

# Continuous Quality Improvement to Eventuate Learning Health Care Systems in Physical Therapy Practice

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## ABSTRACT

**Background and Purpose:** Achieving the Quadruple Aim in health care, necessitates the integration of evidence-based practice and practice-based evidence for quality improvement (QI) and learning. Physical therapists require guidance on approaches to QI that integrate knowledge generated from research and generated in clinical practice. The purpose of this paper is to review a method by which practicing physical therapists can leverage data from their own practices as a basis for QI and learning. **Methods:** The conceptualization of a learning health system (LHS) in relation to QI in health care was reviewed to describe the Institute for Healthcare Improvement model for QI and case operationalizing the model for physical therapists. **Clinical Relevance:** Practicing physical therapists review how to apply a framework for QI based upon relevant practice-based evidence. **Conclusion:** Operationalizing continuous cycles of QI within the physical therapy practice will improve the quality of patient care and patient outcomes and will facilitate the Institute of Medicine's vision of LHS in rehabilitation.

**Key Words:** learning health systems, physical therapy, quality improvement methods

## INTRODUCTION

Achieving the Quadruple Aim in health care requires a commitment to evidence-based practice (EBP) that focuses on improving the quality and safety of patient care, while reducing costs and engaging clinicians for increased job satisfaction.<sup>1</sup> Adoption of evidence into clinical practice involves a complex set of phenomena including the exponential growth in available research, access to evidence in a format that is readily usable by clinicians, and clinician knowledge, skills, and confidence in EBP.<sup>2</sup> Reviewing the increasing volume of research can compete with existing demands of clinical practice. Further, evaluating the readiness of evidence

for implementation can be challenged by a lack of familiarity with the myriad of study designs and interpretation of study results. Even a basic understanding of the efficacy and effectiveness of findings may not provide guidance on the applicability of those findings in relation to specific patients. These barriers have led to increased efforts to develop and disseminate clinical practice guidelines (CPGs) and evidence summaries as guidance for clinicians. Emphasis has also been placed on developing and teaching EBP competencies within specific health professions.<sup>1</sup> Likewise, the profession is beginning to see improvements in the quality of care based upon these initiatives.<sup>3</sup> Yet, guidance is required on how practicing clinicians can adopt systematic approaches to quality improvement that integrate knowledge generated from research with clinical expertise and knowledge generated in clinical practice.

Recent conceptualizations of quality improvement in health care have focused on aligning the latest research with knowledge from clinical practice and patient outcomes.<sup>4</sup> Adoption of electronic medical records in health care makes it possible to analyze significant amounts of clinical data at a rate and volume not previously envisioned. Likewise, health care systems and individual practices have the capacity to generate evidence about their own functioning that can prove essential for learning, quality improvement, and professional development. This capacity offers the potential for practice-based evidence to compliment EBP, creating a system in which both internal knowledge and external knowledge guide patient-centered care. For example, practice-based evidence can prove particularly valuable when patients have many co-morbidities that make application of CPGs and evidence summaries difficult. To realize such a system, practicing clinicians require additional guidance on how to generate knowledge from their own clinics and patient populations for continuous learning and for quality improvement.

The purpose of this paper is to provide

the practicing physical therapists a method to leverage data from their own practices as a basis for quality improvement and professional development. Operationalizing systems for learning from practice-based evidence within an individual practice or larger health care institution can provide a basis for continuous quality improvement and methods for efficient incorporation of research evidence to support the Quadruple Aim.

## LEARNING HEALTH SYSTEMS

In 2007, the Institute of Medicine<sup>5</sup> conceptualized the idea of a learning health system (LHS) that is capable of continuously, routinely, and efficiently studying and improving itself through the collection of clinically relevant data. According to Friedman and colleagues,<sup>6</sup> a LHS has 5 observable components: (1) patients' characteristics and experiences are available as data, (2) knowledge derived from this data is available to support health-related decisions, (3) improvement is continuous through ongoing study related to specific goals, (4) infrastructure enables this to happen routinely, and (5) stakeholders within the system view these activities as part of their culture.

Within the LHS, there is bi-directional knowledge generation and dissemination, where the system scans the external environment for knowledge from research that can be used to improve outcomes, safety, and quality of care. It also generates internal knowledge about its own functioning through outcomes-based decision-making that informs changes to processes and practices. The knowledge gained from internal assessment of care can then be disseminated to the broader external health care system. Hence, knowledge generation and dissemination flow from the research environment to the clinical environment to the research environment, forming a continuous communication network while breaking down the artificial barriers between clinical care and research.

The development of a LHS in rehabilitation has been explored. Jette,<sup>7</sup> in his 2012

Mary McMillan lecture, suggests physical therapists must incorporate 3 critical skills noted by Atul Gawande<sup>8</sup>: (1) they must be interested in data and its relation to performance; (2) use the data to solve problems, especially related to patient-centered care; and (3) know how to “scale up.” Scaling up allows one to use data to assess the organization’s ability to collaborate, disseminate new knowledge, and reduce failures by assuring processes are followed that have been shown to be effective. Applying these 3 skills would allow physical therapists to establish the foundation of a learning system vital to continuous quality improvement.

## QUALITY IMPROVEMENT

Over the past few decades, health care systems worldwide have been under scrutiny because of issues regarding quality and errors. In the United States, two landmark reports from the Institute of Medicine (IOM) identified the impact of medical errors and threats to safety on patients, families, health care, and the nation. In 1999, *To Err is Human*,<sup>9</sup> shed light on the frequency of safety problems and medical errors in the United States health care system. This report identified the physical, psychological, and economic toll of medical errors. After this report was released, the public and government officials demanded more information on not only the problems with safety and errors but also on potential solutions. In *Crossing the Quality Chasm*,<sup>10</sup> the IOM provided an update on problems associated with quality and medical errors and offered recommendations for fundamental changes to the United States health care system. Among the suggestions was the need for clarity on what performance expectations lead to a safe and error-free health care system. This suggestion initiated the push to have system-wide quality and safety performance measures. As a result, the United States sought a new organizational framework for its health care system that included a patient-centered care model, the use of evidence-based practice interventions, reliance on outcomes based performance measures, and a comprehensive plan to prepare the workforce to better serve patients in a world of expanding knowledge and rapid change.

Over the nearly two decades since these reports, the recommendations proposed by the IOM have not been fully realized. According to a 2017 study, approximately 15% of all hospital expenditures and activities are related to medical errors and safety issues.<sup>11</sup> Some economists estimate that the

United States spends a trillion dollars annually on direct and indirect costs associated with medical errors and quality problems.<sup>12</sup> Fortunately, recent evidence suggests that the decades-long emphasis on quality improvement in health care is having some positive effects. For example, Peterson-Kaiser Health System Trackers<sup>13</sup> indicate that common hospital acquired conditions, like adverse drug events and falls significantly decreased between 2014 and 2017 attribute the decrease, in part, to the effective implementation of practices to improve patient safety and quality of care.

Quality improvement has its roots in the automobile, manufacturing, and aviation industries.<sup>14</sup> In these industries methods such as total quality management and LEAN Six Sigma are used to improve quality and efficiency and eliminate waste. Similar goals of improving quality, efficiency, and cost are now being applied to health care. The Institute for Healthcare Improvement (IHI) has been a leader in incorporating the principles of quality improvement into health care and, to that end, adopted the Quadruple Aim, which relates health care system quality to improvements in population health, patient experience, costs of care, and health care team well-being.<sup>15</sup>

### Quality Improvement in Physical Therapy: A Systems Approach

Physical therapists often think about quality care and safety in relation to their patients. Commonly asked questions include, “Am I doing the right things for my patients? Are the activities and exercises I am providing safe for my patient to do?” Usually, physical therapists think in terms of their relationship with the patient as primarily responsible for safe and effective rehabilitation. However, unpacking this relationship, additional factors may affect the safety and outcome of treatment. On the patient side the motivation to improve or the fear associated with the pain they are experiencing are important factors that may affect the outcome of care. The patient may be under stress that keeps them from complying with the treatment plan. On the physical therapists’ side, experiences with similar patients, the amount of time available with each patient, and the exhaustion felt toward the end of the day may affect the overall success of the intervention and perhaps influence safety.

If a systems approach to rehabilitation is adopted, clinicians might also recognize that the surgery the patient had prior to coming to the physical therapist, the stresses of pay-

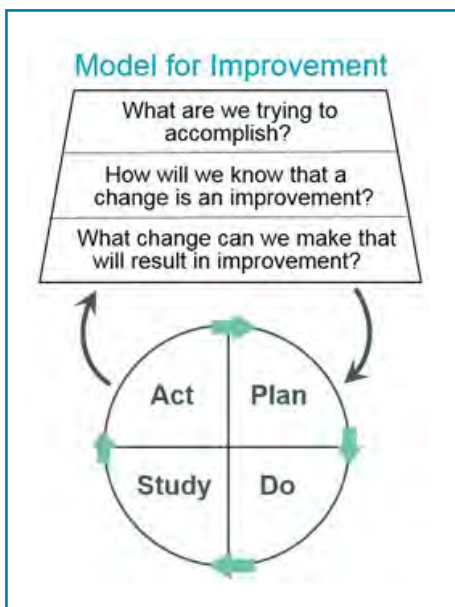
ment and insurance coverage limitations, the patient’s home or work environments, and the quality and structure of the clinic and hospital all play a role in the ultimate success of rehabilitation. As we begin to investigate the efficacy and effectiveness of rehabilitation care, clinicians need to recognize that there are many stakeholders within this picture. As health care workers start to look at continuous quality improvement, therapists may find themselves in discussions with stakeholders who are not traditionally thought of as important to physical therapy care. For example, natural collaborators for quality patient-centered care might include occupational therapists and speech language therapists; moreover, strategies to improve care may go beyond the walls of rehabilitation.

In taking a systems approach to quality improvement in physical therapy, clinicians come to recognize that quality improvement within the system of care requires that all members of the health system commit to continuous learning with a goal toward process and outcome improvement. To achieve the Quadruple Aim, health professionals must evaluate evidence from research (external evidence) and evidence related to their own performance (internal evidence) to plan and implement changes that will improve patient outcomes, patient safety, and the quality of care. Advances such as access to electronic health records of all providers seeing a patient and professional and inter-professional registries can provide access to data on a much larger scale than previously possible. However, challenges remain regarding how to harness the data and interpret it in relation to quality improvement goals.

### The Institute of Healthcare Improvement Model of Improvement

To systematically approach quality improvement initiatives within the clinical setting the integration of a guiding framework is essential. A physical therapy team working on a quality improvement project (QIP) might want to adopt one of the most highly regarded frameworks—the IHI Model of Improvement that includes a Plan-Do-Study-Act, or PDSA, cycle (Figure 1). The PDSA cycle is the most commonly used tool in quality improvement programs within health care.<sup>16</sup>

The QIP team would first want to answer the 3 questions that initiate the IHI’s Model of Improvement. First, they determine, “What are we trying to accomplish?” Here, they consider the aim of the quality improvement efforts. The aim or purpose statement



**Figure 1. The Institute of Healthcare Improvement Model for Improvement. Reprinted with permission from Langley GJ, Provost LP. *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance*. 2nd ed. Copyright 2009, Wiley Books.**

should be bold, realistic, clear, concise, measurable, and meaningful. The QIP team is encouraged to describe the specific level of improvement, who the quality improvement program will affect, and the timeframe.

Next, the QIP team will determine, “How will we know that a change is an improvement?” To answer this question, the QIP team will develop a measure or measures to assess the change. In some cases, this could be an outcome measure or measures that demonstrate the impact of the intervention on the patient, his or her health, or well-being. An outcome measure is considered the gold standard in quality measurement. For example, the QIP team may choose to measure if the average Oswestry score for patients with low back pain is above the minimal clinically important difference over 6 months.

The QIP team may select a process measure to see if positive change or an improvement occurs. A process measure looks at the steps in the process that could lead to improvement. An example of a process measure is determining the percentage of patients with low back pain who completed the Oswestry Disability Index over a 6-month period. For process measures, the primary interest is measuring if the process was performed, not its outcome.

The final measure type is referred to as a balancing measure. Balancing measures look at unanticipated consequences of change. For example, if a quality improvement program aims to improve lower extremity strength for all patients with anterior cruciate ligament impairment and the clinician changes all patients’ exercise programs to an accelerated, high velocity exercise program, one might expect greater stress to the lumbar spine. So, a balancing measure may include using a validated low back pain measure to ensure the program is not having an unanticipated negative effect on another bodily area.

The last question to consider in the IHI Model of Improvement is, “What changes can we make that we believe will result in improvement?” Ideas for change should be based on the experiences of working within the system. Therapists may look at workflow changes, changes in the work environment, changes in care plans for certain populations, or the use of newer evidence-based practices.

After answering the 3 initiating questions, the QIP team would progress through the 4 stages of the PDSA cycle. The first stage of the PDSA cycle requires that the QIP team plan the strategy they will use to test their improvement solution. During the plan stage, the QIP team should state the question they want to answer and make a prediction about what they think will happen. Consider the overall aim of the quality improvement project and what is expected to happen with this specific solution. This stage also requires the QIP team to consider the 4 Ws: “Who is responsible for the plan?, What will they do to implement the solution?, When will they start and complete the testing for this solution?, and Where will they start the solution (for example, in one clinic or department or throughout the system).” Also, the QIP team should consider what data need to be collected to assess if the changes have been successful.

After completing the Plan stage, the QIP team moves on to the Do stage. During this stage, the QIP team implements the plan as outlined in the first stage and collects appropriate data to later determine the level of success. The team should document unanticipated challenges encountered during the plan because documentation will be helpful in determining the needs for a subsequent PDSA cycle.

After implementing the planned changes and collecting the requisite data, the QIP team will move into the Study stage. In this stage, the collected data is analyzed to evaluate the level of success and identify challenges.

A comparison to the initial predictions and prior performance of the selected measures will help determine the level of success. Ideally, QIP team will discuss the results prior to entering the final stage of the cycle.

In the final, or Act stage, the QIP team reviews the outcomes from the Study stage to make decisions on subsequent actions. Subsequent actions might include (1) making the strategy that was tested in the PDSA cycle standard practice if the results showed success, (2) amending the original plan and re-testing if there was success but was below expectations, or (3) abandoning the plan and starting a different plan if no positive change was demonstrated. If the decision is to amend the original plan or start a new plan, the QIP team moves through a new PDSA cycle.

### QIP CASE EXAMPLE

The following case example will be used to further illustrate the utility of the PDSA cycle in the guidance of a quality improvement project within an LHS.

An outpatient clinic, which is part of a statewide organization, provides physical and occupational therapy services to their local community. In an effort to improve quality of care, the therapy team desires to increase their effective use of functional outcome measures to drive evidence-based best practice. To aid in this effort, the clinic establishes a local QIP team and begins with the IHI model to determine their objective. The first step is to review the clinic’s Electronic Medical Record. The QIP team finds that the outcomes of upper extremity issues are problematic in their clinic, so they request a more detailed analysis comparing their clinic’s results to the organization’s data (Table 1). The QIP team notes some concerning issues especially regarding the average treatment duration and sessions for upper extremity conditions and the lackluster Quick DASH results. Using the IHI Model for Improvement, the QIP team develops objectives to the quality improvement program (Table 2).

During the Plan stage of the PDSA cycle, the QIP team decides to focus on the use of the Quick-DASH, as this tool is currently used by both occupational and physical therapists and the initial results demonstrated problems with its implementation. Upon further study of the comparison data, the QIP team decides that a major issue is the low percentage of patients with upper extremity problems who were provided the Quick DASH (28% vs 65%). In addition, the QIP team survey the clinicians and find

**Table 1. Electronic Health Record Data Comparing the Clinic to the Organization Data**

Organization Profile for Shoulder/Elbow/Wrist Pain	Case Clinic	Case Organization
# of patients: n	105	2,843
Age: mean (SD)	49 (16)	45 (14)
Gender: %	62 (female) 38 (male)	57 (female) 43 (male)
Average # treatment sessions	14.4	8.8
Average treatment duration in weeks	8.6	5.2
% patients provided with QuickDASH in initial evaluation	28	65
Average pre-treatment QuickDASH score	59.4	48.6
Average post-treatment QuickDASH score	44.6	27.4
Average change score	14.8	21.2
% of patients with QuickDASH change score $\geq$ 16 points (MCID)	45	70
% of patients with no/mild disability post-treatment	54	75

that most clinicians did not understand the purpose of the QuickDASH and did not use the findings in treatment planning.

To reach the objective of increasing the usage of the QuickDASH and improve the clinic's care for patients with upper extremity problems, the QIP team designs the following plan:

1. Improve front office processes that assures patients are receiving the QuickDASH.
2. Motivate patients to complete the QuickDASH by having clinician's review the results with the patients.
3. Develop an education program for clinicians to review the QuickDASH purpose and its importance to care planning.

In addition, the team decides on the following measures to assess after 3 months:

- (1) % of patients receiving the QuickDASH in the initial evaluation.
- (2) % of patients completing the QuickDASH in the initial evaluation.
- (3) Average pre-treatment QuickDASH score.
- (4) Average post-treatment QuickDASH score.
- (5) Average change score of QuickDASH from pre- to post-treatment.

During the Do stage of the PDSA cycle, the QIP team implements the training process to front office staff and clinicians through a series of in-services and individual meetings. The QIP team finds that although there was initial resistance to the new proce-

**Table 2. The Clinic's Quality Improvements Objectives Using the IHI Model**

<i>What are we trying to accomplish?</i>	Improve health related outcome measures pertaining to upper extremity functioning and occupational performance.
<i>How will we know that change is an improvement?</i>	Improved scores of quality indicators focusing on increased use of the QuickDASH and enhanced health outcomes.
<i>What change can we make that will result in improvement?</i>	Targeted education of all team members to enhance knowledge of utility and benefit of functional outcome measures.

dures, most clinicians and staff find the training helpful.

In the third stage, or Study stage, the QIP team will meet to analyze, interpret, and discuss the collected data to establish the success of the plan. Table 3 shows the results of the measures after 3 months. The QIP team determines that the educational intervention was successful in improving the dissemination of the QuickDASH as a greater percentage of eligible patients were receiving the QuickDASH that has now surpassed the organization's rate; however, they are disappointed in the average and change scores. This is especially important because the QuickDASH change score did not surpass the minimal clinically important difference (MCID) of 16 points.

In the Act stage, the QIP team determines the QuickDASH training will become a standard operating procedure in their clinic. Since the pre-post intervention QuickDASH

scores did not reach the MCID, the team discusses that a new PDSA be initiated and include a training program reviewing available CPGs on upper extremity injuries (UEI). They establish a new group to explore the literature on UEI CPGs and discuss ways to implement a new training program for the clinicians.

As our case demonstrates, QIP teams repeatedly develop PDSA cycles to test new ideas or make modifications to existing ideas, moving from one cycle to the next. Aligning to the LHS concept, the QIP team recognizes that there will always be room for improvement based on new knowledge from the external environment (from research or policy) and knowledge from internal data analysis. Ivers et al<sup>16</sup> and Wells et al<sup>17</sup> suggests that engagement in quality improvement leads to better patient outcomes and the development of a culture of improvement.

**Table 3. Quality Indicators 3 Months After Quality Improvement Plan**

Quality Indicators (after 3 months)	Case Clinic	Case Organization
% of patients receiving the QuickDash in the initial evaluation	87%	72%
% of patients completing the QuickDash in the initial evaluation	79%	61%
Average pre-treatment QuickDASH score	56.9%	49.3%
Average post-treatment QuickDASH score	42.4%	28.9%
Average change score	14.5	20.4

**CONCLUSION**

Current health care systems are focusing on establishing a culture of quality incorporating learning from external (research) and internal (clinical EHR data) sources while providing the infrastructure that allows for continuous assessment of new clinically generated data. For this phenomenon to be effective in rehabilitation, physical therapists need to establish processes to integrate external evidence in the clinic and develop the infrastructure to assess and learn from their internal evidence or clinically generated data. In this paper, the authors provide a method and case example guided by the IHI Model of Improvement, to establish a continuous quality improvement program based on clinically generated data from an EHR for physical therapists.

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