Model for Improvement - Part 1: A Framework for Health Care Quality

Cheryl D. Courtlandt, MD, FAAP[a,b,c,*], Laura Noonan, MD, FAAP[a,b,d], Leonard G. Feld, MD, PhD, MMM, FAAP[b,e]

KEYWORDS

• Quality Improvement • PDSA cycle • Model for improvement • Healthcare improvement • Pediatric quality

Health care expenditures represent a staggering portion of the United States government spending.[1] Competitive pressures and scarce resources are forcing health care organizations to reduce costs, eliminate waste, increase productivity, and ensure patient safety.[2] Continuous quality improvement is an imperative mandate for the success of health care organizations.[3] The use of formal improvement strategies is new to health care but has a long history in industry especially manufacturing. Industrial improvement initiatives were oriented toward decreasing waste, increasing efficiency, eliminating duplication and creating opportunities for expansion in industry or increasing market share.

The earliest industrial quality improvement efforts were pioneered by Joseph Juran, W. Edward Deming, and Philip Crosby.[4–6] Juran's theory[4–6] postulated the concept of fitness for use. This approach built interdisciplinary teams using various diagnostic tools to understand why certain manufacturing processes produced products that are unusable. His theories focused on determining the causes of inferior production and using that information or set of circumstances to decrease production of substandard product. A theory proposed by Philip Crosby,[6] defined quality in terms of

[a] Division of General Pediatrics, Department of Pediatrics, Levine Children's Hospital at Carolinas Medical Center, P.O. Box 32861, Charlotte, NC 28232-2861, USA
[b] Center for Advancing Pediatric Excellence, Department of Pediatrics, Levine Children's Hospital at Carolinas Medical Center, P.O. Box 32861, Charlotte, NC 28232-2861, USA
[c] Asthma Program, Levine Children's Hospital at Carolinas Medical Center, P.O. Box 32861, Charlotte, NC 28232-2861, USA
[d] Area Health Education Center, P.O. Box 32861, Charlotte, NC 28232-2861, USA
[e] Department of Pediatrics, Levine Children's Hospital at Carolinas Medical Center, P.O. Box 32861, Charlotte, NC 28232, USA
* Corresponding author. Division of General Pediatrics, Levine Children's Hospital at Carolinas Medical Center, P.O. Box 32861, Charlotte, NC 28232-2861.
E-mail address: cheryl.courtlandt@carolinashealthcare.org (C.D. Courtlandt).

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performance, a quality performance produces zero defects. If defects are produced, these defects increase the cost of production or delivery of service and impacted on profit margin or consumer safety.

Deming[5,7] made key contributions by outlining a framework of knowledge necessary for the application of the science of improvement. Deming's theory focused on four components: an appreciation of a ''system,'' understanding variation, acquisition of knowledge, and the knowledge of psychology. These factors and their interaction represent the cornerstone of improvement science. All improvement theories include the following concepts: commitment of the organization to quality; focus on the customer or consumer; modification of systems, not people; ability to foster teamwork; and encouraging group problem solving. Using improvement science, decisions are made based on objective not subjective information.

The effectiveness of these improvement methods in manufacturing was acknowledged by health care management. Twenty years ago, the Institute for Healthcare Improvement (IHI) launched its first project called ''The National Demonstration Project on Quality Improvement in Healthcare'' which explored the application of modern quality improvement methods to health care.[8] In 1990, the landmark book *Curing Healthcare*,[8] introduced the concept of creating a culture of continuous quality improvement in health care. *Crossing the Quality Chasm*, published in 2001 by the Institute of Medicine, defined six aims of health care quality. These quality indicators recommended that patient care should be timely, effective, efficient, patient centered, safe, and equitable.[2] Even though the health care industry has made strides in improving quality of health care, major gaps persist in performance of health care systems and these gaps represent significant risk to patient safety.[9]

Currently, the focal point of quality improvement in health care has shifted from institutions to include individual providers. The question is often asked, ''What is quality?'' ''How is it measured?'' Health care providers are expected to assess and improve their patients' outcomes but lack training in quality improvement and limits their ability to fully implement quality initiatives.[10,11] Future trends in health care delivery will require practitioners to participate in continuous quality improvement as part of their daily practice. Acquisition of this skill set will become as important as the underlying medical knowledge used to diagnose and treat disease.[12] The process of quality improvement requires careful planning, thorough documentation, consistent analysis, and openmindedness to results. Fortunately, there are methods and tools to assist the practitioner in the development of quality improvement skills.[13]

THE MODEL FOR IMPROVEMENT

All methodology of quality improvement is based on the same underlying theories of improvement science.[4–6,13] Associates in Process Improvement (API) developed the Model for Improvement in 1996[13] to illustrate how to facilitate change. The Model for Improvement is an effective and easily understood method that can be implemented by either large health care systems or a small office practice. This model uses methodology that produces specific, measurable results. The IHI and other leading health care quality improvement organizations utilize the Model for Improvement to advance health care quality projects (**Fig. 1**).

In any complex system, change can be difficult to accomplish; incorporation of several key elements is necessary to produce system change.[13]

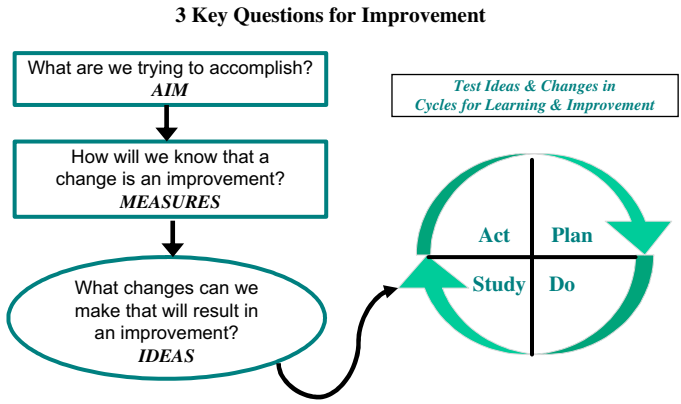

Fig. 1. Model for improvement. (*Data from* Langley G, Nolan K, Nolan T, et al. The improvement guide: a practical approach to enhancing organizational performance. San Francisco (CA): Jossey-Bass Pub; 1996.)

Key elements to system change

1) The *will* to do whatever it takes to make a change to a system
2) The *ideas* on which to base the design of the new system
3) The *execution* of the changes to the system.

The Model Asks Three Fundamental Questions

What are we trying to accomplish?

The Aim statement is a written statement of the *expected* or *anticipated* accomplishments from an improvement effort (**Box 1**). The key components include: a general description of the Aim, a clear description of what is trying to be accomplished, the rationale and importance of the effort, some guidance for executing the work, specifying the target population, establishing a time period for the project, and setting measurable goals.

An Aim statement captures early decisions, aligns the team, communicates with others and acts as a touchstone throughout an improvement project. This document is key to successful projects, many projects fail due to flaws in the Aim statement. The goals included in the Aim statement should be measurable, numeric and preferable absolute rather than relative. Attaining the goals should be a stretch, achievable not impossible, not business as usual.[13,14]

How will we know if a change is an improvement?

"*All improvement is change but not all change is an improvement*" (**Box 1**).[13] "How will we know that a change is an improvement?" is a question often asked during the improvement process. To adequately assess change, three types of measures are used in improvement science: outcome, process, and balancing measures.[13] *Outcome* measures are global measures, directed related to the Aim statement. In the ideal scenario, they reflect the desired outcome of the improvement effort. Process or intermediate measures are related to key changes to be implemented during the improvement effort. A process measure evaluates the interval change or steps to attain the outcome of the improvement effort. These measures are usually proximal to the overall outcome. Balancing measures are used to evaluate if a change is

Box 1
Key questions for improvement

Model for Improvement

Question 1: What are we trying to accomplish?

Aim: A specific, measurable, time-sensitive statement of expected or anticipated results of an improvement process.

A strong clear Aim statement gives direction to improvement efforts and is characterized by the following:

- Intentional, deliberate, planned
- Unambiguous, specific, concrete
- Aligned with other organizational goals or strategic initiatives
- Agreed upon and supported by those involved in the improvement project and leadership

Include:

- A general description of the Aim - should answer, "What are we trying to accomplish?"
- Rationale/importance
- Specify target population and time period
- Measurable goals

Question 2: How will we know that a change is an improvement?

Measures: measures are indicators of change.

These measures can also be used to monitor a system's performance over time. Project measures should:

- Be directly linked to Aims and goals
- Seek usefulness over perfection.
- Be integrated into daily work whenever possible.
- Be graphically and visibly displayed, usually as run charts.
- Include outcome, process, and balancing measures.

Note these system or project measures are not the same as the "study" measures for PDSA cycles described below.

Question 3: What changes can we make that will result in an improvement?

Ideas: Ideas for change or *change concepts* to be tested in a P-D-S-A cycles can be adapted from:

- Evidence - results of research/science
- Critical thinking or observation of the current system
- Creative thinking and extrapolations from other situations

When selecting ideas to test, consider the following:

- Direct link to the Aim
- Likely impact of the change (avoid low-impact changes.)
- Potential for learning and adding to knowledge base

- Feasibility
- Logical sequencing
- Series of tests that will build on one another
- Scale of the test (cycle of one)
- Shortness of the cycle (1 day or week NOT 1 month)

causing unexpected effects. Change can improve one part of a system but undermine another. The most skeptical person of a group is a source for balancing measures, often they outline credible reasons why a particular project will fail or why certain goals are impossible.[14]

The optimal measure set includes four to eight measures; at least one should be a balancing measure. All of the measures must be aligned with the Aim statement. The most successful improvement projects have measures that are easily collected and improvement can be shown quickly.[14,15] Methods for data collection should be simple and easily integrated into daily work. The results of any improvement efforts should be displayed graphically over time through the use of simple run charts. A run chart shows a pattern or trend over time. These charts should be annotated to show implementation of a change, explain a result or note an unusual circumstance[16,17] (**Fig. 2**). Additional information on measurement for quality improvement can be found in the article by Randolph and colleagues found elsewhere in this issue.

What changes can we make that will result in an improvement?

The Model for Improvement permits testing of ideas or changes or implementing change concepts that have worked in other settings (**Box 1**). Change concepts are general approaches to change, the rationale is to generate specific ideas to test.[13] These concepts may be feasible and effective in one setting but may need adaptation to a new setting. Change concepts need to be altered to fit the existing culture, resources, or institutional goals. Ideally, a change concept initially is a vague or innovative strategic idea that is further whittled down to a specific actionable idea or change that can be tested.[13]

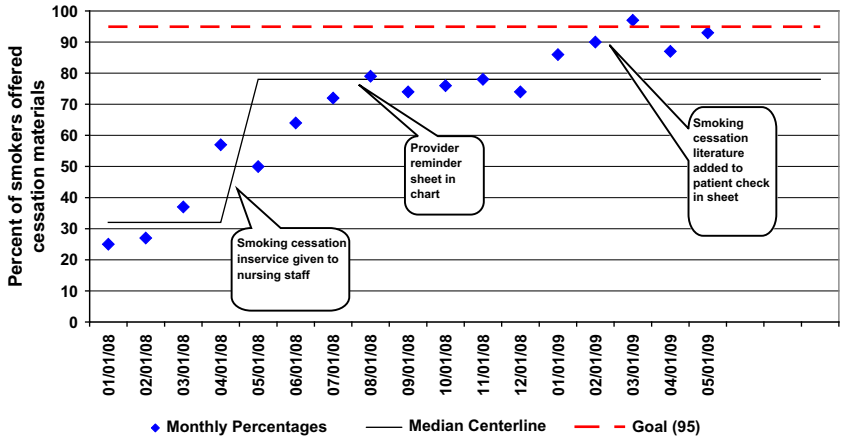

Fig. 2. Example of Run chart: Caregivers that smoke offerred Smoking Cessation.

Another method to support change is a *change package*. A change package is a group or set of changes that through evidence-based study can affect a particular outcome. For example, the of use asthma action plans, the use of inhaled corticosteroids in moderate asthma, and having an identified primary care provider/pediatric medical home are elements of an asthma care change package. These items used as a group, have been shown to produce improvement of asthma care in some health care settings.

Using Plan-Do-Study-Act Cycles to Test an Idea or Change

Walter Shewart, in 1924, penned a one-page memo outlining his idea of quality processes.[18] From his work came the PDCA cycle, later referred to as the PDSA cycle. The plan-do-study-act cycle (PDSA cycle) is a short rapid cycle used to test an idea or a change (**Fig. 3**).

The P phase

The objective for the learning should be stated with clear assumptions. All details of the plan serve as documentation for the implementation of subsequent phases.

The D phase

The data collection phase indicates the collection process, any barriers to the process or unexpected occurrences that may affect the interpretation of the data.

The S phase

During this phase, data are studied and interpreted. The analysis is then compared with the initial predictions or assumptions. Data should be displayed in a run chart or Pareto chart. (A Pareto chart is a bar graph reflecting the frequency of occurrence, illustrating the predominance of a specific cause.) PDSA cycles may use either qualitative or qualitative data. This phase should review the data collection instrument, its use, and ease of collection. The data are specific to the cycle and end with the cycle.

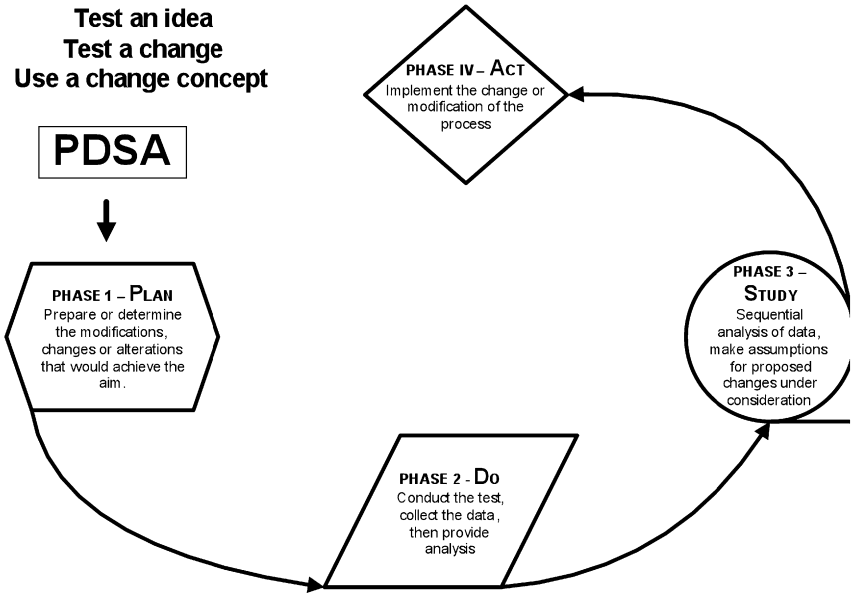

Fig. 3. PDSA cycle.

The A phase

The last step in the cycle, analyzing the data collected to attain new learning or knowledge, addresses required changes in the testing process and poses additional questions to be answered before implementing a change.

PDSA cycles assist improvement teams in adapting good ideas to their specific situation. When used appropriately, PDSA cycles force small-scale thinking. The PDSA cycle promotes detailed stepwise thinking, allows for making predictions, forces thoughtful deliberation on the increased knowledge, and subsequently facilitates change. Use of small-scale change can cause rapid adaptation and implementation of change in various health care settings (**Fig. 3**).[13,14,18]

CASE STUDY

Super Smart Pediatrics is a suburban practice, with a diverse patient base, that includes numerous insurance plans. The practice has 7 full-time doctors, 3 part-time doctors, several midlevel providers, 10 nurses, and 15 front office and medical record staff. The practice has grown significantly over the past 15 years and currently serves 15,000 patients.

The practice manger of Super Smart Pediatrics noted that recently there were more complaints from office staff, practice providers, and patients. During a casual discussion with the practice manager, one of the partners revealed her frustration with working harder and harder, and feeling overwhelmed especially by patients with chronic diseases. She felt there was never enough time to address all the necessary patient issues. Her partners treated illnesses in different fashions leading to confusion among patients. In addition, the number of new patients enrolling in the practice had decreased over the past 2 years and two neighboring practices were growing and adding additional staff.

After several discussions with other staff members, Super Smart Pediatrics' employees and partners realized many of them were concerned with the direction of the practice. Two of the partners and the office manager visited several other practices and had some frank discussions with their colleagues. They observed different approaches that were successful in other offices but were unsure where to begin.

Fortunately, the practice manger had kept a log of all the complaints from the previous year, he was able to divide the complaints into three categories: Office Efficiency, Staff Efficiency, and Provider Efficiency. The Pareto chart in **Fig. 4** illustrates the data.

The office manager used a Pareto chart (www.lchcape.org) and displayed the complaint data for discussion at the staff meeting. The providers and staff of the Super Smart Pediatrics were surprised by the data and requested an examination of potential causes for the relatively large proportion of complaints regarding provider efficiency. The practice manager conducted a simple three-question survey to assess of the causes of provider inefficiency. The survey was given to providers, staff, and patients over 5 days at three different times. The results are displayed in the Pareto chart in **Fig. 5**.

Identifying the Problem

Super Smart Pediatrics identified a problem through frustration and job dissatisfaction of a partner and office manager. Identification of a concern, problem, or deficiency may come from various sources. Sources may include the work environment, recurring problems or a special interest of the staff. Strategic thinking will identify projects that are sensible and feasible for a particular group, practice, or organization. A focus may be suggested by a compelling issue on at the national, state, regional, or local level. New evidence-based practice guidelines not implemented in a particular setting are another source of quality improvement projects. Every attempt should be made to

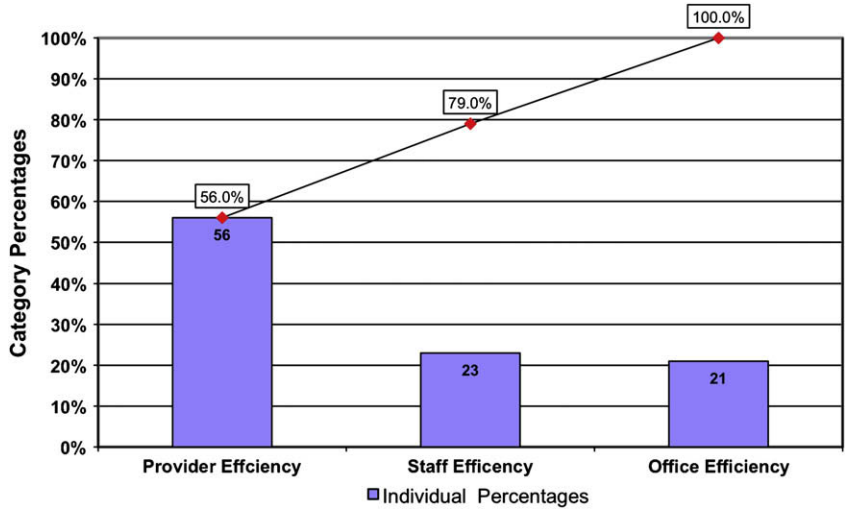

Fig. 4. Pareto Chart: complaints collected by Super Smart Pediatrics.

develop a passion factor in any improvement project, because change is difficult. Topics should attract attention or generate the necessary interest to move the project forward. Finally, external pressures on providers may be the driving force of improvement projects. For example, recently established requirements for Part IV of Maintenance of Certification are "sparking" the interest of many providers to participate in office-based quality improvement projects.[11,13–15]

Development of a Team

Case study (continued)

After several staff meetings, Super Smart Pediatrics decided to focus on provider variability. The practice decided to focus on asthma since it was the most common

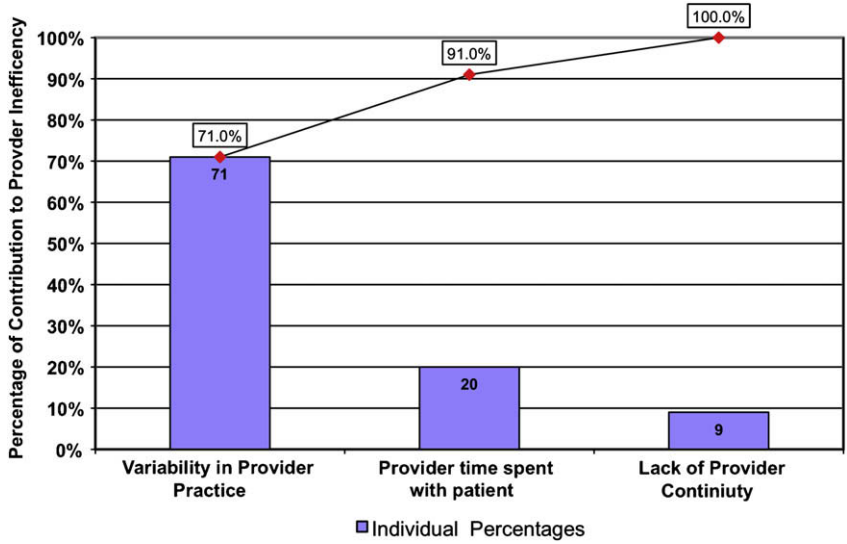

Fig. 5. Pareto Chart: causes of provider inefficiency.

chronic illness seen in the practice. The new National Asthma Education and Prevention Program (NAEPP) guidelines were not being implemented uniformly in the practice and subsequently this lead to confusion by both staff and patients. An improvement team was assembled from front office, billing, nurses, midlevel providers, and physicians. A future goal was to add an interested parent or patient.

Once a project has been identified, it is important to assemble a team because quality improvement is not a solo endeavor but a "team sport." Successful projects recruit team members from all disciplines. Several team options exist ranging from a small core group to larger groups that include all the stakeholders. The ideal size is 4 to 8 team members, as larger groups may limit ability to make decisions and move forward. Ad hoc team members may include specific content experts and allied health care professionals[19–21] (www.lchcape.org for team chart).

Using Quality Improvement Tools to Start a Project

As the project progresses, there are several useful QI tools to smooth the progress of the project. Several tools are described or illustrated in the case study and additional tools are on the Web site, www.lchcape.org. Using these tools requires practice, but once mastered accelerates the improvement effort.[22,23]

Case study (continued)

The Super Smart Pediatrics Asthma Team met twice weekly during lunch time for 30 minutes using the 7-step meeting agenda (www.lchcape.org), with a weekly report to the entire practice incorporated into the existing staff meeting.

Meetings should be incorporated into an existing scheduled meeting. Meeting frequency may limit the involvement of some group members so meetings should be focused and brief to continue momentum and interest.[19] The Aim statement developed by Super Smart Pediatrics outlines their Aim, the goals, the measures, and some ideas for initial PSDA cycles (www.lchcape.org) (**Box 2**).

Sharing the Aim statement with others not directly involved in the project often provides a new perspective on the problem. The objectives should be clear even to those not involved with the project. Feedback should be sought about goals and their measurement. It is critical that the Aim statement is reviewed by supervisors and senior leadership or practice management. Is project compelling? Is it aligned with strategic objectives of the organization or practice? A project without leadership support will be difficult to implement and impossible to sustain.[24–26]

Case study (continued)

Super Smart Pediatrics Asthma Team developed their Aim statement using existing change concepts. The Super Smart Pediatrics Asthma Team realized that identification of asthma patients in the practice was necessary for all future steps. The first PDSA cycle (PDSA Planner 1) illustrated that the providers had different criteria for the diagnosis of asthma and coded/billed differently. The team used a simple check sheet to gather data and used a Pareto chart to display the results (**Figs. 6** and **7**).

As a result of the first PDSA, the practice realized that the first step in decreasing provider variability was education and reaching a consensus.

The second PDSA cycle (PDSA Planner 2) was focused on decreasing provider variability around diagnosis and coding of asthma (**Fig. 8**).

The third PSDA cycle (PDSA Planner 3) examined ways for the office to identify patients with asthma (**Figs. 9** and **10**).

Smart Start Pediatrics was slowly identifying the patients with asthma. The team used the concept of brainstorming (www.lchcape.org) to cultivate ideas to speed the

Box 2
Super Smart Pediatrics Aim statement

Aim statement:

A specific, measurable time-sensitive statement of expected results of an improvement project

Super Smart Pediatrics will improve the care of their patients with asthma by implementing evidence-based changes to improve care. They will accomplish this by involving the entire health care team to ensure patient staff and provider satisfaction. We will accomplish this by January 2009

Goals

>90% of asthma patients will have an asthma action plan

>90% of asthma patients will receive flu vaccine

>90% of asthma patients will have an asthma flow sheet

>90% of asthma patients will have planned visits for asthma care.

Measures

Clear indicators of change, related to Aim statement.

Most useful when integrated into daily work

% of asthma patients with an asthma action plan

% of asthma patients who receive the flu vaccine

% of asthma patients with an asthma flow sheet

% of asthma patients with asthma who have planned visits

% of no-shows for planned asthma visits

Plan for data collection: Survey 20 charts every week for flu shots, action plans, flow sheets, and planned visits. Report these results in run charts

Ideas

These changes or change concepts will be the basis for PDSA cycles

Changes are based on current research or evidence

Critical observation of current system

Feasibility

Identification of patients with asthma to Implement current guidelines

Establish practice guidelines for diagnosis

Implement planned asthma visits

Implement asthma flow sheet

process. During discussions, they realized that another system problem may be part of the solution. The practice experienced a tremendous demand for flu shots that they were unable to meet during the winter and realized better planning was needed. The practice decided on a mass mailing survey to gauge patient interest in a flu shot clinic. The team added one question to the survey: ''Does your child have asthma?'' Using an informal survey to assess flu shot interest, the practice identified 658 additional patients with asthma. The total number of identified patients with asthma in the practice was similar to the 5% of the practice previously expected. The Super Smart Pediatric Asthma Team decided to trial a flow sheet for patient's charts to decrease the variation

PDSA Planner
PDSA 1
PLAN
Can Super Smart Pediatrics identify patients with asthma using billing data and the office computer?
1. Using all the billing codes can the computer identify all children, age 2 to 18 in the practice with asthma.
2. What are the various diagnosis codes used by the providers for asthma?
3. When compared to billing data will all patients with asthma be identified?

Predictions/Hypotheses
The computer will be able to identify all patients with asthma in the practice.
There are approximately 5% of the practice patients have asthma

Plan for data collection: The office manger will run a test report to identify all children age 2-18 using all of the billing codes of asthma
Pull 20 charts to verify the diagnosis of asthma
Pull 20 charts of patients that providers identify as having the diagnosis of asthma

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DO
Only 170 patients identified by office computer
16/20 charts pulled matched billing with diagnosis code
14/20 provider identified charts had a diagnosis of asthma
Wheezing, reactive airway disease and cough were alternative diagnoses.

STUDY
80% of patients were identified correctly using chart verification using diagnosis codes and billing data
A smaller than expected numbers of patients were identified using asthma billing codes
Alternative Diagnoses have been used for patients with asthma

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ACT
Patient Identification for asthma may be limited due to numerous codes used by providers.
The diagnosis of asthma varies with provider
Need to survey providers and reach a consensus on diagnosis and codes to be used
Next PDSA cycles will include surveying providers about how they make the diagnosis of asthma

Fig. 6. Super Smart Pediatrics Asthma Team PDSA Planner 1.

of asthma care received by each patient. Several of the measures from the Aim statement were readily assessable from the flow sheet (**Fig. 11**).

Initial cycles should be done on a small scale. A cycle of one can yield valuable information (**Fig. 12**).

Several cycles should be run to increase knowledge before instituting major change. Failed cycles are good learning opportunities when small (**Fig. 13**).

Super Smart Pediatrics expected to easily identify all the patients with asthma. Several PDSAs were needed to identify those patients targeted in their quality improvement project. To increase learning during a failed test, the following questions should be asked: Was the test conducted well? Does the change tested need

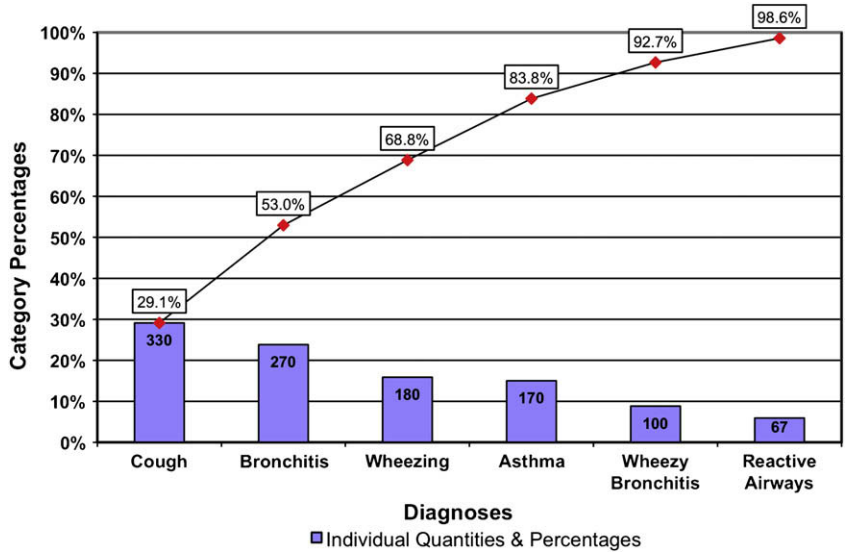

Fig. 7. Pareto Chart: diagnosis codes.

modification in our setting? Could the measures detect improvement or were they insufficient? Was the prediction or theory wrong?[13,14]

With successful tests, knowledge and learning will increase. As implementation of the change nears, testing should occur under as many conditions as possible. Prior thinking to special situations, busy times, vacations, or other factors are essential for successful change. Effective changes are made by conducting many test cycles to increase learning before implementing the changes to the entire practice or setting. After making a change a team should ask "What did we expect to happen? What did happen? Where there unintended consequences? What was the best thing about this change, the worst? What might we do next?" Reflection on the cycle is as important as the performance of the cycle. The learning and knowledge from a failed test is as important as a successful test.

After testing a change on a small scale, learning and refining from each PDSA allows for implementation on a broader scale. Implementation is the permanent change to the way work is done.[13] This step involves building the change into the system or workflow. Hardwiring change effects documentation, written policies, hiring, training, and possibly compensation. For example, testing a change may include a small number of providers using the asthma flow sheet as portrayed in PDSA 4 and 5 (**Fig. 14**). Implementation is the extension to the entire group of practitioners.

By using the Model for Improvement, health care providers can successfully identify areas that require change or improvement, set goals and determine measures, test changes and ideas using the PDSA cycle and then implementing those changes also using the PDSA cycle.

SUSTAINING CHANGE

"There will come a time when you think you are finished. That will be the beginning."

Louis L'Amour

PDSA Planner

PDSA 2

PLAN

Decrease Provider variability in the diagnosis of asthma and coding so patients can be identified and the guidelines can be better implemented

Predictions/Hypotheses

After reaching consensus, using the same diagnosis criteria and billing codes all patients the asthma in the practice will be identified.

Plan for change or test: All Providers at Super Smart Pediatrics will be reviewing the current guidelines for the diagnosis of asthma.

A local pulmonologist will consult with the practice to develop a working definition for asthma. The practice will establish specific codes to be used for billing asthma visits.

DO

Over a two week period, the providers met and established criteria for the diagnosis of asthma for the practice and some common billing codes.

Two weeks after the meeting the practice manger pulled 20 charts of patients recently seen using the new criteria and billing codes

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STUDY

Practice manager realized that several patients identified as having asthma previously were seen in the practice for other reasons and were not coded for asthma as well

19/20 patients matched diagnosis and billing codes

1/20 patients with the diagnosis of asthma did not have an appropriate code

4 patients with asthma were seen for other reasons but were not coded for asthma

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ACT

Using the established criteria >90% of patients with asthma were identified correctly

The practice manger will each month pull 20 charts to check the consistency of diagnosis and billing codes

Future questions identified for PDSA cycles

1) How will the patients not recently seen be identified as having asthma?
2) Should charts have an external method of identification so can be coded if seen for another reason?

Fig. 8. Super Smart Pediatrics Asthma Team PDSA Planner 2.

Change is difficult but sustaining change is even more complex. Once change has been implemented, there is a tendency to revert to the old system. To overcome this tendency, several sustainability strategies must be introduced. These strategies include assigning ownership, hardwiring the change into the system, periodic measurement and feedback, and involvement of senior leadership.[25]

Hardwiring sustainability into a new system is imperative. ‘‘The old way’’ has to be more difficult or inconvenient to perform. Organizations that are successful in sustaining improvement involve all staff and build the improvement-related expectations into job descriptions, evaluations, and merits. These organizations are not just focused on ‘‘the project’’ but incorporate improvement into the fabric of daily work. Concrete plans for turnover and absences, staff orientation, and training are all methods to sustain an improvement effort. Accountability is a core principle of sustaining improvement. Finally, educating patients about the improvement effort encourages staff to remain consistent and extends accountability.[14,25]

PDSA Planner

PDSA 3

PLAN

Attempt to identify patients with asthma not recently seen or seen for other reasons and mark charts.

Predictions/Hypotheses

There are too many patients in the practice for every chart to be examined if the child has asthma by the new consensus criteria therefore the practice has decided to place a blue stripe on charts when they come for well visits or sick visits for other reasons.

Plan for change or test: Upon registration of all patients the staff will ask "Does your child have asthma "if yes a blue stripe will be applied. If no, the chart will be reviewed by the nurse to see if the patients meet the practice asthma criteria. If yes, Blue stripe applied and provider notified. If provider makes a new diagnosis of asthma, a request to have chart marked with a blue stripe is made.

DO

Over a one week period, a blue stripe will be placed on every encounter form and on every chart of patients with asthma, regardless of the reason they are seen in the practice.

STUDY

Summarize data:

36 additional patients were identified with asthma using the new criteria and billing codes patients matched diagnosis and billing codes

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ACT

Additional patients were identified but small numbers. The practice manger will each month pull 20 charts to check the consistency of diagnosis and billing codes and correctly identified with blue stripes. Need to identify more patients more quickly.

Future questions identified

1) If the practice sent out letters to all patients about a flu shot clinic and listed asthma as one of the target chronic illness , how many more patients would be identified
2) Will sending out the letter to entire practice overwhelm the practice with requests for flu shots and cause dissatisfaction in other patients

Fig. 9. Super Smart Pediatrics Asthma Team PDSA Planner 3.

Ongoing measurement is vital to sustaining any improvements.[16,17] The measurement process is shifted into audit mode. Data collection should occur with a frequency to detect if the process is losing gains; depending on the project this may be monthly or weekly. Data should be openly displayed and discussed. Successes, no matter how small, should be celebrated. By showcasing the staff and their successes, a culture that is data driven will slowly emerge. These victories can be used for marketing or further accreditation. A more in-depth discussion of data during the sustainability phase of improvement is available in the article by Randolph and colleagues found elsewhere in this issue.

The final strategy for sustaining improvement is the involvement of senior leadership.[27,28] Senior leadership involvement enables a shift from a project view to a strategic vision. The creation of a shared vision is essential to sustaining improvement. ''The one-year project view,'' must be eliminated by senior management to guarantee success of any improvement project. The effort required to sustain improvement is often more than is needed to spread improvement. Sustaining and spreading of

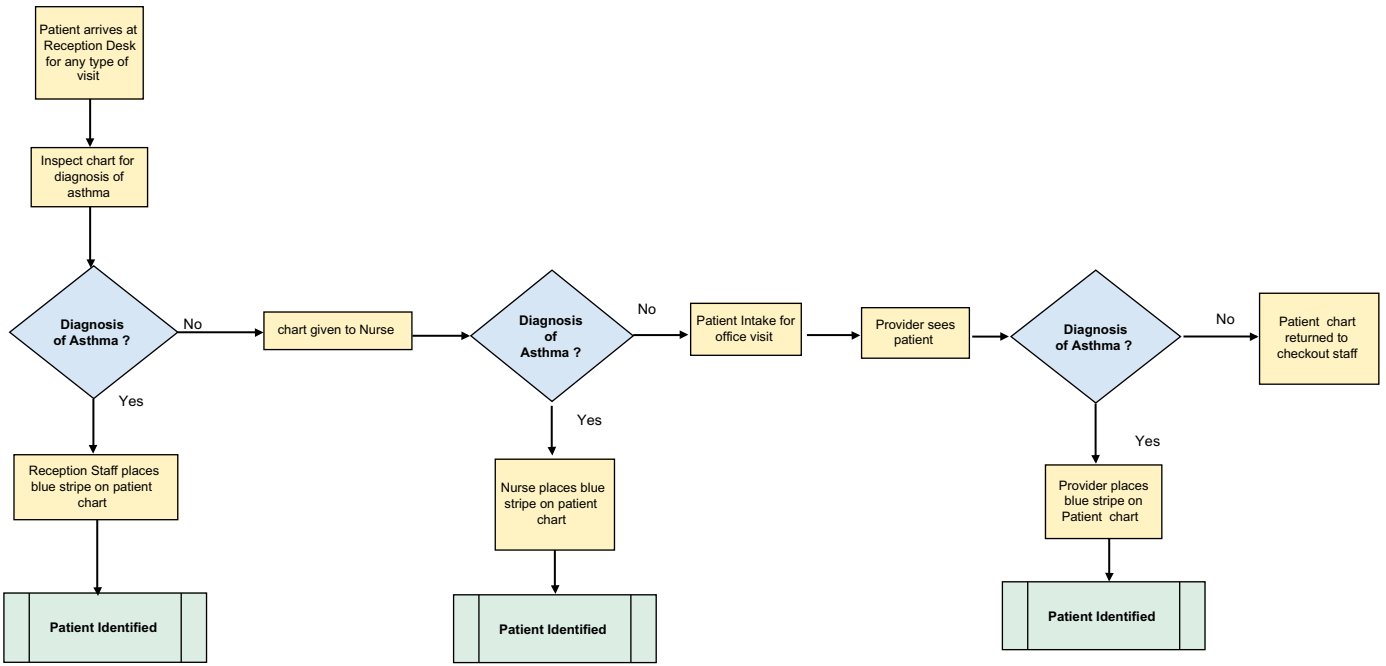

Fig. 10. Asthma Patient Identification Process flow chart.

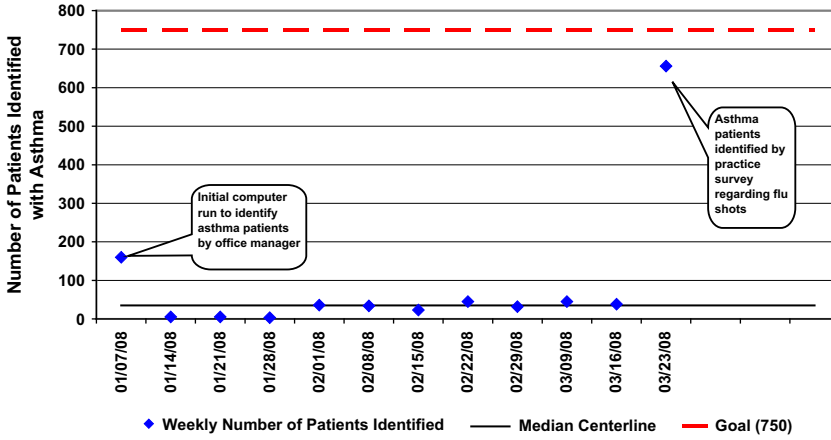

Fig. 11. Run Chart: weekly asthma patients identified.

PDSA Planner

PDSA 4
PLAN
Dr. Exceptional will use a flow sheet while seeing 3 patients for asthma follow up this week. The flow sheet is one that is currently utilized by a similar practice in the area.
Predictions/Hypotheses
Dr. Exceptional will use the flow sheet to decrease variation of asthma care

Plan for change or test: The office manger has identified 3 patients that are scheduled for asthma follow up this week. Their charts have been flagged. At registration an asthma flow sheet will be added to the chart. Dr. Exceptional and the nurse will fill out the flow sheet documenting the continued asthma care and scheduling the next appointment.

DO
Dr. Exceptional and nurse used flow sheet on 3 patients for asthma follow up. The flow sheet was lost once and had to be replaced prior to the end of the visit.

STUDY
Summarize data:
3 patients had flow sheets done, the sheet was easy to fill out but got lost once. Nurse had to go to the front desk to replace sheet.
3/3 patients had flow sheets filled out
1/3 patients had flow sheet misplaced
34 patients with asthma were also seen that week

ACT
The flow sheet worked well to collect information for asthma care but was easily lost . Nurse had to go to front desk to retrieve a lost one.
The flow sheet needs to be a different color or more easily found in the chart
Future questions identified for PDSA cycles

1) Should flow sheets be different colors ?
2) How should the flow sheet be attached ?
3) Where should the flow sheets be besides the front desk ?.

Fig. 12. Super Smart Pediatrics Asthma Team PDSA Planner 4.

PDSA Planner

PDSA 5

PLAN

Dr. Exceptional and 2 mid level providers will use the flow sheet while seeing 9 patients each for asthma follow up this week. The flow sheet will be colored white or blue or yellow. The flow sheet will be attached with a paper clip or permanently mounted or fastened to the chart. The flow sheet will located in provider and nurse work space as well as the front desk.

Predictions/Hypotheses

Dr. Exceptional and the mid level providers will use the 3 different colored flow sheet and 3 different attachments to find out the best combination

Plan for change or test: The office manger has identified 27 patients that are scheduled for asthma follow up this week. Their charts have been flagged. Different combinations of flow sheet and attachment have been assigned. At registration an asthma flow sheet will be added to the chart. Dr. Exceptional and the nurse will fill out the flow sheet documenting the continued asthma care and scheduling the next appointment.

DO

Dr. Exceptional and providers decided to eliminate the blue form immediately because writing could not be seen well on it. The trial continued with the 2 color combinations and 3 attachments. No flow sheets were misplaced. Nurse pulled permanently mounted sheet out to fill out his portion

STUDY

26 patients had flow sheets done 1 patient rescheduled
3/3 providers preferred the yellow flow sheet
3/3 providers preferred the flow sheet fastened
3 additional patients with asthma were also seen that week
Less than 2 minutes was added in filling out flow sheet, decreased time searching for information

ACT

The flow sheet worked well to collect information for asthma care and fastening it was the best option. The yellow sheet was preferred over the white.
The flow sheet will be trialed by the rest of the practice using the yellow flow sheet fastened to the chart, the flow sheet needs to be a different color or more easily found in the chart

Future questions identified for PDSA cycles

1) How well will the flow sheet copied?
2) Will the flow sheet work as well when used by entire practice?

Fig. 13. Super Smart Pediatric Asthma Team PDSA Planner 5.

improvement often overlap, spreading an improvement project, particularly in large organizations, is often started before improvement gains are sustained.

Case Study (Continued)

Super Smart Pediatrics had many successes to celebrate and reached their goal one month before the date expected (**Figs. 14–16**).

After 3 months of continued improvement, the team decided to develop a sustainability plan.

Super Smart Pediatrics sustainability plan

The practice manager was assigned ownership of the improvement project; written specific quality improvement tasks and expectations into all staff job descriptions. Evaluations and merits were linked to participation in the asthma care system.

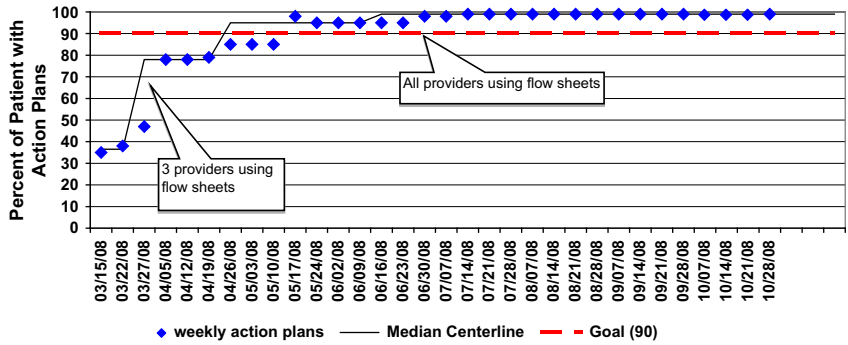

Fig. 14. Run Chart: asthma action plans.

SPREADING CHANGE

The basis for spread comes from Everett Rogers, *Diffusion of Innovations*. "Diffusion or spread, is the process by which and innovation is communicated through certain channels over time, among members of a social system."[29]

This work has become the landmark writing on spreading improvement. Spread of improvements in health care is different from spread of other innovations.[30] When making an assessment of improvements gained, several factors that impact spread must be considered.[29]

- Relative advantage over current practice
  - Compatibility with current practice
  - Simplicity of change
  - Trialability—test change with little investment (risk/cost/time)
  - Observability of change, results need to be seen by those adopting the change

The improvement must be communicated effectively, this may occur person to person, or through much broader channels.[14,29] Time is required for the spread of the improvement to occur. Spread does not occur all at once in a population, rather it is linear across people depending on their receptivity to change and the kind of evidence they need.

Spread may be more difficult in a group of independent practices versus an integrated health care system. Spread can occur at different levels: from one physician

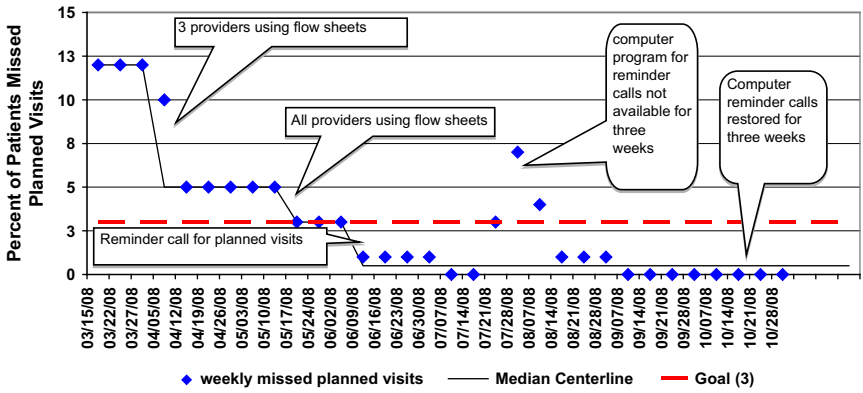

Fig. 15. Run Chart: missed planned visits.

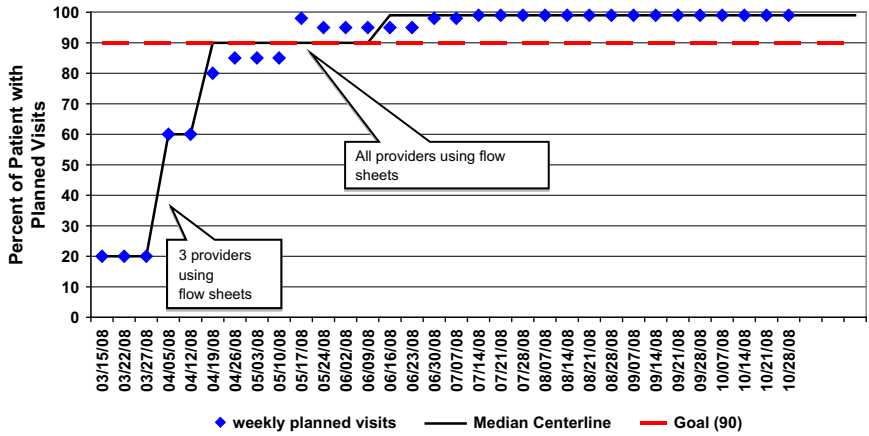

Fig. 16. Run Chart: planned visits.

in a practice to the entire practice; from one practice site to all the sites of that practice; or between organizations or hospitals. Each level will require different motivators and incentives. In health care, spreading improvements does depend on key individuals, the messenger, and the ''stickiness'' of the message. ''*This change will save money for the health care system versus. this change will help get you home earlier.*''[30]

One critical success factor for spread is the role of leadership.[24,27,28]

There are islands of improvement in many organizations or practices, but without commitment from leadership most improvements fail to spread. For further information on spread, refer to the white paper ''A Framework for Spread'' is available on the IHI Web site, www.ihi.org, and can be used at all levels of spread.[31] Leaders must inspire and communicate a shared vision; model the way; challenge the current process, no longer accepting the status quo; enable others with resources, training, and time; and encourage the heart by celebrating the successes.[27]

In our case study, Super Smart Pediatrics' level of spread was from one physician to the entire practice. The leadership of the founding partner was a key element in the success. The changes made by the pilot physician and the team demonstrated improved asthma care. Measurement and feedback became a routine part of their monthly provider meetings.

Advanced Improvement Methods

Using the model of improvement, any quality initiative can be successful. Once an improvement project is under way, run charts can be converted to control charts and the process of improvement can be analyzed. Statistical control charts are frequently used in industry to monitor quality in production. This method can be readily extended to health care. These control charts illustrate if a process is in ''control,'' or within limits of acceptable variation. Data points are plotted around a mean and confidence intervals are established. Monitoring the control chart of process can detect problems with a process or special causes that are outliers to a controlled process. There are numerous types of control charts, applicable to many health care indices. For example, charts can be used to monitor the proportion of patients with a particular disease and their outcome or rare events such a central line infections that are monitored by days between infections (**Fig. 17**).

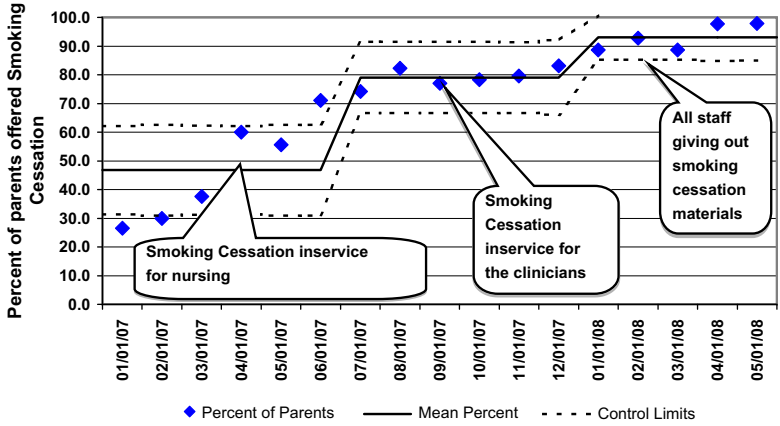

Fig. 17. Control Chart: parents offered Smoking Cessation.

Another advanced improvement methodology is planned experimentation. This method conducts a series of tests under varying conditions. This methodology is different from most familiar scientific experimentation. Under traditional experiments, factors under study are tightly controlled. Planned experimentation uses series of tests that are performed by changing levels of factors and background variables and observing the effects. In planned experimentation, factors are not controlled but are used in combination to see what effect is achieved. This type of experimentation is more oriented toward real world occurrences, because rarely can the health care system operate in perfectly controlled situations.

Case study (continued)

Super Smart Pediatrics has worked diligently on asthma care for their patients and has made impressive gains. They realized their patients with asthma were improved but continue to have exacerbations. They postulated that smoking by parents was having some impact on their patients' asthma and they wanted to encourage smoking cessation. After implementing several office changes they reached their goal for offering smoking cessation materials to most of their parents that smoked (**Fig. 17**). After several weeks and improvements, their process of delivery of smoking cessation

Response Variables: • Smoking Cessation • Asthma Exacerbation		Quit Line Referral		No Quit Line Referral	
		Patch	Gum	Patch	Gum
Quit Smoking Contract	Follow up calls				
	No follow up calls				
No Quit smoking contract	Follow up calls				
	No follow up calls				

Fig. 18. Factorial design to improve asthma care by Smoking Cessation.

materials was noted to be in control. The practice noticed they were all offering different advice on smoking cessation and were unsure what method to endorse. They decided to do a small planned experiment using a factorial design in the practice offering many options and combinations for smoking cessation to determine which methods seem to have success in their practice (**Fig. 18**).

Using planned experimentation, several short test cycles can be performed in order to identify factors that may effect a particular outcome. Using factorial design, many factors can be studied simultaneously using only a few patients. As more knowledge is accumulated, more assumptions regarding the effect of the factors and their interaction can be made. Initial factorial results for Super Smart Pediatrics showed the combination of the quit line, patch and follow up calls were the most strongly associated with smoking cessation and lack of asthma exacerbation. As a factor, a smoking contract seemed not to have any impact. As more knowledge is obtained, the number of factors can be revised and their interaction studied further. For further information on Planned Experimentation and Factorial design, see the book *Quality Improvement through Planned Experimentation*.[32]

SUMMARY

The Model for Improvement is a rigorous and reasonable method for busy health care practitioners to use to improve patient outcomes. Use of this model requires practice for clinicians to be comfortable, however it is critical to develop the necessary skills to participate in quality improvement initiatives. The future of health care in the United States depends on every practitioner delivering safe, effective, and efficient care. The case study demonstrates how this methodology can be applied in any busy health care setting. Incorporating this approach to quality improvement into daily work will improve clinical outcomes, advance health care delivery and design. The techniques of planned experimentation can further an improvement project, refine interventions, gain further improvement, and standardize processes to ensure reliability. Further information, training, and resources can be found in the many organizations now dedicated to improving the quality of health care.

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