


EXPERIENCE REPORT

Building, scaling, and sustaining a learning health system for surgical quality improvement: A toolkit

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Abstract

This article describes how to start, replicate, scale, and sustain a learning health system for quality improvement, based on the experience of the Michigan Surgical Quality Collaborative (MSQC). The key components to operationalize a successful collaborative improvement infrastructure and the features of a learning health system are explained. This information is designed to guide others who desire to implement quality improvement interventions across a regional network of hospitals using a collaborative approach. A toolkit is provided (under *Supporting Information*) with practical information for implementation.

KEYWORDS

Learning Health System, collaborative improvement, quality improvement, surgical improvement, toolkit

1 | INTRODUCTION

Keeping up with changing health care evidence and practices is challenging even for the best organizations. Hospitals and health care organizations must stay abreast of clinical quality metrics and manage the growing burden of administrative reporting requirements to avoid financial penalties. In this rapidly changing environment, the ability to both monitor and improve health care quality is critical to an organization.

Many health care organizations are attempting to tackle this challenge by creating a Learning Health System (LHS). A LHS is a system that “learns” from its own experiences in patient care, turning data into knowledge and knowledge into performance in a continual cycle of improvement.¹⁻⁴ The LHS framework requires an infrastructure of data collection, analysis, and implementation that can respond in real time to improve performance and promote the adoption of best practices.^{4,5} Mirroring the features of the “Plan, Do, Study, Act” (PDSA) approach to quality improvement, the LHS cycle incorporates the ability to continuously learn, iteratively build, and rapidly disseminate the improvement process (Figure 1).

2 | THE MICHIGAN SURGICAL QUALITY COLLABORATIVE

While a single institution can be an LHS, it can also be operationalized as a multi-institutional improvement collaborative wherein knowledge and interventions can be efficiently disseminated and scaled across many hospitals or organizations. The MSQC comprised 70 hospitals in Michigan and includes all hospitals that perform major surgery in the state. The group was formed to improve surgical care throughout the state by collecting data on clinical outcomes after surgery and using the data to implement quality improvement interventions. The coordinating center (comprising surgeons, nurses, statisticians, and program/business managers) maintains a centralized, validated, clinical registry for 50 000 general surgery, vascular, and gynecologic operations per year. Data are freely accessible to all member hospitals, and an audit-and-feedback mechanism delivers data to individual surgeons and institutions about their own outcomes and process of care utilization rates compared with statewide norms. Sites can then initiate local or regional quality improvement measures and use the continuous data

Michigan Surgical Quality Collaborative Learning Health System Model

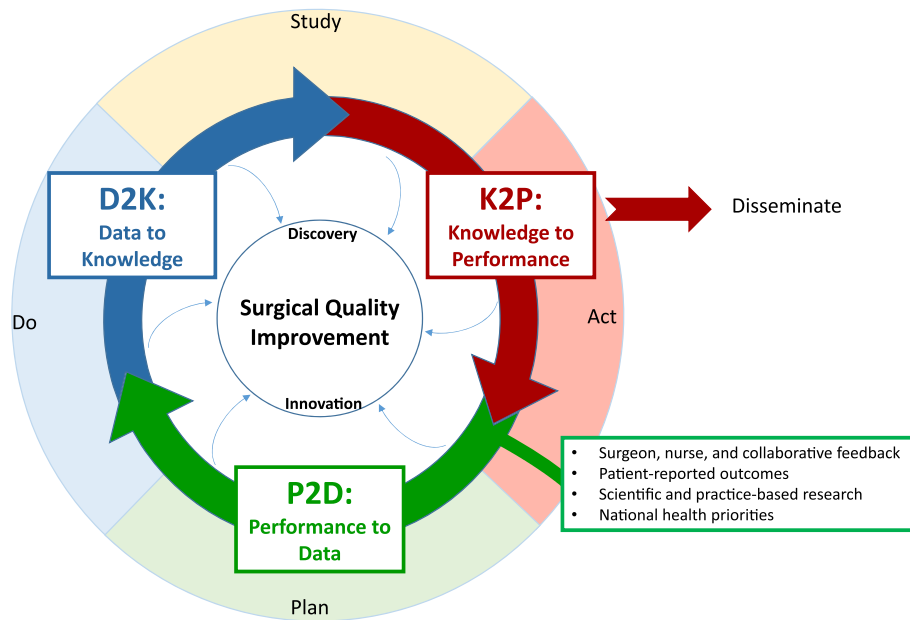


FIGURE 1 Michigan surgical quality collaborative learning health system model

collection to evaluate their performance. In addition, the MSQC centrally designs quality improvement interventions and disseminates these throughout the sites, with a mentored implementation component.

Blue Cross and Blue Shield of Michigan/Blue Care Network (BCBSM/BCN) Value Partnerships program provides funding for the collaborative.⁶ Stimulated by the success of national collaboratives such as the Department of Veterans Affairs National Surgical Quality Improvement Program (VA-NSQIP) and the Northern New England Cardiovascular Disease Study Group,^{7,8} BCBSM/BCN began supporting the initiation of regional collaboratives in several specialty areas across the state of Michigan.⁶ These regional collaboratives, some of which are adjuncts to large national programs, have advantages over broad national efforts in that they are more agile, foster grassroots participation, and offer a more accessible and personal hands-on approach to management.⁹ Participation in the collaborative is financially supported, and this allows small community hospitals to participate as well as larger, academic hospitals. As a result, data collected from these diverse sites may more accurately represent the statewide population compared with other collaboratives that require institutions to fund their own participation.

3 | BENEFITS OF A MULTI-INSTITUTION LEARNING HEALTH SYSTEM

When health care institutions partner with one another in quality improvement, they are able to leverage economies of scale for data gathering, analysis, benchmarking, and sharing expertise. Harnessing knowledge and resources from teams with diverse working environments, the collaborative approach seeks to accelerate the adoption of evidence-based medicine from years to months.¹⁰ As institutions

work together on a health care problem, they can share experiences and barriers specific to their local environments. Rather than reinventing solutions, institutions can benefit from outside perspectives, rapidly learning from each institution's experience. Others have likened this model to that of the airline industry, where critical safety issues identified in a single aircraft influence service delivery for all aircrafts across the country.¹¹

4 | ADDRESSING THE OPIOID EPIDEMIC: A LEARNING HEALTH SYSTEM IN PRACTICE

The MSQC currently uses the rapid cycle of learning and improvement inherent in a LHS to address the national opioid epidemic. Surgeons prescribe 10% of the nation's opioids,¹² and the vast majority of these pills are not used, potentially leading to opioid dependence, misuse, or diversion into the community.¹³ We leveraged the existing MSQC infrastructure to apply LHS methodology—translating performance to data, data to knowledge, and knowledge to performance—to reduce the number of opioids prescribed to surgical patients over a 16-month period.

5 | PHASE I: PERFORMANCE TO DATA

Opioids prescribed after surgery have gained national attention for their role in the escalating opioid epidemic.^{14,15} To learn about this problem, the MSQC team sought feedback from the collaborative sites, reviewed scientific and practice-based research, and solicited patient experiences. With this knowledge, the MSQC clinical leadership designated postsurgical opioid prescribing as a quality improvement focus area with high priority. The coordinating center team

added additional data collection variables to the MSQC data platform to determine the amount of opioids prescribed after surgery. They also added patient-reported opioid consumption, and other patient-reported outcomes including satisfaction with care and postoperative pain. Data were collected on a subset of patients undergoing five of the most commonly performed operations in the MSQC database:

- (1) laparoscopic and open hernia repair
- (2) laparoscopic and open cholecystectomy
- (3) laparoscopic and open hysterectomy
- (4) laparoscopic and open appendectomy
- (5) laparoscopic and open colectomy

Patients were surveyed by telephone or mail at postoperative day 30 and were given 90 days to respond. Basic project management skills were employed to plan for structured data collection, analysis, and systematic review.

6 | PHASE II: DATA TO KNOWLEDGE

In the next phase, collected data were analyzed to ascertain health practitioner prescribing practice(s) as well as the patient-centered outcomes of consumption and satisfaction. In this example, we collected

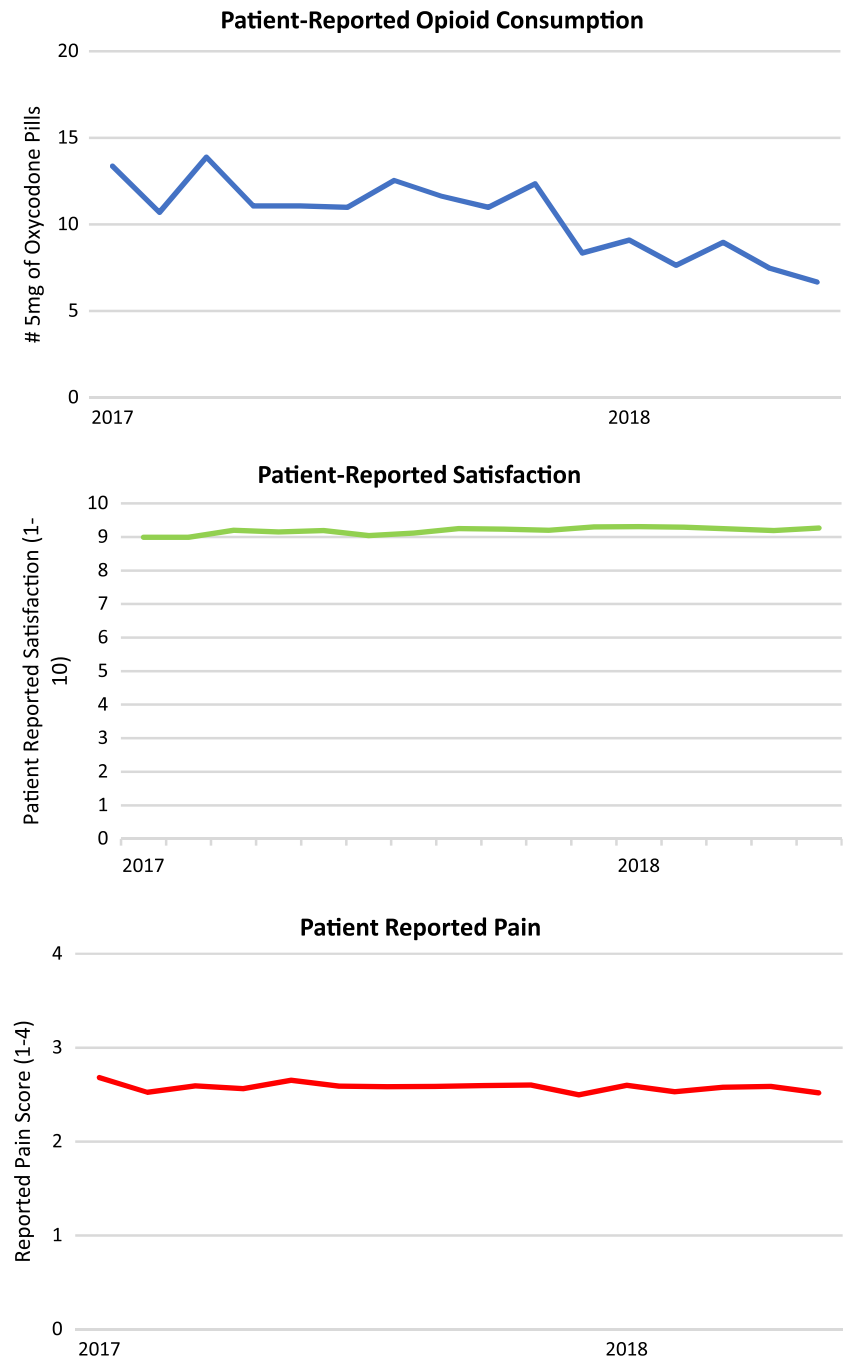


FIGURE 2 Patient-reported outcomes for opioid consumption, satisfaction, and pain

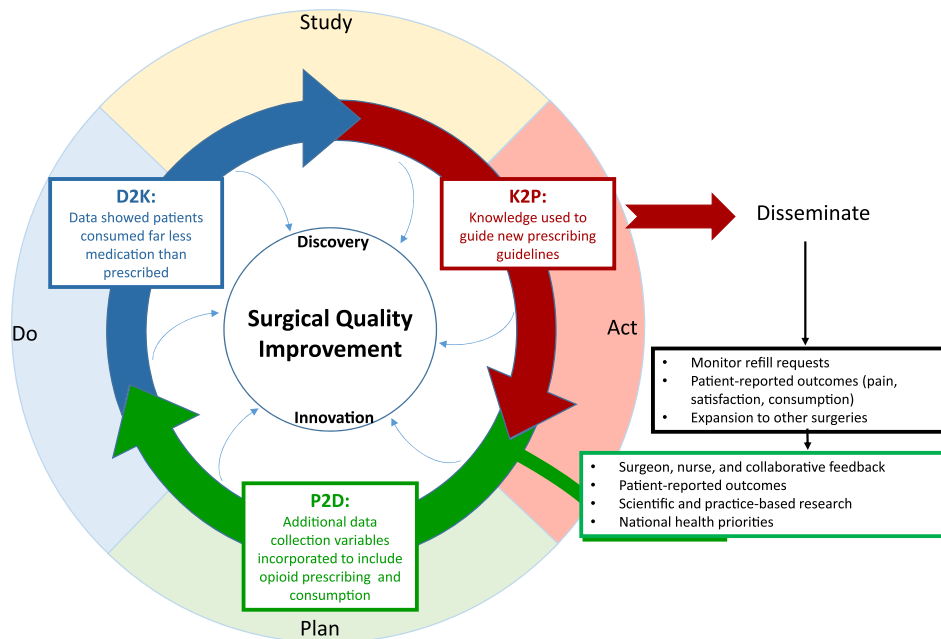


FIGURE 3 Michigan surgical quality collaborative learning health system model: opioid prescribing

opioid prescribing, consumption, and satisfaction data for over 10 000 patients over several months. For each of the five procedures, there was significant variability in the number of opioid pills prescribed after surgery indicating uncoordinated prescribing practices among providers and institutions. Furthermore, consumption data showed that most patients consumed far less medication than they had been prescribed, indicating that postoperative prescribing could be reduced without compromising patient pain control needs. Patient satisfaction was maintained (Figure 2).¹⁶ The MSQC used these data to generate knowledge in the form of procedure-specific prescribing guidelines. Specific prescription quantities were recommended for each procedure based on the number of pills the majority of patients reported using.¹⁷ These recommendations were then disseminated to guide prescribing practice via online forums, in-person meetings, and quality initiative workgroup calls.

7 | PHASE III: KNOWLEDGE TO PERFORMANCE

The knowledge was then used to guide future patient care, and performance was evaluated with continued data collection to complete the cycle. For example, over the course of this project, we continued to collect data on opioid prescribing and consumption during and after dissemination of prescribing guidelines, allowing us to evaluate whether practice changed at each site. The results demonstrated reduced opioid prescribing and less variability between providers across the entire collaborative.¹⁶

While learning occurs at all points in the cycle, sharing the performance data is especially valuable during this phase since it encapsulates the success as well as identifying the failures of the project and avoids “reinventing the wheel.” For example, some sites noticed an increase in requests for refills, leading to a reexamination of the

prescribing guidelines. Other feedback led us to improve the patient-reported outcome survey questions before they were implemented to a broader population of patients (Figure 3).

This real-world example, focused on the current opioid epidemic and surgical opioid prescribing, illustrates how an improvement collaborative can accelerate improvement and learning on a large scale using the principles of a LHS. Other examples of quality improvement projects at the MSQC include implementation of a colectomy bundle that demonstrated a 42% reduction in surgical site infections,¹⁸ colorectal cancer quality assessment project identifying gaps in performance on surgical, pathology and multidisciplinary measures of care quality,¹⁹ and enhanced recovery protocol implementation.²⁰ As a general rule, these projects require approximately 18 months to complete. However, the demonstration of value is often a longitudinal goal, with a timeline of approximately 3 years in order to allow the iterative cycle of improvement to yield sustained benefit.

8 | STRATEGIES TO SUSTAIN MOMENTUM

In an environment already besieged with multiple reporting and data requirements, focusing on yet another quality improvement project is challenging for busy front-line clinicians. Participant engagement and coordinating center communication is critical to success for sustaining improvement project momentum.

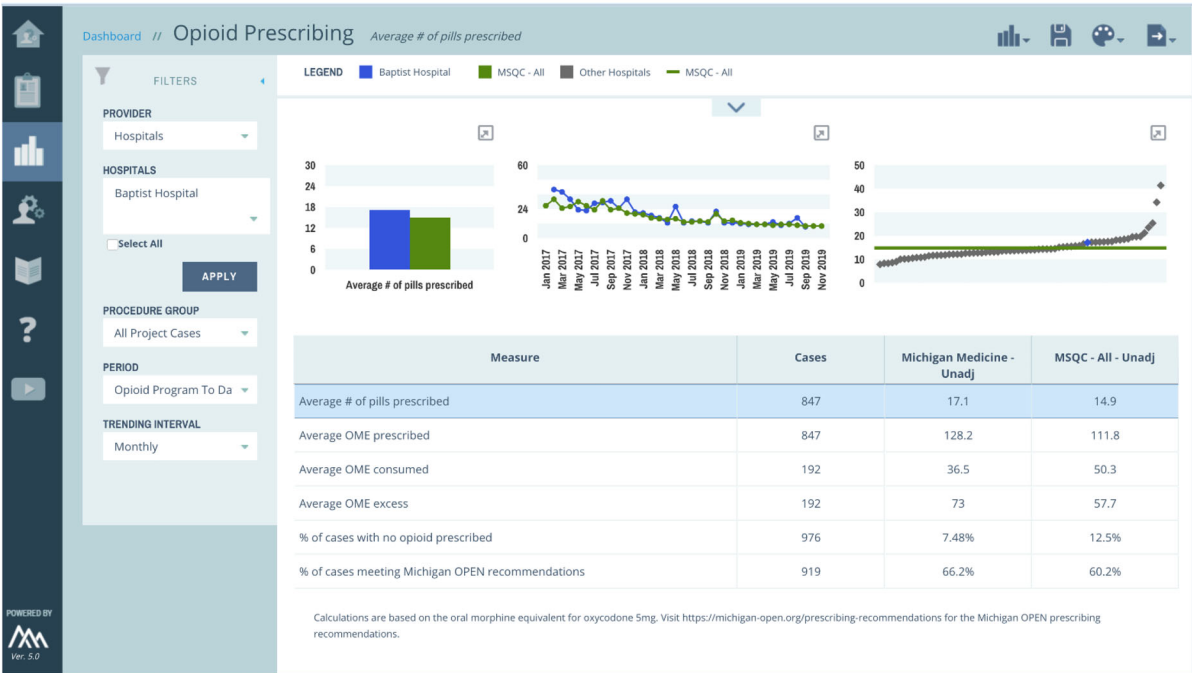
To foster engagement, collaborative leadership should solicit feedback and opinions from the collaborative membership routinely, as they have the most familiarity with institutional data collection, data reporting, and performance improvement. Meetings, conferences, conference calls, and site visits must be high yield so that participants derive demonstrable benefit from ongoing participation. The clinicians are busy people who are being asked to add work to their already busy lives. The collaborative leadership, therefore, must make sure that value is offered in return.

In our experience, offering continuing medical education (CME) for participation in meetings and site visits is one way to encourage engagement.

Additionally, the MSQC strives to keep the administrative burden of participation to a minimum. Strategies MSQC uses to help to ease the administrative load include (a) offering a comprehensive “one-stop” information hub in the form of tool

kits, (b) streamlined data collection with data integration, and (c) providing a 24/7 data analytic platform to retrieve metrics. For the opioid project, the addition of an opioid dashboard within the data collection platform helped to continue to track progress on opioid prescribing goals. (Please see Figure 4 for an example prototype display).

(A) Opioid Dashboard.



(B) Data Collection Platform.

The Data Collection Platform interface shows a 'Details' view for a specific case. It includes a breadcrumb trail, a list of categories (Prophylactic IV Antibiotics, Postop, Labs, Postop Occurrences, Postop Events, Follow Up, ERP, Pain, Opioid Use, Admin Options), and a form for 'Opioid Use'. The form has an 'Add Row' table and a 'MSQC Opioid Use' section with various input fields and checkboxes.

Type of Opioid Prescribed	Opioid Dose Prescribed	Opioid Dose Pre-scribed Unit
Oxycodone PO (OxyContin, Percocet, Roxicodone)	5	mg

MSQC Opioid Use

Type of Opioid Prescribed *
Oxycodone PO (OxyContin, Percocet, Roxicodone)

Opioid Dose Prescribed Unit
mg

Opioid Dose Prescribed
5

Quantity Prescribed
15

Was the prescription filled?
No

Do you know how many doses were taken?
No

How many doses were taken?
How many doses were taken?

How many refills were there?
How many refills were there?

Is the patient currently taking this medication?
No

FIGURE 4 Example of prototype MSQC opioid dashboard (A) and data collection platform (B)

Similarly, communication within the collaborative needs to be ongoing, purposeful, and deliberate. Intentional, informative updates keep the collaborative well informed and nurture the “community of practice” and collegiality among the members. Communication in the MSQC is both vertical (BCBSM, coordinating center and sites) and horizontal (between and among sites). To solicit feedback from the collaborative participants on the operational, administrative, and clinical aspects of the coordinating center, a survey is distributed biannually. This feedback serves as an effective and efficient tool to improve from within as it provides open and honest anonymous communication.

9 | BUILDING AN IMPROVEMENT COLLABORATIVE LEARNING HEALTH SYSTEM: A TOOLKIT

With a decade of experience in quality improvement experience, the MSQC often receives questions from other states and organizations about how to start an improvement collaborative that uses the rapid-learning approach to quality improvement from an LHS model. Our success has cultivated numerous collaborative relationships nationally and internationally and has generated strong interest in developing new regional centers aimed at transforming perioperative care.²¹ Since funding is often a barrier to new regional collaborative organizations, funding models may include support from health care insurance payers, private-public partnerships, grant funding, and/or combinations of these mechanisms to drive similar initiatives.²² To address the most commonly asked questions and assist others in starting a LHS collaborative model, the MSQC has compiled a toolkit as a ready-made solution to share knowledge and provide practical information (provided in *Supporting Information*). It includes details regarding how to develop staffing (organization and structure), find resources (funding and revenue), plan and organize (meetings, site visits, workshops), and satisfy legal and regulatory issues surrounding data collection and analysis.

10 | CONCLUSION

In summary, multiple institutions in an improvement collaborative can use LHS principles to accelerate the translation of evidence into practice, magnifying the impact of quality improvement efforts. Collaborating institutions can learn from others' mistakes and successes, and a supportive central infrastructure can provide mentoring to help institutions address obstacles in practice improvement. In our own experience, the MSQC has formed an LHS that has collected data and implemented interventions aimed at improving patient safety issues including opioid prescribing, health care-associated infections, and other adverse patient outcomes. An iterative cycle of monitoring and improvement is the goal to bring rapid change, large-scale results, and yield sustained benefit.

CONFLICT OF INTEREST

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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