

UPMC Prescription for Wellness: A Quality Improvement Case Study for Supporting Patient Engagement and Health Behavior Change

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Abstract

Addressing patient health and care behaviors that underlie much of chronic disease continues to challenge providers, medical practices, health systems, and insurers. Improving health and care as described by the Quadruple Aim requires innovation at the front lines of clinical care: the doctor–patient interaction and office practice. This article describes the use of Lean Six Sigma in a quality improvement (QI) effort to design an effective and scalable method for physicians to prescribe health coaching for healthy behaviors in a primary care medical home within a large integrated delivery and financing system. Building on the national Agency for Healthcare Research and Quality and Robert Wood Johnson Foundation–funded Prescription for Health multisite demonstration, this QI case study provides important lessons for transforming patient–physician–practice support systems to better address lifestyle and care management challenges critical to producing better outcomes.

Keywords

quality improvement, health behavior change, lifestyle medicine, Six Sigma, patient engagement

Faced with the national imperative to transform health care and achieve the Quadruple Aim,¹ health care organizations across the United States are seeking innovative approaches to manage the health of their populations. Evidence linking lifestyle risk factors with prevalent and costly chronic conditions suggests that scalable solutions for health behavior change are critical to the success of these efforts.² Physician counseling can serve as a powerful motivator for health behavior change,^{3–5} and patients expect to receive such counseling from their physicians.^{3,6}

However, the pragmatic challenges of delivering this type of service in ambulatory care have remained an obstacle to implementation. Barriers include lack of time and reimbursement,^{3,4,7–9} limited internal resources,^{3–5,9} lack of training and skills,^{2–5,8,10} and the low confidence of providers.^{2,10,11} Consequently, among the 80% to 90% of patients presenting at a physician's office at least once a year with or are at risk for unhealthy behaviors,^{8,12} at most 35% to 45% are counseled^{2,4,7,10,13–15} and even fewer are referred to services for support.¹³

Between 2002 and 2007, the Agency for Healthcare Research and Quality and the Robert Wood Johnson Foundation funded Prescription for Health, a national

trial that utilized primary care practice–based research networks across the United States.^{5,16} The project tested strategies for delivering behavioral counseling and connecting patients to community resources, focusing on leading health-risk behaviors: smoking, poor diet, physical inactivity, and excessive alcohol consumption.^{3,8}

Prescription for Health provided insight into the elements necessary for successful partnerships between physician offices and community resources and demonstrated the value these relationships could have in managing population health. UPMC, a large integrated health care delivery and financing system consisting of more than 3000 employed physicians and a Health Plan, is

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Table 1. UPMC Prescription for Wellness, by Background and Six Sigma Phases, 2009-2014.

	Phase	Dates	Description
Background work	Education Pilot	May 2009 to November 2011	Process Improvement collaboration focused on improving physician awareness of Health Plan coaching programs
Lean Six Sigma Quality Improvement Project	Six Sigma Define, Measure, Analyze (DMA) phase	December 2011 to April 2012	Six Sigma class commences; process evaluation, measurement, observation, and documentation conducted
	Six Sigma Intervention (I): Phase 1	May 2012 to April 2014	“People and Process” intervention
	Six Sigma Intervention (I): Phase 2	May 2014 to July 2014	“Technology” intervention: integration between the electronic medical record and Health Plan Care Management System

positioned to implement this kind of collaborative model. The UPMC Health Plan encompasses a provider network of more than 1200 primary care physicians in more than 400 practice sites in southwestern Pennsylvania using a patient-centered medical home (PCMH) model. The Plan supports 80 registered nurse practice-based care managers (PBCMs) in physician offices to assist in population health management activities for enrolled patients.¹⁷ UPMC Health Plan also has offered health management coaching programs to its members since 2008 as part of a robust health engagement platform.¹⁸ Early engagement efforts consisted of Health Plan-initiated calls to members based on health risk assessments and medical and/or pharmacy claims. When contacted, members are offered telephonic coaching sessions to develop competencies in relevant behaviors. Internal program evaluations for lifestyle coaching confirmed effectiveness in improving health behaviors (eg, tobacco cessation, weight loss) with the highest impact associated with program completion (unpublished data, UPMC, 2011).

In 2009, UPMC Health Plan partnered with an urban, academically based PCMH site to increase provider awareness of the Plan’s health coaching programs. The practice was composed of 56 internal medicine physicians and 61 medical residents, who provided services to 10 000 Plan members. Practice staff and providers were given information about lifestyle coaching programs and encouraged to refer Health Plan patients. The name Prescription for Wellness was used to help convey the process and role of the physician.

The first 2 years of this pilot demonstrated an increase in provider referrals to health coaching, and program participation and outcome rates comparable to other referral methods. However, the process relied on manual handoffs and was not scalable to other sites. Thus, in 2011 a UPMC Lean Six Sigma student selected Prescription for Wellness for her class experience. The Six Sigma project spanned a period of 3 years and was conducted in phases (Table 1). The objectives of the Lean Six Sigma project were to

1. Increase process efficiencies so that the approach could be expanded to other UPMC practices
2. Improve outcomes via greater patient reach, participation, and, ultimately, behavioral change success rates

The vision was to replicate best practices from Prescription for Health to “super-charge” patient engagement and health outcomes by leveraging the motivational power of the physician to increase use of Health Plan coaching programs, and to support practice staff who might otherwise struggle to find follow-up support for patients in their behavior change efforts.

Methods

Each year, UPMC Health Plan offers a Lean Six Sigma training program to qualified employees. Lean manufacturing and Six Sigma are widely used in the field of quality and performance management.¹⁹⁻²¹ Lean Six Sigma combines Six Sigma’s 5-step DMAIC (*Define, Measure, Analyze, Improve and Control*) method of process improvement with tools from Lean for reducing waste, increasing speed, and decreasing variation.²² With the availability of this quality improvement framework and support, the study team initiated the DMAIC methodology to evaluate the existing pilot and identify a path forward for UPMC Prescription for Wellness.

Define

The study team conducted clinic visits, interviews, and focus groups to define current state. An interdisciplinary team was assembled to include the practice administrator, physician champion, practice nurse manager, on-site PBCM, health coach, training and quality team, and health plan informatics staff.

Table 2. Prescription for Wellness Education Pilot Provider Survey “Voice of the Customer.”

Indicate how important the following factors are in determining whether you discuss healthy lifestyle changes with patients. Healthy lifestyle changes include quitting smoking, losing weight, changing eating habits, managing stress, or increasing physical activity.

N = 19 physicians, physician assistants, residents, certified registered nurse practitioners

Factor	Average Rating (1 = Not Very Important; 10 = Very Important)
Time available to spend with patient	9.2
Availability of resources or programs to offer assistance to patients	8.2
My knowledge and skills about the topic	7.7
Patient interest in discussing the topic	7.5
Belief that it will influence the patient's behavior	7.5
How well it fits into my daily routine	6.1
Reimbursement/payment opportunity	3.5

The Education Pilot process relied on the on-site PBCM, who had access to the office electronic medical record (EMR) and to the separate Health Plan Care Management System (HPCMS). When a physician entered an order, the PBCM received an EMR message, then logged in to the HPCMS and created a message for the health coach. The health coach would attempt to reach the patient and offer the coaching programs.

The study team assessed provider health behavior counseling practices using an emailed survey endorsed by the physician practice leader. Survey results (Table 2) indicated the greatest barriers to engaging patients were time, resource availability, physician skills, and the patient's perceived desire to change. Reimbursement and payment were rated lower relative to other barriers.

Measure

Next the study team defined and gathered process and outcome measurements.

The process measures were the following:

1. *Cycle time*: The number of days from the physician order to the health coach reaching the patient. A defect was defined as >7 days to reach the patient. This was selected because of delays in relaying the physician order to the health coach, given the manual nature of the process and its dependence on a single staff member. The study team suspected high variability in this process would impact how a patient responded to the order.
2. *Percent of referrals unable to reach/reached*: A defect was defined as unable to reach patient because an order could not be fulfilled if the health coach could not speak to the patient.

3. *Percent of patients reached who declined/participated*: Measured only for patients reached. The study team agreed that if a patient agreed to receive information or an intervention, this was a success; therefore, a defect was a patient declining any of the options available.

The outcome measures were the following: There was not a single measure of health improvement for all patients. Therefore, the study team selected measures available for patients who agreed to enroll in 2 specific behavioral program areas:

1. *Tobacco cessation rate*: Relevant for members who were enrolled in a health coaching program focused on quitting smoking.
2. *Weight loss ≥5%*: Relevant for patients enrolled in a health coaching program focused on weight management.

Analyze

The Six Sigma iterative funnel framework (Figure 1) was used to narrow the list of possible interventions, after which stakeholders were engaged to help rank them based on the following criteria:

1. *Impact on physician behavior*: How much does the item impact the actions of the physician?
2. *Impact on patient behavior change*: How much does the item impact the actions of the patient?
3. *Impact on measurement ability*: How much does the item impact the ability to monitor and evaluate the process?
4. *Impact on scalability/efficiency*: Does the item increase the efficiency of the process? Could it be done in any practice?

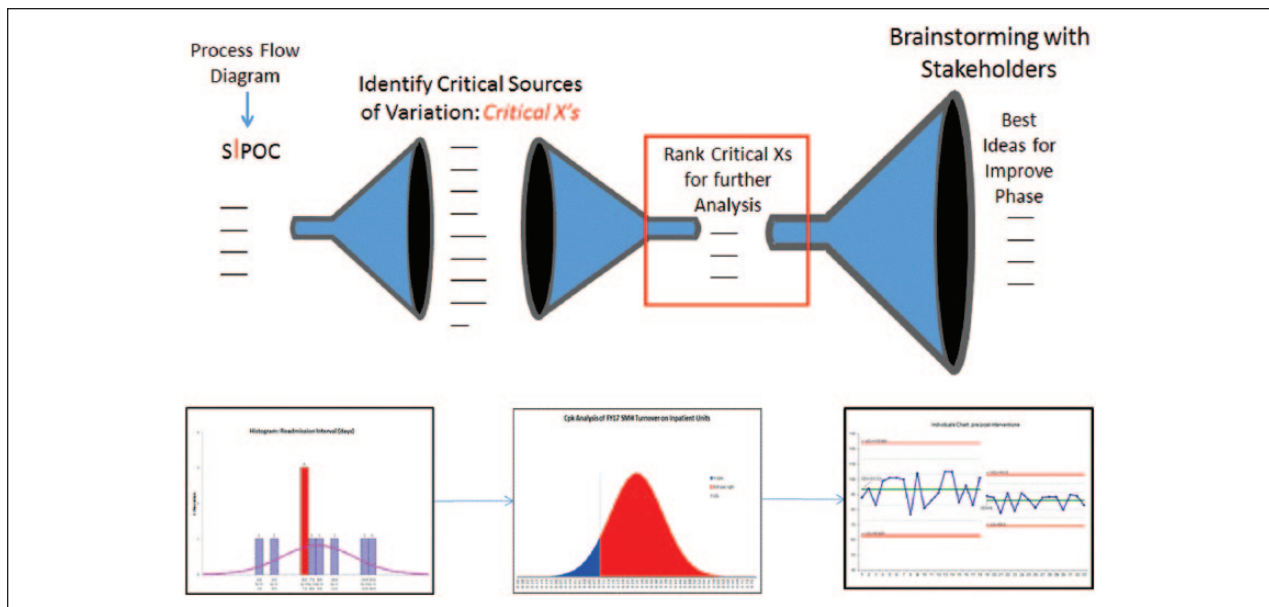


Figure 1. The Six Sigma iterative funnel model for identifying improvements.

The iterative funnel is used to prioritize improvements most likely to yield the desired process and outcome measures. It depicts the process of discovery that explores many sources of variation to determine those most critical. That path is interdependent with data analysis: one may identify new data sources with analysis; conversely, through data evaluation one may reveal unknown sources of variation. Finally, ranking the critical sources of variation (ie, the “Critical Xs”) leads to root cause analysis and brainstorming of interventions with the guidance of project stakeholders.

SIPOC, Suppliers, Inputs, Process, Outcomes, Customers.

Improve

The result of this step was the following prioritized list of interventions:

People, Process, and Technology Interventions:

1. *(Phase 1) Health Coach Training*—Implemented May 2012: To decrease variability, the study team identified specific call strategies and outlined a quality assurance checklist, and the quality review team conducted call audits and provided feedback to staff.
2. *(Phase 1) Modify EMR order*—Implemented November 2012: The study team updated the order to “medicalize” the intervention: emphasizing that the physician is *prescribing* as part of the treatment plan, and that the patient was expected to follow up. The following options were added: a follow-up plan, patient instructions, health coach FAQs, and a way to access the order from existing alerts for tobacco users and overweight patients.
3. *(Phase 1) Physician and Practice Staff Training*—Completed November/December 2012: The study team provided role clarification and scripting and emphasized the team approach with the physician

at the hub, consistent with the published consensus lifestyle medicine competencies.²

4. *(Phase 2) Build Technology Bridge*—Implemented May 2014: A technical interface between the office EMR and HPCMS removed 2 steps from the original workflow. This enhancement also removed the prerequisite for a participating site to have a care manager—the limitation for scaling to other sites. (Note: This was the highest ranked intervention; however, other organization technology projects were more urgent. This real-world constraint led to a time line gap of approximately 16 months between the “people and process” and “technology” interventions.)
5. *(Phase 2) Expand Program Offerings*—Implemented June 2014: The electronic order set was expanded to include condition management and behavioral health.

Results

The cycle time from physician order to health coach–patient telephonic contact was observed throughout the project. After Phase 1 (Interventions 1, 2, and 3), the cycle time measurements demonstrated no statistically significant difference in mean time from order to reach

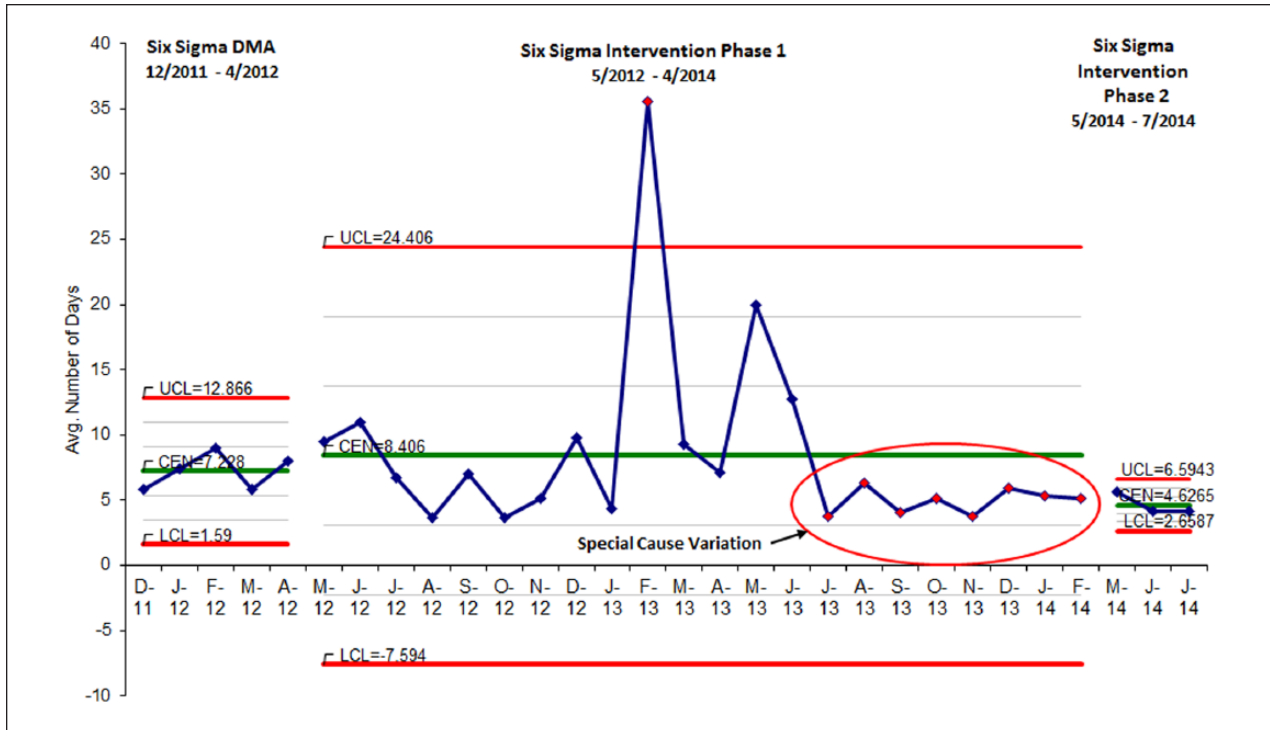


Figure 2. Prescription for Wellness Six Sigma process control chart: average days from physician order (“order”) to patient reached by telephone for health “coaching (“reach”), by project phase. Individuals Chart or a type of a statistical process control chart that isolates the data points for the Six Sigma DMA period, and Phase I and Phase 2 of the Six Sigma Intervention Periods. The upper control limit (UCL) and lower control limit (LCL) lines indicate ± 3 standard deviations around the mean (CEN). The individual data points circled indicate special cause variation, which is automatically determined by rules embedded in the software. The comparison of Phase I with the DMA phase, as well as a comparison of Phase I to Phase 2 indicates no significant differences for the mean of cycle times (Order to Reach Days) between these tests of change. The comparison of means pre/post baseline data was determined by a t test matrix (Statistical Software is SPCXL 2d010). Further analysis was provided by a test of proportions that is used for “discrete” data that represent counts of process measures. Note that there is a gap in data for March and April 2014. This was a real-world limitation because of the resources required to sustain the monitoring for the “old process.” As the organization prepared for the implementation of the technology integration, measurement was discontinued for a short time with the knowledge that the “new process” was soon to be implemented. The automated nature of the new process allowed for the identification of these data points much more efficiently and so measurement was resumed in May 2014. DMA, Define, Measure, Analyze.

(Figure 2). A series of special cause variations was observed (demonstrated by 8 consecutive points below the mean) from July 2013 to February 2014. A possible cause for this was a new PBCM and an additional supervisor assigned to the site in summer 2013. It is impossible to know how long this improvement may have been sustained. The installation of a technology solution remained critical in enabling UPMC to extend the program to other practices.

In Phase 2 (after implementing Intervention 4, the technology bridge), the study team observed a significant decrease in the mean Order to Reach Days as compared to the DMA phase (Figure 2). This reduction was both statistically significant ($P = .027$) and “clinically significant” as the team had previously observed a correlation between patient participation and Order to Reach days < 7 .

Participation and reach rates were measured using data from the HPCMS. Although the defects in the process were measured (patients who were not reached or who declined), the positive rate was reported, as it was less confusing to stakeholders (Table 3). The findings included the following:

1. Participation Rate significantly increased between DMA and Phase 1 ($P = .012$).
2. Participation Rate significantly decreased between Phase 1 and Phase 2 ($n = 69$ in Phase 2; $P = .001$).

To further delineate the impact on behavioral outcomes 2 questions were evaluated: Did the Six Sigma project increase the success rates at the pilot practice? How did Prescription for Wellness compare to what was

Table 3. Prescription for Wellness Patients Reached and Agreed to Participate in Health Coaching, by Six Sigma Phase.

Six Sigma Phase	Patients Reached/Patients Physician Ordered (N/N) (%)	Agreed to Participate/Patients Reached (N/N) (%)
DMA Phase	92/134 (69)	61/92 (66)
Intervention Phase 1	332/511 (65)	262/332 (79) ^a
Intervention Phase 2	69/98 (70)	42/69 (61) ^a

Abbreviation: DMA, Define, Measure, Analyze.

^aPairwise comparisons showed that Phase 1 and Phase 2 differed significantly ($P = 0.001$) from the previous phase for participation.

observed in UPMC's usual "book of business" and in the industry?

An analysis of the successful outcomes for patients referred in Six Sigma Phase 1 versus those referred in the Education pilot was conducted. Outcomes (recorded weight; reported tobacco use status) were obtained from the medical record with an entry up to 12 months after the Prescription for Wellness order. Findings included the following:

- Twice as many members quit smoking (26.1%) during the Six Sigma Phase 1 period compared to the Education Pilot (14%); however, this was not statistically significant (adjusted Cox $P = .18$).
- There was no significant difference in the proportion of members who lost 5% or more body weight between the Education Pilot (38.6%) and Six Sigma Phase 1 (35.5%).
- *Thus, the only measured difference in this analysis was not statistically significant.*

Next, the study team reviewed the 2010-2014 success rates reported internally for all weight management and tobacco cessation programs, regardless of referral source. These measures were obtained by self-report during a telephonic session conducted at 30, 90, or 180 days after the program and documented by the health coach in the HPCMS. Success was defined as: tobacco abstinence or losing 5% or more of initial body weight.

- Quit rates for tobacco cessation coaching were between 5.4% and 19.9%, with decreasing success rates with time elapsed from quit date.
- Success rates for enrollees in weight management coaching ranged between 32.6% and 45.8%, with higher success rates as time elapsed from program end.
- *Thus, Six Sigma Phase 1 results demonstrated a higher tobacco cessation rate than usual Health Plan business and a similar weight loss success rate.*

The peer-reviewed literature was evaluated to identify benchmark outcomes for similar work that included

physician initiation, health coach support, and for tobacco cessation, access to appropriate pharmaceutical options. Two studies^{23,24} were identified that were selected as benchmarks (to date, 2013). Smith et al²³ reported 8-week tobacco quit rates of 27% to 45%, depending on the medication regimen used. Appel et al²⁴ reported 46% to 53% of participants with a weight loss of 5% or more of body weight at 6-month follow-up.

The Provider Survey was not repeated as part of the project. However, anecdotal feedback from physicians, office staff, and health coaches shared that the innovations led to a sense of greater engagement, professional satisfaction, and clinical impact.

Discussion

After a 3-month proof-of-concept period of the technology-assisted workflow at the pilot site, the study team evaluated readiness to expand Prescription for Wellness to other practices by reflecting on the objectives.

First, the technology integration made a cumbersome and manual process more efficient and enabled the potential expansion to other UPMC practices.

The team was less confident about the results for patient engagement and behavior change. However, these are challenging points of measurement, with several limitations, that will be summarized. There were relatively stable patient engagement and behavioral outcomes on par with similar inputs in the UPMC book-of-business, and in published literature to date.^{23,24} With the demonstration of scalability and potential impact to population health presented, UPMC leadership embraced system-wide expansion of the pilot in August 2014. Expansion was a critical step toward further reiteration and improvement based on stakeholder feedback and data monitoring and evaluation. UPMC is currently conducting a comprehensive review of the outcomes and a controlled study of Prescription for Wellness.

Limitations to interpretation of results include the following:

- Patient response to health coaching is sensitive to variables that were not controlled as part of this project, including employer incentives and

seasonality. Phase 2 data span a period of only 3 months, and occurs during the summer, which tends to demonstrate a decrease in participation. The decrease in Phase 2 participation rates is consistent with other health coach participation rates during this same interval in 2014. Analysis of whether these changes were part of an ordinary trend line or if there was special cause variation at this site was outside the scope of the Six Sigma project.

- This study was performed in real time, over several years and in multiple phases. Therefore, formal sample and effect sizes were not calculated before or during the study.
- The evaluation of behavioral outcomes versus the pilot phase was conducted prior to the Phase 2 (technology bridge) implementation. A similar comparison for Phase 2 was not conducted because of the small sample size during this period. Six Sigma Phase 2 ended after 3 months because of the decision to expand to additional sites and to deploy additional interventions. It is expected that this enhancement and the associated improvements may continue to lead to an upward trend in results.

The study team believes this case study provides useful lessons that can have applications in a variety of practice settings. Although the work reported here was conducted in primary care, Prescription for Wellness is applicable to all physicians and practices, regardless of specialty. This case study, using a Lean Six Sigma approach, produced a high-value, key stakeholder-owned, system-wide innovation addressing a major challenge in health care. Since 1998 when Mark Chassin asked if health care is ready for Six Sigma quality,²⁵ more care providers have begun to experiment with methods such as Lean Six Sigma to standardize their quality improvement efforts. Concepts such as high reliability, robust process improvement, and consistent performance, although initially with a great emphasis on patient safety, have important applications for other health care activities, such as clinical transformation and population health.²⁶

The study team found the stepwise Lean Six Sigma DMAIC model to be simple enough to lend itself to problem solving at any level. It helps focus resources and attention on the right problems and uses data to identify and evaluate if the interventions have made an impact. The team shares these stepwise methods here in the hope that it may inspire others to tackle a challenge in their own practice. The team echoes the thoughts shared by Cohen et al in 2005, that embracing a quality improvement mind-set “espouses the belief that all primary care practices can do something now to help their patients be healthier.”²⁷

At the same time, during this quality improvement journey, the study team often thought of the adage, “Perfection is the enemy of the good.” Although the aspirations were certainly for exponential improvements in health outcomes, the team recognized when it had created a scalable and impactful process that was as good as and, in major ways, better than the existing coaching and engagement practices for patients, physicians, and staff. The Lean Six Sigma framework helped drive these efforts; yet the pursuit of defect-free results did not deter the movement forward, while actively striving for continued improvement.

A few lessons were learned from this experience that were particularly poignant and may be useful to others exploring the use of quality improvement in clinical transformation and population health.

First, the final stage of the Six Sigma project is *control*. This step requires a plan to outline processes for maintaining improvements. The study team’s efforts for this step included the following:

- Defining defects in the new process, methods for detection, and a plan to address them
- Mentoring and training health coach leaders to perform ongoing quality reviews and auditing
- Identifying and retaining multiple executive and physician sponsors
- Clarifying organizational ownership and daily operations oversight

The ability to move beyond a pilot project to a sustainable initiative rested heavily on this attention to process controls. A robust plan for sustainability is critical for successful long-term results in practice redesign, as highlighted in 2005 by those reflecting on the second round of Prescription for Health trials.^{3,27}

Second, consistent with some of the Prescription for Health demonstrations,^{4,5} the effort demonstrated the value of technology for timely communication and integration in usual workflow. In retrospect, the delay allowed the team to fully understand the requirements and to build the technology to support them. Too often, a premature technical solution is introduced and then workflows are constructed around it. However, if the technology solution is not well designed or iteratively tested, then the technology does not translate to behavior change for providers or patients. Additionally, implementing a solution without a thorough understanding of the problem also will result in many other costs of poor quality—wasted resources, loss of customer (in this case physician and office staff) confidence and satisfaction, errors, and lost opportunities to make an impact on patient health and care.

Third, it is relevant to note that reimbursement was ranked low as a barrier to behavior counseling relative to

other items. This is contrary to the belief that if services of this nature are paid for, they will be provided. This work, as well as the Prescription for Health efforts, demonstrate that redesigning processes in ambulatory care to address health behavior change is complex, but that when resources and systems are aligned, physicians are willing to refer patients to resources for support. Although reimbursement models aligned with lifestyle medicine will certainly help drive care in the right direction, it will not be sufficient to transform practice.

Finally, the importance of leadership at all levels to the ongoing success of these efforts must be acknowledged. This experience suggests that quality improvement may be less about the training or the tools, and rather more about the willingness of leaders and teams to approach health care challenges with an open mind, make decisions based on evidence, and use a systematic approach to manage and lead change.

Conclusion

The UPMC Prescription for Wellness journey reinforces the potential for quality improvement in health care using a Lean Six Sigma framework. Using a proven methodology to address people, process, and technology suggests a path forward as health systems strive to mobilize physicians and practices in the work of supporting patient health behavior change. This project set the stage for ongoing work throughout Western Pennsylvania in the UPMC network. As of April 2017, more than 12 000 patients have received prescriptions from more than 800 physicians.

As more health care systems embrace population health and lifestyle medicine,^{2,28} models of innovation will be key. This quality improvement case study can serve as a solid platform for progress, taking us all one step closer to addressing chronic disease and achieving the Quadruple Aim. Our patients deserve no less than this ongoing effort.

Authors' Note

The Standards for Quality Improvement Reporting Excellence (SQUIRE) were used as guidelines for preparing this manuscript.²⁹

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Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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