Chapter 14
Introduction to Patient Safety and Quality

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To Err is human, the landmark publication by the institute of Medicine (IOM) in 1999, [1] estimated between 44,000 and 98,000 people died in US hospitals annually as a consequence of a medical error. For many years, this number was the most quoted and the estimate did not change.

In an article in the Journal of Patient Safety in 2013 [2]—a review article places this number somewhere between 220, 000 and 400,000 per year. This is the third leading cause of death following heart disease and cancer. In aviation terms is the equivalent of three jumbo jet crashing per day. This is equivalent to the number of graves at the Arlington Cemetery in Washington DC, founded in 1866.

In 1999, the IOM described the "nation's healthcare system as fractured, prone to errors, and detrimental to safe patient care." It defined patient safety as "freedom from accidental injury and further stated that ensuring patient safety involves the establishment of operational systems and processes that minimize the likelihood of errors and maximize the likelihood of intercepting them when they occur" [3].

Healthcare is complicated. It is people working in a complex environment often with limited resources. The environment is complex as it involves the patient, the people, the technology, the policies—the system factors and the latent factors—the place the work occurs and the workload. Unlike the airline pilot whose sole focus is to fly the plane, the healthcare provider is often performing multiple tasks simultaneously. Unlike the pilot, who has a co-pilot-aa a second set of eyes, the

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healthcare provider is often alone in the moment of decision-making. The majority of errors that occur in healthcare are not due to the performance of an individual. Rather, the errors are a consequence of systemic issues.

Case Scenario

Nurse Betty, a nurse on the medical floor gets a call from her child's daycare informing her child has a high grade fever, vomiting, and diarrhea and it would be best if Betty collected her child from the daycare as soon as possible. It is 1:30 pm, a busy day on the wards, with complex patients. Betty, following discussion with her charge nurse, divides her patient assignment and signs out her patients to two of her colleagues and rushes to collect her unwell young daughter. Nurse Mary, a nurse with 26 years of experience, has a complicated patient who is requiring much of her attention. Mary has not yet eaten lunch. She decides to administer the 2 pm medications before taking her lunch break. She refers to the sign out Betty provided. Patient AB is due for her dose of hydroxine. Mary goes to the medication room where the medication bins are stored, goes to the medications beginning with the letter H, and is about to pick up the hydroxine when she hears her name being called. She steps out for a second, answers and then returns to pick up the medication. She administers the medication to patient AB, completes her charting and goes for her lunch break. Ninety minutes, patient AB is found to be diaphoretic, confused with a blood pressure of 70/40. Mary realizes she gave Hydralazine 50 mg instead of the hydroxine. Mary was devastated by this error.

Swiss Cheese Model

James Reason's analysis of errors showed medical errors is seldom a consequence of an isolated individual error. Usually, errors are the consequence of multiple, "smaller errors in environments with serious underlying system flaws." Reason developed and introduced the Swiss cheese model (Fig. 14.1).

In this model, there are multiple layers of defense. However, when the holes are aligned, the defense is lost and errors occur (Fig. 14.2).

Process Mapping

Before the answer to what actually occurred can be established, it is essential to review each step of the actual sequence of events.

There are three possibilities;

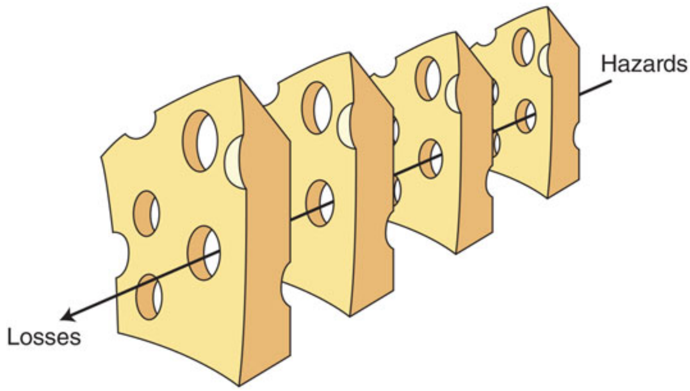

Fig. 14.1 Swiss cheese model

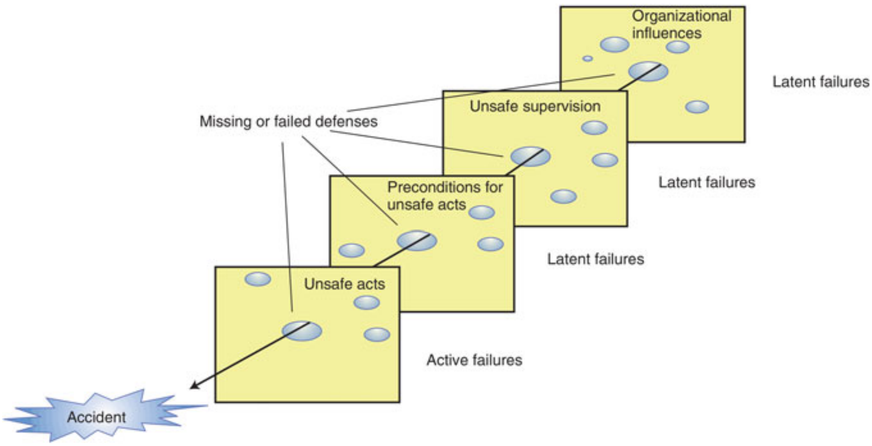

Fig. 14.2 Multiple layers of defense of Swiss cheese model

- The Perceived process (what we think is happening)
- Reality process (what actually is happening)
- Ideal process (what the process could be).

A process map (Fig. 14.3) of the actual events is mapped out—the reality process. The multidisciplinary team meets reviews and finds several issues, gaps, and possible causes that led to this medication error. The process mapping should be done promptly to allow for accuracy.

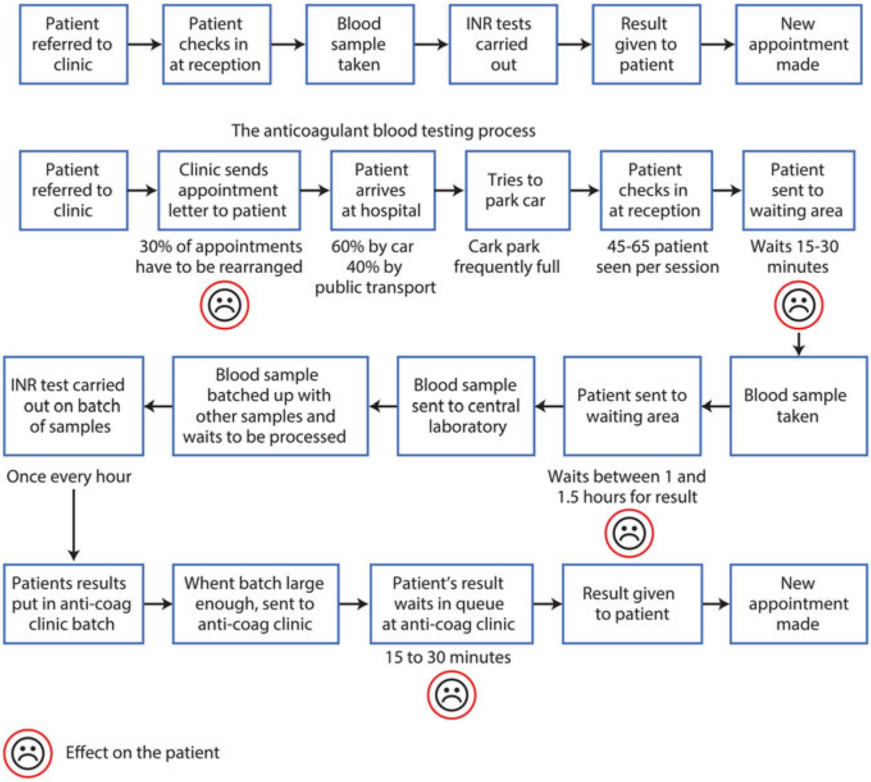

Fig. 14.3 Reality process map

Root Cause Analysis

A root cause analysis (RCA) is a retrospective tool utilized to identify possible opportunities to prevent the error occurring again. It has been used in industrial accidents and has now found its way into healthcare. An RCA involves a multi-disciplinary team and the participants of the event reviewing the events, to try and establish how and why the error occurred. It is a nonpunitive, nonjudgmental 'fact finding' analysis.

During the RCA, it is essential to keeping asking why until a cause of the error is revealed—the concept of the 5-whys (Fig. 14.4).

This often allows the group to drill down to the likely root causes of the event and hence offer feasible actions. Possible causes are assigned to one of the categories on the skeleton of the Ishikawa Fishbone Diagram (Fig. 14.5) equipment, process, people, management, environment, and materials.

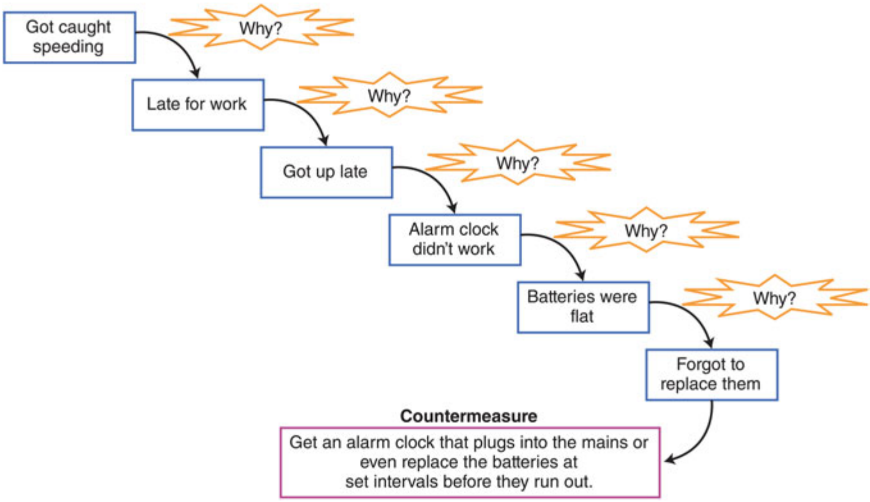

Fig. 14.4 The concept of the 5-whys

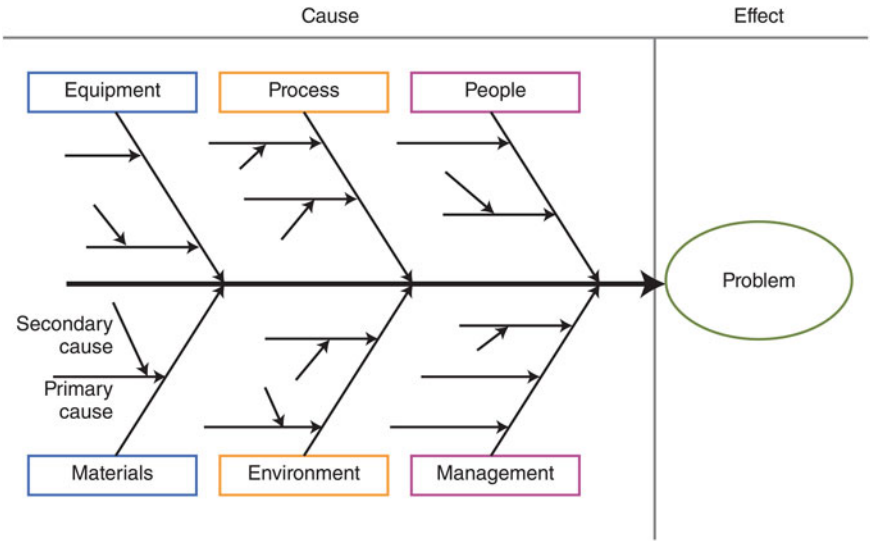

Fig. 14.5 Ishikawa fishbone diagram

Back to the Case Scenario—What Happened to the Patient in Room 15—Findings During the RCA

Why is Mary so busy?

- Betty had to leave urgently
- Mary was already had full patient assignment
- No time to find extra coverage

Why did Mary pick the wrong medication?

- She was interrupted
- The two medications were in adjacent bins (stored alphabetically)
- Look Alike—Sound Alike medications (Fig. 14.6)

Through the RCA, many possible gaps and areas for improvement are identified. Often, many possible errors and opportunities are identified.

Using the look-alike, sound-alike medications, we can ask the five whys.

Plan, Do, Study, Act Cycle (PDSA)

Once you ask the question, identify an opportunity, usually a possible solution presents itself. This then allows the group to perform a test of change or Plan, Do, Study, Act (PDSA) cycle. A P Define the aim of the PDSA. This should be specific.

Fig. 14.6 Look alike—sound alike medications

Plan Plan the change to be made, what and how will the change be measured.
Who is going to the work—define the team.
By when will the work be done?
Do Test the change.
Study analyze the data.
Act Refine the change PDSA allows a small change to be implemented, measured and refined (Fig. 14.7).

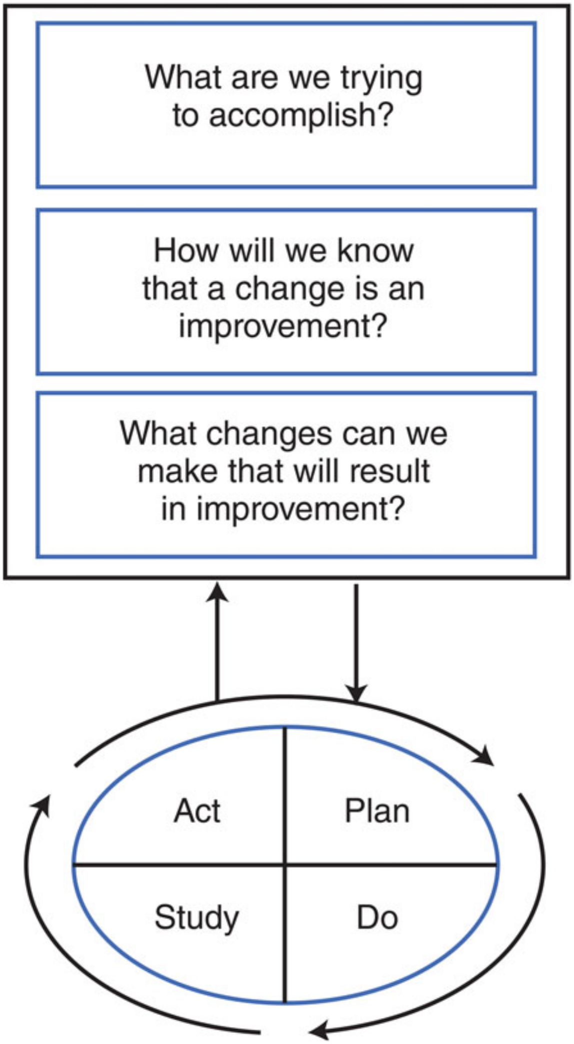

Fig. 14.7 Plan, do, study, act cycle

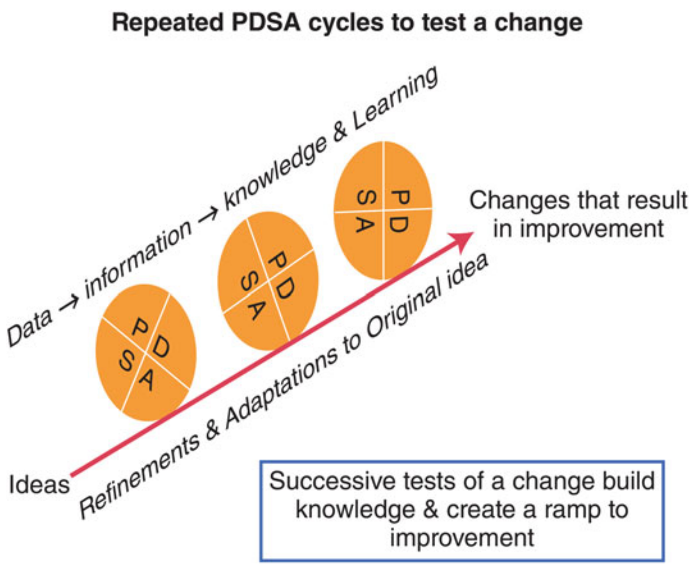

Fig. 14.8 Continuous improvement of plan, do, study, act cycle

This process of continuous improvement may take several cycles. It is best to start with a very small change, and refine the process to ensure the gap is addressed. Once that occurs, the change can be spread for continuous improvement (Fig. 14.8).

Lets Go Back to Our Case Scenario

The patient recovers quickly; the error is disclosed to the patient and the family.

Nurse Mary is devastated by this event. She is unable to finish her shift, and her manager sends her home. She asked to take a few days off work to “recover”. Over these few days, Mary has difficulty sleeping, very little appetite and frequently relives the event. Every time she relives it, she questions why and how she could have made such an error. She is unable to talk with her husband as she feels guilty as it was her fault.

Often, we think of the patient as the “victim” of a medical error. In reality, patient is the first victim, the caregiver and sometimes other members of the healthcare team are the second victims. [7] Too often, they live with this in silence, often traumatized by the fear of causing another error, doubting their skills and face personal anguish. Often, and they go back into the workplace and live in anguish about they will fail the next patient [8].

The implementation of support systems is critically important to provide constructive support.

LEAN

The concept of LEAN has been used in many manufacturing areas. The roots of LEAN lie in the Toyota car manufacturing industry. It has now found its way into healthcare. The premise of applying LEAN is to remove the waste (Japanese mudra) or the non-value added work in a process leaving the only the value added work.

Areas of waste that occur every day in healthcare include;

- *Motion*—nurses are looking for IV poles, transporters looking for stretchers, pharmacists looking for missing medication doses, physicians going to different floors to care for patient when the units are not geographically cohorted
- *Transportation*—it is necessary to transport a patient to the CT scanner, but if the scanner is at the opposite end of the hospital, the time to get there, while necessary is actually wasted
- *Inadequately used intellect*—people doing work that is not utilizing the intellect. If the nurse is always "looking for something," whilst necessary to provide care, is not a good use of intellect
- *Excess inventory*—ordering a large amount of a new medication with a short shelf life that expires. In addition to the lost medication, the medication needs to be stocked and space is needed to store
- *Nonstandard work*—people doing things in different ways with different outcomes
- *Waiting*—a patient waiting for 20 min on a stretcher for an procedure
- *Overproduction*—multiple forms asking the same question, repetitive testing, preparing "extra meds" just in case
- *Defects*—medical errors, hospitals acquired infections

Process mapping is an important step in LEAN. This allows the actual way of performing a task is done to be mapped thus allowing the waste to be easily visualized.

For example, a resident is sitting down and completing five discharge paperwork packets at one time—this is called batching. The resident does this because the printer is at the other end of the unit and time would be wasted if he completed, printed, walked to the printer, walked back to his computer and then completed the next one. Whilst the resident may feel he is improving efficiency, in reality, patients who are clinically ready to be discharged are waiting. Additionally, now the nurse will have five patients ready for discharge at the same time.

An A3 is a tool used in LEAN. A3 refers to the size of the paper which allows for a structured approach to problem solving. The PDSA process is rooted in the A3 process.

The steps in developing an A3 are:

1. Problem/Aim Statement
2. Current State—where are we today
3. Future State—where do we want to be and by when

4. Gaps—what is preventing us from getting from 2 to 3
5. How are we going to get there, what tests of change are we going to do
6. Doing the tests of change
7. Completion plan—who will do what and by when
8. Confirmed that the change worked or not and next steps

The Science of Measurement

There is a difference in measuring data for research purposes and measuring data for Quality Improvement (Table 14.1).

Measures

There are three types of metrics used in quality improvement.

Outcome Measures—examples include the percentage of patients with a hemoglobin A1C in an acceptable range, all patient with heart failure are prescribed an angiotensin receptor blocker.

Process Measures—examples include how many diabetic patients had an annual eye examination, adherence to hand hygiene, the frequency of use of a ventilator bundle.

Balancing Measures—are the changes designed to improve outcomes causing a problem in other areas. An example is, in order to reduce length of hospital stay, readmissions rates increase.

Table 14.1 Measurement for research versus measurement for improvement

	Measurement for research	Measurement for learning and process improvement
Purpose	To discover new knowledge	To bring new knowledge into daily practice
Tests	One large “blind” test	Many sequential, observable tests
Biases	Control for as many biases as possible	Stabilize the biases from test to test
Data	Gather as much data as possible, “just in case”	Gather “just enough” data to learn and complete another cycle
Duration	Can take long periods of time to obtain results	“Small tests of significant changes” accelerates the rate of improvement

http://www.ihi.org/resources/Pages/HowtoImprove/ScienceofImprovementEstablishingMeasures.aspx

The Role of the Hospitalist in Quality

The hospitalist is well positioned to be a part of quality improvement across the continuum of care from the inpatient setting to transitions of care to the post-acute setting. The hospitalist role, daily work, and understanding of what an efficient process could look like offer many opportunities.

Take a day in the life of the hospitalist.

Hospitalist Mike comes into work at 7 am, meets the nocturnist, takes sign out (hands-off communication). Mike then rounds on his four potential discharges for the day with the bedside nurse, clinical pharmacist and case manager. He completes the discharge paperwork, reviews the discharge planning with the patients and places the discharge order. He then sees his other patients one of whom he anticipates will be a discharge the following day. He begins the discharge paperwork for this patient aiming for an early discharge the following day. The ER calls with three new patients. The first patient is an elderly lady who was just discharged 12 days prior, forgot to fill her medications and is now presenting with symptoms of heart failure. The second is an uninsured patient without a primary care provider and a COPD exacerbation. The third patient is a patient with metastatic cancer requiring pain management.

At every juncture in the day, there are endless possible ways to improve efficiency, cost, and quality.

- Interdisciplinary Communication
- Hand Off communication
- Ensuring appropriate resource utilization through cost conscious care
- Identifying and anticipating early discharges
- Engaging the patient and patient family
- Ensuring appropriate transitions of care
- Managing length of stay
- Managing throughput
- Reducing readmissions
- Core Measures—implementing evidence-based practice
- Reducing Hospital-Acquired Conditions (HAC)
- Medication Errors
- Improving Patient Satisfaction
- End of Life Care

The American Board of Internal Medicine in collaboration with many professional societies has published the Choosing Wisely lists that are

- Supported by evidence
- Not duplicative of other tests or procedures already received
- Free from harm
- Truly necessary

These lists offer many opportunities to identify a quality improvement process to identify and minimize waste, improve efficiency, improve quality of care and reduce healthcare costs.

References

1. Kohn et al. To err is human: building a safer health system. 2000.
2. James J. J Patient Saf. 2013;9(3):122–8.
3. Institute of Medicine. To err is human: building a safer health system. Washington, DC: National Academy Press; 2000.
4. Reason J. Human error: models and management. BMJ. 2000;320(7237):768–70 PMCID: PMC1117770.
5. https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/QAPI/downloads/FiveWhys.pdf
6. http://www.educational-business-articles.com/5-whys.html
7. Medical error: the second victim. BMJ 2000; 320 doi:http://dx.doi.org/10.1136/bmj.320.7237.726. Published 18 Mar 2000. Cite this as: BMJ; 2000;320:726.
8. Denham C. TRUST: the 5 rights of the second victim. J Patient Saf. 2007;3(2):107–19.