> <li>Informed Exploration</li> </ul>	<ul style="list-style-type: none"> <li>Informed Exploration</li> <li>Enactment</li> <li>Evaluation: local impact (<b>1<sup>st</sup> pilot study</b>)</li> </ul>	<ul style="list-style-type: none"> <li>Informed Exploration</li> <li>Enactment</li> <li>Evaluation: local impact (<b>2<sup>nd</sup> pilot study</b>)</li> </ul>	<ul style="list-style-type: none"> <li>Enactment</li> <li>Evaluation: local impact (<b>3<sup>rd</sup> pilot study</b>)</li> </ul>	<ul style="list-style-type: none"> <li>Evaluation: local impact (<b>dissertation study</b>)</li> </ul>
Humble Theory	<p>Traditional Face-to-Face PT CE training programs can result in low training transfer.</p> <p>Training transfer could be improved with CE interventions that maximize training transfer facilitators, and minimize training transfer barriers.</p>	<p>Traditional Face-to-Face PT CE training program that uses post-training eCoP can facilitate training transfer.</p> <p>Providing a lecture on the topic of training transfer within a CE program may facilitate training transfer (idea generated from reflection and interest in facilitating metacognition of training transfer process).</p> <p>An eCoP can be used to impact training transfer</p> <p>Tracking personal post-course behaviors may facilitate behavior change (e.g. using metric tracker)</p>	<p>A comprehensive face-to-face PT CE training program that has training and post-training events (as outlined in PraTT v3) can facilitate training transfer.</p> <p>Providing a lecture on the topic of training transfer within a CE program can facilitate training transfer</p> <p>Questionnaires can serve as a CE intervention and facilitate training transfer by serving as a sequenced reminder over time.</p> <p>An eCoP can be used to impact training transfer</p> <p>Tracking personal post-course behaviors may facilitate behavior change</p>	<p>Comprehensive face-to-face PT CE training program consisting of pragmatic evidence based pre-course, course, and post-course training activities will facilitate training transfer.</p> <p>An eCoP can be used to impact training transfer</p> <p>Tracking personal post-course behaviors may facilitate behavior change</p>	<p>A multi-component PT CE training program (based on the PraTT model v5), consisting of pragmatic evidence based pre-course, course, and post-course training activities will facilitate adoption of targeted behaviors (use of lumbopelvic manipulation CPR and manipulation)</p>
Training Transfer Model/ intervention	<p>Pragmatic Training Transfer model (PraTT) v1:</p> <p>Initial theoretical design concept based on humble</p>	<p>PraTT v2:</p> <p>Course: Face-to-face 8 hours with lab, lecture (theory/cases), review job aide, and training transfer</p>	<p>PraTT v3:</p> <p>Course: Face-to-face 8 hours with lab, lecture (theory/cases), review job aide, and training transfer lecture (no</p>	<p>PraTT v4:</p> <p><b>Pre Training: APTA reading, facilitate supervisor involvement, encourage pre-course blog use</b></p>	<p>PraTT v5</p> <p>Pre Training: APTA reading, <b>online blog/discussion board activity, no supervisor pre-</b></p>

	<p>theory</p> <p>Face-to-Face PT CE training program and maximize training transfer facilitators, and minimize training transfer barriers.</p>	<p>lecture (no group interaction).</p> <p>Post-course: eCoP (blog), metric tracker (tool to track personal post-course behaviors), and job aide (CPR algorithm)</p>	<p>group interaction).</p> <p>Post-course: eCoP (blog), <b>email reminders every 2 weeks to use eCoP</b> (blog), metric tracker, and job aide (CPR algorithm)</p> <p><b>Using questionnaires as an intervention in the model (as well as to collect DBR data to iterate design)</b></p>	<p>Training: hand on lab, lecture (theory/cases/<b>emphasis on 3 of 5 criteria</b>), review job aides, and Training transfer lecture (no group interaction)</p> <p>Post Training: eCoP (blog w/ <b>community coordinator posting weekly blog comments</b>), metric tracker, and job aide (CPR algorithm)</p> <p>serial questionnaire (at 0 and 6 wks post-course w/ <b>items on perception of innovations</b>), eCoP (blog)</p>	<p><b>course activity</b></p> <p>Training: hands on lab, lecture (theory/cases), review job aides, and training transfer lecture (<b>group interaction</b>)</p> <p>Post Training: serial questionnaires (0, 6, and <b>12 wks post-course</b> w/ items on perception of innovations), post-training job aides, online post-training support system (eCoP –blog, <b>discussion board</b>, posted documents, metric tracker), <b>weekly blog email reminder.</b></p>
Focus of Cycle	<p>Explore and expand initial humble theory</p> <p>Questionnaire literature</p> <p>Needs Analysis</p> <p>Audience Characterization</p> <p>Explore initial target audience adoption facilitators and barriers following any PT CE training</p>	<p>Continue literature review, and based on findings expand humble theory development and PraTT v2 model iteration</p> <p>Create training program from detailed design</p> <p>Pilot test PraTT v2 model based training program</p> <p>Create and pilot questionnaires and use results to iterate interventions and determine self-reported behavior changes.</p> <p>Iterate design and identify design principles learned.</p>	<p>Determine the impact of individual interventions of the PraTT v3 model</p> <p>Continue to iterate and pilot questionnaires.</p> <p>Determine impact of email reminder intervention on the use of eCoP system</p> <p>Look at impact of questionnaires as a form of reminder on training transfer</p> <p>Iterate design and identify design principles learned.</p>	<p>Identify impact of interventions on participants</p> <p>Determine impact of pre-training activities, particularly on post-training eCoP use.</p> <p>Iterate design and identify design principles learned.</p>	<p>Identify impact of interventions on participants</p> <p>Iterate design and identify design principles learned.</p> <p>Primary focus of dissertation is to study physical therapists adoption process following a multi-component (PraTT v5 based) training program</p>
Methods	<p>Literature Review</p> <p>No intervention</p> <p>In person interviews: n=3</p> <p>Self-reflection as a PT</p>	<p>Literature Review</p> <p>Pilot test PraTT V2 model/ intervention: n=5</p> <p>Questionnaire closed and open-ended questions at 0 and 6 weeks post-</p>	<p>Literature Review</p> <p>Pilot test PraTT v3 model/ intervention: n=4</p> <p>Questionnaire: closed and open-ended questions at 0 and 6 weeks post-</p>	<p>Pilot test PraTT v4: model/ intervention: n=1</p> <p>Questionnaire: closed and open-ended questions at 0 and 6 weeks post-course. The pilot participant completed.</p>	<p>Mixed Methods formal study</p> <p>Use PraTT v5 model/ Intervention: n=22</p> <p>Questionnaires 0, 6, and 12 weeks post-course</p>

		<p>course. Note that only 1 pilot participant completed the 6 week post-course questionnaire</p> <p>Observation of instructors and eCoP (blog) use</p>	<p>course. All pilot participants completed.</p> <p>User Interviews (only 2 completed post-course six week phone interviews)</p> <p>Observation of instructors, and eCoP use</p>	<p>User Interviews (pilot participant did not complete)</p> <p>Observation of users eCoP activity</p>	<p>User Interviews: coding/themes (15 participants completed)</p> <p>Observation of users eCoP activity</p> <p>Memos</p> <p>Case/cross case analysis</p>
Key Cycle Findings	<p>Training Transfer is a problem worth researching/ solving in the PT field, and DBR is an appropriate methodology to use based on the complexity of the problem and possible solutions.</p> <p>Peers are perceived by PTs as important in the training transfer process, particularly after a training event.</p> <p>Trainees can be geographically isolated from training cohort peers, and may have no knowledgeable co-workers on the training domain following a training event.</p> <p>Enabling factors (e.g. job aides) facilitates training transfer</p> <p>Physical therapists view hands-on lab time as important in learning a new psychomotor skill such as manipulation</p>	<p>Literature review: General training transfer facilitating factors identified and worked into PraTT v2.</p> <p>Questionnaires: Positive pilot participant reaction to training program, increased in pre/post course knowledge. No change in pre/post behavior from the single participant who completed six week questionnaire.</p> <p>Questionnaires could serve as part of intervention as well as data collection tool</p> <p>Realized the concept of “build and they will come” did not work for my peer-coaching system blog and metric tracker. This significantly challenged the assumption that course attendees will be willing to utilize eCoP to collaborate with course peers on training transfer.</p> <p>Blog posting by participants and metric tracker use = 0%</p> <p><u>Design Principle:</u> Insure changes to interventions are reflected in</p>	<p>Pre-training, training, post-training learning activities should all play an important role in training transfer per literature review.</p> <p>Questionnaires: Positive pilot participant reaction to training program, increased in pre/post course knowledge. No change in pre/post behavior of 4 participants as measured at six weeks post-course.</p> <p>2 week reminder to use an eCoP was not enough to stimulate use of eCoP. However, a community coordinator may be able to increase use of eCoP through providing a continuous presence in the community.</p> <p>Participants reported their patients did not have 4 of 5 LMCPR criteria, but did have 3 of 5.</p> <p>Questionnaires are showing to be an effective reminder tool and possibly promotes metacognition on training transfer process</p> <p>Some support for use of training transfer lecture as a</p>	<p>PraTT v4 supervisor requirements too logistically complex</p> <p>Questionnaires: Positive pilot participant reaction to training program, increased in pre/post course knowledge. <b>Did adopt LMCPR, but not LM at 5 week post-course. Need to study behavior change over longer period.</b></p> <p>Some support for questionnaire items on perception of innovations</p> <p>Pilot participant did not do the pre-read assignment</p> <p>Continued no online interaction on blog and no use of metric tracker</p> <p>Continued support for training transfer lecture as a facilitator of adoption</p> <p><u>Design Principle:</u> People are busy, so keep interventions simple. If you add to the design, test that feature on follow-on cycles, and if no support, then remove. Be careful to not create a complex monster as you continue to add/tweak an intervention</p> <p>If researching a feature, do not throw it out prematurely based on</p>	<p>See dissertation Chapter 6</p>

		<p>questionnaire so that data collected remains relevant to evaluating most current model and interventions</p> <p>Each DBR cycle can include multiple phases of the ILDF framework</p>	<p>facilitator to adoption.</p> <p>Blog postings by participants and metric tracker use = 0%</p> <p><u>Design principle:</u> Do not overlap cycles. It is too hard to determine the impact of the iterated changes. Keep it simple by doing one cycle, make changes, and then do another cycle making sure to look at the impact of the new changes made.</p>	<p>limited or no feedback. It may take several cycles to fully test certain features (e.g. pre-course reading, metric tracker, eCoP).</p>	
<p>Key changes to PraTT model based on above “Key Cycle Findings”</p>	<p>PraTT v2 should include CE interventions that have some technology based post-training peer support system that connects course trainees from distant locations and allows them to interact.</p> <p>PraTT v2 should include a job aide (CPR algorithm) and hands-on lab</p>	<p>Add to PraTT v3:</p> <p>Post-training reminder: every two weeks send an email reminder to trainees to use the eCoP. This is designed to stimulate more use/interaction on blog, thus creating an eCoP</p> <p>Treat questionnaires as intervention (reminder)</p> <p>Data analysis led to minor iterations of content of all interventions and questionnaires</p>	<p>PraTT v4 should contain pre-course, course, and post-course training activities.</p> <p>Pre-course: Get supervisor and trainee involved in eCoP before the course. Add pre-course reading</p> <p>Course: Add focus on using LM if 3 of 5 LM CPR criteria Training-Activities (in addition to those listed in cycle II) (during training):</p> <p>Post-course: Add questionnaire items about perception of innovations</p> <p>Continuous presence on eCoP by community coordinator is needed (more than just a periodic email reminder to use system)</p> <p>Encourage pre-course blog use in order to increase the use of eCoP after.</p>	<p>PraTT v5 simplified: removed supervisor activity as this did not seem pragmatic in PT population due to autonomous practice</p> <p>Added discussion board to increase online post-course interaction</p> <p>Added pre-course blog activity to increase post-course blog activity (due to increased familiarity with the system)</p> <p>Added weekly blog email reminder to increase use of blog</p> <p>Added group interaction in training transfer lecture</p> <p>Expanded study period to 12 wks post-course</p>	<p>See dissertation Chapter 6</p>

### Appendix U: Phone Interview Dates

Name	Course Date	“6 week interview” (# days after course)	“12 week interview” (# days after course)
Susan	22 Sept 2012	4 Nov 2012 (43 days)	21 Dec 2012 (83 days)
Mary	13 Oct 2012	2 Dec 2012 (50 days)	16 Jan 2013 (95 days)
John	13 Oct 2012	4 Dec 2012 (52 days)	15 Jan 2013 (94 days)
Todd	13 Oct 2012	6 Dec 2012 (54 days)	17 Jan 2013 (96 days)
Trisha	20 Oct 2012	6 Dec 2012 (46 days)	23 Jan 2013 (95 days)
Tim	20 Oct 2012	14 Dec 2012 (54 days)	21 Jan 2013 (93 days)
George	20 Oct 2012	11 Dec 2012 (51 days)	23 Jan 2013 (95 days)
Jeff	3 Nov 2012	27 Dec 2012 (54 days)	8 Feb 2013 (97 days)
Leslie	3 Nov 2012	22 Dec 2012 (49 days)	7 Feb 2012 (96 days)
Lilly	3 Nov 2012	28 Dec 2012 (55 days)	Did not complete
Rebecca	3 Nov 2012	21 Dec 2012 (48 days)	Did not complete
Kelly	10 Nov 2012	15 Jan 2013 (66 days)	Did not complete
Jen	10 Nov 2012	27 Dec 2012 (47 days)	Did not complete
Clay	1 Dec 2012	5 Feb 2013 (66 days)	Did not complete
Keith	15 Dec 2012	4 Feb 2013 (51 days)	3 Mar 2013 (79 days)
Mean # days		52 days	93 days

Note that the questionnaires were sent out at the six and twelve week post-course point. It then took time to get the questionnaires back from the participant's, and setup the follow-on phone interview. This explains why the interviews were conducted beyond the point suggested by their title (i.e. “6 week interview” is really a 52 day interview). Total: 25 interviews for a total time of 14 hours and 43 minutes

## **Appendix V: LBP and the Lumbopelvic Manipulation Clinical Prediction Rule**

### **Low Back Pain**

Low Back Pain (LBP) is the leading cause of activity limitation for adults under 45 years of age, and second only to the common cold for causing work absence in the United States (Kent & Keating, 2005; Steenstra, Verbeek, Heymans, & Bongers, 2005; Thelin, Holmberg, & Thelin, 2008). The costs associated with LBP, such as lost worker productivity (indirect cost) and healthcare expenses (direct cost), are estimated to be between \$84 to \$624 Billion annually in the US alone (Dagenais et al., 2008). LBP is the most frequent condition seen by outpatient physical therapists (Mikhail et al., 2005). Despite these physical therapy and other medical interventions, the prevalence of chronic LBP (i.e., low back pain that persists over time) is increasing (Freburger et al., 2009).

One possible reason for the increase in chronic LBP may be the lack of effective care for acute (new onset of symptoms) LBP that ideally fully abolishes all symptoms, returning the patient to full function and preventing relapse of the condition. Unresolved acute LBP lingers on and evolves into chronic LBP. Consistent with this conjecture, researchers have found a lack of evidence supporting many of the most frequently used LBP treatment methods used by physical therapists and other health care providers (Fritz et al., 2007; Jette & Delitto, 1997; Mikhail et al., 2005; Poitras et al., 2005; Willett et al., 2011). Some researchers have suggested that many of these seemingly ineffective

treatments may actually be effective if matched with the right subgroup of LBP patients (Delitto, et al., 1993; Fritz et al., 2007). In other words, treating all LBP patients with the same treatment (i.e., “magic bullet” approach) is not supported as effective, but if the LBP population could be broken down into subgroups that have preferential responses to specific treatments then treatments would be more effective (Bouter, Van Tulder, & Koes, 1998; Delitto et al., 1993). Support is growing for this alternative approach to managing LBP patients, identifying subgroups that can be matched with appropriate treatments (Fritz et al., 2007; Hebert, Koppenhaver, Fritz, & Parent, 2008).

### **Lumbopelvic Manipulation Clinical Prediction Rule**

Evidence suggests that this subgrouping method is more effective at improving LBP patient outcomes than non-matched traditional treatment approaches (Brennan et al., 2006; Kent, Mjosund, & Petersen, 2010). One specific subgrouping technique, called Clinical Prediction Rules (CPRs), has been used to develop clinical decision making algorithms that identify LBP treatment subgroups (Childs & Cleland, 2006; Glynn & Weisbach, 2011; McGinn, et al., 2000). CPRs require that a provider evaluate a patient and identify if an evidence based parsimonious set of key criteria are present that are predictive of a diagnosis, prognosis, or an appropriate matched treatment approach. The most widely validated treatment oriented CPR related to LBP is the lumbopelvic manipulation CPR (Childs, et al., 2004; Cleland, Fritz, Kulig, Davenport, Eberhart, Magel, & Childs, 2009; Flynn et al., 2002; Glynn & Weisbach, 2011).

The Lumbopelvic Manipulation CPR (LMCPR), developed in 2002 and validated in 2004, is used to identify LBP patients that are most likely to have significant

reductions in symptoms and self-perceived disability following treatment with Lumbopelvic Manipulation (LM) (Childs et al., 2004; Flynn et al., 2002; Fritz, Whitman, Childs, Palmer, & Cleland, 2006). The LMCPR is comprised of 5 criteria. These criteria are having a low Fear Avoidance Belief Questionnaire score for the Work section (FABQW<19), having at least one hip passive internal rotation range of motion greater than 35 degrees, having at least one lumbar spinal segment classified as hypomobile with central passive accessory movement testing, having no back associated pain below the knee, and having low back symptoms for less than 16 days (what is commonly considered within the realm of “acute” low back pain. Whereas “chronic” low back pain is commonly considered having symptoms for at least 4-6 weeks, but often much longer).

The rule is commonly considered positive or highly predictive of having success with lumbopelvic manipulation, when 4 or more of the five criteria are present on a patient with low back pain (Childs et al., 2004). In this scenario, a patient would have a 95% chance of having significant improvements (i.e. 50% reduction in self-perceived disability as measured by the Modified Oswestry Disability Questionnaire or MODI) in low back pain with up to only a few manipulation treatments over one week. If at least 3 of the 5 criteria are present, then the patient still has a 68% chance of having a 50% reduction in MODI with manipulation. Note that the tool (MODI) to measure the outcome from the manipulation treatment is not actually one of the LMCPR five criteria, but is still an essential tool to be used with the LMCPR in order to determine if the patient improved at the level that was expected. Therefore, in this dissertation I consider seven behaviors as being related to using or adopting LMCPR. These are measuring the

five LMCPR criteria, the MODI, and actually deciding how many of the LMCPR criteria a patient has during the low back pain evaluation (see table 15 columns A-G).

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## **Curriculum Vitae**

Jesse Ortel graduated from Rainier Beach High School, Seattle, Washington, in 1988. He received his Bachelor of Arts from University of Puget Sound in 1992. He received his Masters of Physical Therapy from Baylor University in 1996, and has served as an U.S. Army physical therapist since. He completed his Doctorate of Physical Therapy from Temple University in 2006.