

Summer Training Report

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CHALLENGES AND OPPORTUNITIES OF TELEMEDICINE DURING COVID-19 IN INDIA

ABSTRACT

Background: Within weeks, COVID-19 has transformed our practice of palliative care and clinical medicine as we all know it. Telemedicine has developed as a basic innovation to carry medical care to patients while endeavoring to reduce the transmission of COVID-19 among patients, families, and clinicians. It is additionally important to preserve scarce resources like personal protective equipment. Calamities and pandemics present unique challenges in providing healthcare. In spite of the fact that telemedicine won't solve them all, it is appropriate for situations in which medical practitioners can assess and manage patients.

Objectives: To Identify the Opportunities and Challenges of the Telemedicine system in the Healthcare Sector.

Methods: We sought to discuss opportunities and challenges of telemedicine in India by reviewing the secondary literature that evaluates telemedicine as a means to facilitate access to care, deliver highly specialized visits, diagnostic consultations, rehabilitation, and remote monitoring of several types of diseases.

Results: Opportunities for telemedicine include the replacement of or complement to in-office evaluations, decreased time between follow-up visits, reduction in disparities in access to healthcare, and promotion of education and training through interactions between primary care physicians and tertiary referral centers. Basic difficulties include the joining of the systems for data monitoring with a simple to-utilize, secure, and cost-effective that is both broadly embraced by patients and healthcare systems.

Keywords: challenges, opportunities, telemedicine, COVID-19, India

INTRODUCTION

According to the American Telemedicine Association (ATA), “Telemedicine is the natural evolution of healthcare in the digital world”. World Health Organization has defined telemedicine

as, “the delivery of healthcare services, where distance is a significant factor, by all healthcare professionals for the exchange of valid information for the exchange of valid information for the diagnosis, treatment, and prevention of disease and injuries, research and evaluation, and for the continuing education of healthcare providers, all in the interests of advancing the health of people and their communities.” The word “telemedicine” literally translates to ‘healing at a distance’. In the midst of the novel coronavirus outbreak, the rules were given to decongest the healthcare facilities as doctors can consult the patient distantly which would protect the patients and the doctors from virus transmission, and do not disrupt the lockdown measures. Incorporating telemedicine is the most transformative change hospitals have made to supply healthcare in the post Covid-19 world without compromising on quality of care and outcomes.

Research Question:

- What are the challenges and Opportunities to implement telemedicine in health care sector in India?

Objectives of the Study

- To Identify the Opportunities and Challenges of Telemedicine system in Healthcare Sector.

Research Methodology

The current study depends on review of secondary literature. For planning of this research paper, journals, papers and applicable government websites has been accessed by author. The study attempts to look at the opportunities and challenges of telemedicine in healthcare sector in India.

Results:

LITERATURE REVIEW

Ravin (2015) conducted a survey to analyze the challenges faced in delivering of ehealth care services in selected rural areas of Madhya Pradesh and Maharashtra. Challenges for providing ehealth care services in rural areas are also discussed, such as workforce issues, quality of care concerns, reimbursement, licensure, awareness and access to broadband services. The study concluded that village health workers play crucial role in generating awareness about ehealth service and act as mediator between village and the ehealth center. The ehealth care through ICT offers a new platform for the treatment of patients residing in rural and remote areas.

Sinha (2012) Enlightening Aspect of Telemedicine in Punjab has talked about the different technical issues, their downsides in India. A lot of measures should be executed. They have examined telemedicine as far as neuron careful crises and prescribed the standards for telemedicine infrastructure, connectivity, Data Interchange and Exchange along with Minimum Data sets and security to be continually refined for successful usage of this developing technology.

Xiao (2007) In his paper Wireless telemedicine and m-health: Technologies, applications and research issues clarifies the use and future possibilities of telemedicine innovation with models. A concise conversation about LINCOS project was additionally introduced. A point by point conversation on different specialized issues like compression, artificial intelligence was introduced. Clinical sensors, home monitoring frameworks, Electrical Medical Records EMRs which were viewed as the future of telemedicine frameworks was likewise informed upon.

Pal (2005) Telemedicine Diffusion in a Developing Country: The Case of India introduced a point by point concentrate on the situation of telemedicine in a developing nation like India. Inferable from the majority share 75% of the Indian population living in rural zones, the authors examine the need of telemedicine in India and have discussed three Indian telemedicine implementation cases such as Apollo telemedicine enterprises, online telemedicine research institute(OTRI), Asia heart foundation and talked about factors of the essential components for telemedicine such as Setting Clear Program Objectives, Garner Government Support, Adapting User-Friendly Interfaces, Measuring Cost-Effectiveness and User Satisfaction to be effectively executed even more.

Some challenges and Opportunities in the adaption of telemedicine systems are discussed below:

Challenges: Some of the hindrances identified for the successful implementation of the telemedicine system in Indian health sector are got from above review:

- **Cost:** India ranks 184Th out of 191 in terms of GDP% spend on healthcare, as per WHO. Government spending on the healthcare industry stands at 1.15% of the Gross Domestic. Health spends must at least increase to 2.5% of GDP, at a minimum. The cost of the infrastructure is a major worry as there are insufficient funds accessible for giving healthcare services to the majority.

- **Safety, security and confidentiality of patient records:** Telemedicine would create electronic databases of patient records. These could be stored in centralized servers, and would therefore be subject to risks like hacking viruses, etc, that any database is exposed to. Adequate safety measures would have to be ensured for the security and confidentiality of the data.
- **Infrastructure:** One of the key challenges in resource-constrained settings is the skewed distribution of healthcare delivery infrastructure. While a huge extent of the population lives in rural areas, healthcare establishments are situated in urban settings. Telemedicine has the potential to play a connecting job in defeating these infrastructural challenges. Resource constraints also drive frugal innovations. One example is encouraged teleconsultations drove by community healthcare workers. They follow a checklist-based initial evaluation and afterward contact a clinician to give a real-time consultation. The difficulties around ownership of mobile phones and literacy required for a self-started teleconsultation is effectively defeated through this methodology. In regions where telecom infrastructure constraints exist, this model could be delivered over feature phones as an interactive voice service.
- **Technology:** Technology platforms were something accessible and being utilized, yet were not managed, which uncovered both patients and providers to challenges. However, there has to be a change in mindsets. The issue isn't technology however individuals. The myth that online consultation isn't comparable to face-to-face consultation must be dissipated. A change in mentality is essential to make virtual consultation a success. As technological advances are quickly developing, clinical providers should be sharpened and prepared to adopt appropriate technologies. A few medical professionals consider advances in innovations an existential danger; however, this dynamic can be overcome through orientation and utilization of advanced health tools as a component of the training curriculum. The communications at these PHCs are not dependable and the web speed, 33.6 kbps, at which these PHCs get associated with the district or state level emergency clinics, is deficient. In this manner, PHCs can't give moment medicinal services solutions for patients in remote towns through essential online data exchange or further developed video transmission for telemedicine. There is a need to construct maintainable, financially

savvy infrastructure and biological ecosystem for actualizing mHealth all through the nation.

- **Literacy rate and diversity in languages:** only 65.38% of India's population is educated with only 2% being knowledgeable in English. With India being a nation of different languages, it gets troublesome.
- **Lack of basic facilities:** In India, about half of the population lives underneath the poverty level. Fundamental Infrastructural facilities like transportation, power, media transmission, safe drinking water, primary health services, and so forth have vanished. No technological advancement can transform anything when an individual has nothing to change.

Opportunities: According to Data Labs, the telemedicine market in India is expected to reach a market value of \$5.4 Bn by 2025 with a CAGR of 31% from the current year. This could change the health care practices. Through this innovation all can get the health services to their doorsteps. Aside from these some different advantages are as per the following:

- **Remote patient monitoring:** Remote patient monitoring (RPM) allows healthcare providers to track a patient's vital signs and other health data from a distance. This makes it simple to look for warning signs and rapidly intervene in patients who are at health-risk or are recovering from an ongoing medical procedure. Remote patient monitoring solutions make it easier for patients and physicians to maintain close communication. Numerous RPM solutions record and transmit a patient's clinical information automatically, creating a regular report for the doctor. Sometimes, this clinical information is transmitted to a group of health monitoring experts who are responsible for flagging any warning signs and sending them on to the doctor, if necessary.
- **Mobility and Cloud Access:** By 2018, it's evaluated that 65 % of associations with healthcare facilities will result in cell phones. As indicated by a 2015 research2guidancereport, 80 % of specialists as of now use cell phones and medical applications in their clinical practice. Hospitals and insurance agencies presently store clinical records in the cloud so patients can get to their test outcomes online every minute of every day. This, thus, diminishes paper utilization and spares time. Cloud data warehouses are one method of storing information safelyandproductively.

- **Better Investment Opportunities:** Because telemedicine is one of the quickest developing segments in the healthcare industry, numerous organizations are putting resources into it. Mergers among smaller and bigger telemedicine companies give money related security to small organizations and a stage to give telemedicine care viably. Additionally, bigger telemedicine providers are working together with universal medical institutions, helping them to spread their skills abroad, extending the telemedicine showcase, and creating more income.
- **Acceptance:** It has been found that the patients have no difficulty in accepting telemedicine. About 80% of the consumers were satisfied with the treatment given or provided through telemedicine which in accordance with the study done by Carr Hill. They are happy that some senior doctors have seen their case. However, some resistance is seen amongst doctors. Doctors in the government sector will in general view telemedicine as extra weight or workload. Therefore, there is a need to weave telemedicine into the routine duties of the doctors. It is also seen that the government doctors would like to have the technical staff to operate the system rather than operating themselves. The government doctors need to realize that over a long period the unnecessary rush of patients to civil hospitals could reduce, as the patient would be treated at the district level. This would result in the reduction of unnecessary workload. The private doctors are sometimes afraid that telemedicine is likely to reduce their practice. They need to realize that the system enhances their reach and exposure and is only likely their reach and exposure and is only likely to increase their practice further.

CONCLUSION

A Telemedicine service provides a cost-effective treatments and less wasted time for patients and for Health professionals. Expanded prevalence of chronic diseases, technical progressions especially in software and an ascent in the aging population are main considerations driving the enormous development in telemedicine. Hope to see telemedicine become considerably more noticeable in healthcare over the coming years, with more patients than any other time in recent memory approaching top-quality medical care readily available. For the effective usage of different programs of the government Health experts need to increase a comprehension of how to assess, interpret, and apply this data to their specific practice. Telemedicine can also support in improving the quality of

health care by helping to increase the qualifications and skills of health and medical professionals and thereby improve the delivery of health services be instrumental in helping the general population to turn out to be increasingly educated about their health and how to be healthy, however until a more greater level of the population is on-line and technologically literate, low-tech arrangements are probably going to be progressively powerful. By the reception of telemedicine system in rural region, No Medic to E-Medic and Time alone will demonstrate that Telemedicine is a "forward advance a regressive way" or to reword Neil Armstrong "one little step for IT yet one giant jump for Healthcare".

SUGGESTIONS

- There is need to train the doctors in the use of telemedicine systems. Just as doctors learn how to use computers; the use of telemedicine should become an integral part of the education and training of doctors. Telemedicine should be introduced as a topic at the undergraduate level. Training programs should be organized to familiarize the practitioners with the features.
- Taking care of the language issue can help extend the telemedicine reach. In India with more than 22 officially recognized languages and more than 1600 mother tongues, linguistic diversity appears to be a significant hindrance in the method of a patient in one area having the option to converse with a specialist in another district.

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Title of the course: Healthcare Quality Improvement

Duration: April 20th to May 30th.

Time: 5 weeks

Conducted by: Case Western Reserve university

Mode of assessment: quizzes

Course description:

Chapter 1 explains the concept of a quality gap and describes ways in which health care can be improved through analysis of the quality gap. Various models are presented to further emphasize the importance of identifying gaps in health care and continuously working to improve patient care. In Chapter 2 you'll learn steps to take when collecting and evaluating evidence for the improvement of care. You will gain a clear understanding of the following: how to find evidence on the basis of a properly formulated question, how to evaluate the quality of evidence and research, and how to identify the most appropriate resources to use in finding evidence. Chapter 3 describes the positive outcomes that arise from productive teamwork and provides a set of criteria for identifying effective teamwork. In addition to learning how to assess factors that affect the way teams' function, you'll learn how to create a team comprising members from multiple health care professions. Chapter 4 offers valuable information on getting started with effective improvement work. After reading this chapter, you will be able to identify and focus on areas that need improvement. In addition, you will be able to organize your improvement goals

by writing a clear aim statement. In Chapter 5 you will learn the importance of describing the process of care as well as steps for choosing the most appropriate method for communicating about the process. Also included are instructions for considering the organizational culture and

context features that influence clinical processes. After reading this chapter, you will understand how to create a process model that is understandable to everyone who is part of the care team. Chapter 6 emphasizes the necessity of using data to improve health care and explains that different types of data are used to support different objectives. This chapter also discusses using a balanced set of measures for improvement work and introduces the clinical value compass, a tool for identifying measures. In Chapter 7 the benefits of analyzing data over time so that you can monitor the changes that occur in a system. Common cause variation and special cause variation are compared and contrasted in detail. Chapter 8 will help you manage complex system change and will show you how to identify barriers to change. In addition, complex adaptive systems are defined and described in a list of eight principles. Chapter 9 will enable you to identify strategies for sustaining and spreading change. As you read the practical, three-step approach for planning a successful spread effort.

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Chapter 1: The Gap Between What We Know and What We Do

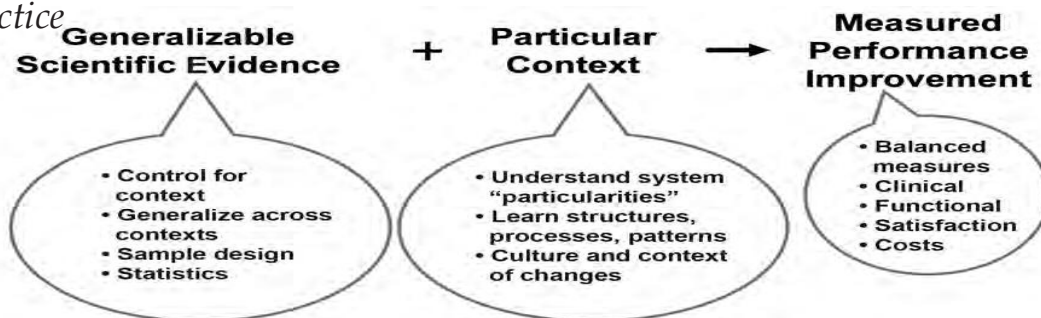
Finding the Quality Gap

Inspecting results of care is one approach to recognize when and where a framework is broken.

Evidence-Based Improvement

There is substantially more to incorporating proof than simply having the correct examination proof. The correct proof is regularly the point of convergence of most wellbeing experts' training. Figure 1-1 is a model that shows the segments of proof-based improvement. This model exhibits how the best logical proof can be joined with information on an individual framework to deliver improved results for patients. The right-hand side shows that what we want for our patients is estimated execution improvement—for every individual patient and for our population of patients. We need top notch care for our patients in numerous areas: clinical, practical, fulfillment, and cost. We frequently start (on the left half of Figure 1-1) with generalizable logical proof. Generalizable logical proof originates from medicinal services research in which examiners control for setting and fabricate information that is generalizable across numerous specific Circumstances. This is the place research configuration, painstakingly developed procedure, and factual investigations are utilized to assess medicines and treatments to decide the degree to which they are powerful.

FIGURE 1-1. *Evidence-Based Improvement Equation for Putting Evidence into Practice*

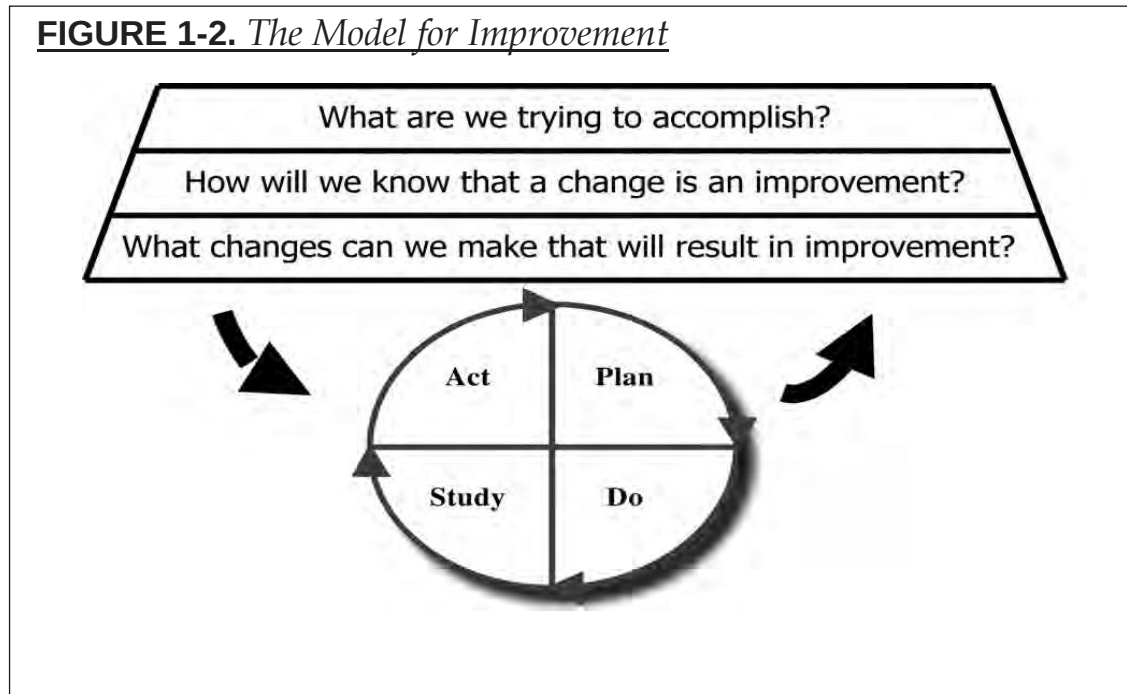


The Model for Improvement

How would we know the Model for Improvement is fruitful? There are numerous models in the writing of frameworks that have been improved with the strategies proposed in this model. Over these models there is one extremely predictable primary concern: Improving medicinal services is a physical game—it is something that we do. Improvement doesn't happen by essentially going to a talk, sitting in a gathering, perusing a book (not even this book!), or performing on the web reproductions. It is accomplished through involvement with applying these techniques, and this

experience is important for accomplishing ability in the full scope of aptitudes required for clinical Practice.

FIGURE 1-2. *The Model for Improvement*



Three Questions in the Model for Improvement

The model distills the improvement procedure into three inquiries:

1. What are we trying to accomplish (aim)?
2. How will we know a change is an improvement (measures)?
3. What changes would we be able to make that will bring about progress (changes)?

When the responses to these three inquiries are resolved, the Plan–Do–Study–Act (PDSA) cycle is utilized to structure and test changes from a more minor perspective.

Chapter 2: Finding Scientific Evidence to Apply for Clinical Improvement

The Importance of Evidence-Based Practice

The emphasis on the use of evidence in health care has grown logarithmically in recent years. New logical information is created at a pace of in excess of 10,000 articles for each year. The sum and the setup of information and data can be overpowering.

EBP is characterized as "the procedure of shared dynamic between specialist, patient, and others critical to them dependent on research proof, the patient's understanding and inclinations, clinical skill or expertise, and other accessible hearty wellsprings of information." At the core of the Colorado Patient Centered Inter Professional Evidence-Based Practice Model is the patient and his or her preferences, values, and experiences. Valid and current research provides the best evidence for the situation.

Sources beyond Research

When research evidence is limited or inconclusive, the Colorado Patient-Centered Inter professional Evidence-Based Practice Model identifies eight additional sources of evidence to help inform care:

1. Path physiology
2. Retrospective or concurrent medical record review
3. Quality improvement and risk data
4. International, national, and local standards
5. Infection control data
6. Clinical expertise
7. Benchmarking data
8. Cost-effectiveness analysis

FIGURE 2-1.*The Colorado Patient-Centered Inter professional Evidence-Based Practice Model University of Colorado Hospital ©2009*



EBP involves applying the best-known evidence, using the clinician's judgment, for an individual patient at a point in time. None of these sources of evidence is considered more important than another, although a particular decision may give more weight to one element than to another. For example, a patient who is a Jehovah's Witness may meet all the criteria for a red blood cell transfusion; however, because of the patient's preferences, no blood products would be given. Genuine use of EBP includes bringing understanding inclinations, experience, and qualities, alongside substantial examination and extra wellsprings of proof, to endure on tolerant consideration choices.

Limitations of EBP

Over the past several years, EBP has begun to show some of its limitations in its methodological ability to improve care and outcomes for patients. Because there is an abundance of evidence available, finding evidence is usually not an issue.

Linking of evidence to systems of care.

One challenge is that while guidelines are explicit, the application of this knowledge locally is implicit and tacit. Simply making the knowledge available does not bridge the gaps in care. The EBP emphasis on applying evidence to one patient at a time limits its impact by not reliably applying evidence to all patients in a specific system or context. EBP provides a solid foundation for asking the right questions and finding answers to apply to patient care; however, it is limited in scope because it does not explicitly address linking evidence to the systems of care.

Formulating the Right Question

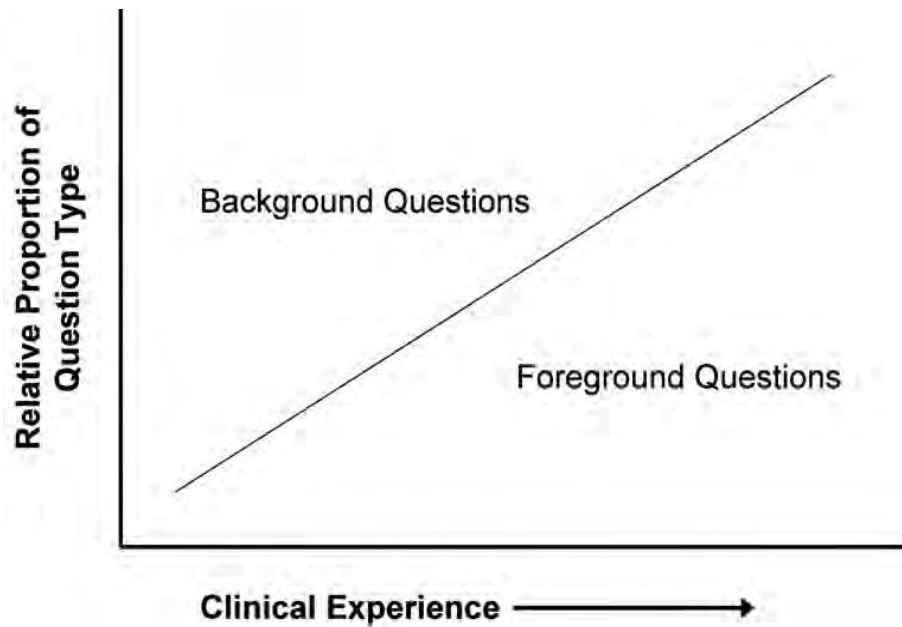
Finding the right evidence begins with asking the right question. When we need to find evidence for an individual patient—such as a patient with CAP—the task is relatively straightforward. A patient has a clinical condition, some diagnostic or therapeutic approach is not clear, and the evidence is reviewed and appraised to guide the clinical decision making. (Of course, skills in finding and appraising evidence must be part of the repertoire.) Asking the right question for system-level improvement is sometimes a little bit different.

Types of Questions

Questions to find evidence can be categorized in several ways. A question might look for a definitive answer (for example, “What are the most common causes of hyponatremia in a patient with liver disease?”). Alternatively, a question might inquire about information that is less definitive (for example, “Why did this patient with liver disease develop ascites now?”). In the former case, the answer will be a specific list of the most common causes of hyponatremia in patients with liver disease. In the latter, the answer will provide a range of options, but the clinician(s) can only surmise why this occurred at this time. Similarly, questions for finding evidence can be specific knowledge-based questions, such as “What are the diagnostic criteria for diastolic heart failure?” These types of questions are “background questions” and are most

commonly asked when an individual does not have a lot of clinical experience (see Figure 2-2). Background questions are used to fill the gaps in one's knowledge base.

FIGURE2_2.*Clinical Experience Versus the Number of Background Questions and Foreground Questions**



Chapter3: Working in Inter professional Teams for the Improvement of Patient Care.

Teams in the Health Care Setting

Regardless of whether as a feature of a Little League baseball crew, the secondary school show club, or a consideration group on a medication ward, nearly everybody has experience working in groups. We are immersed with the terms group and collaboration in the media, in sports, and in the executives' books. Once in a while colleagues are relied upon to finish each errand together, yet groups are intricate, and not all undertakings require a group approach. Likewise, a group isn't just a get-together of individuals gathered; group require authentic turn of events and the administrators.

Work Teams

Work groups will in general be long-standing apparatuses that bear obligation regarding finishing errands in a specific setting. For instance, the initial vignette's inpatient medication group was collected to give care to patients and preparing for the students and it incorporates individuals with various degrees of experience and individuals from various callings. Despite the fact that each has an alternate degree of experience and diverse preparing, they meet up to give care to the patients on the inpatient clinical help. As another model, a neonatal emergency unit work group may incorporate the going to neonatologist, an individual, a pediatric occupant, a clinical understudy, a medical attendant, a dietitian, a drug specialist, a social laborer, and a caseworker. Regularly the patient's family is likewise remembered for this kind of work group. Clinical work groups are steady and unsurprising gatherings in numerous settings.

Project Teams

In contrast to work teams, which tend to focus on a particular setting, project teams focus on specific problems. Quality improvement work often occurs in project teams. In the opening vignette, the work team of the medicine unit had also formed into a project team to increase the rate of influenza vaccination.

Criteria for forming a project team.

When the following four criteria exist in a challenging situation, forming a project team will likely be more effective than individual efforts:

1. The task is complex, and no one person has all the knowledge or skills needed to solve the task.
2. Creativity is required.
3. The testing of changes will require commitment and cooperation across units or departments.
4. The task being examined is cross-functional and involves several professions.

Improvement Teams

Properly formed teams rely on the knowledge, skills, and experience of a wide range of people to solve problems. The dynamic interaction of the individuals helps them make good decisions and find effective solutions. But what are the components of an effective improvement team?

An improvement team should include an individual with enough authority in the organization to institute a change. This person is the team's system leader; he or she understands the implications of the changes and can interact with other system leaders. In our example, Phong and Carlos would have the responsibilities for system leadership. An improvement team also needs team members with technical expertise who understand the day-to-day workings of the system. In our example, the intern who writes orders, the pharmacist who knows about the dispensing of vaccines, and the staff nurses who administer vaccines on the inpatient unit bring this perspective. These individuals understand how the systems operate and what an effective intervention strategy might include. An improvement project team also requires an individual for day-to-day leadership—someone who is part of the process on a daily basis. The resident plays this role with the guidance of Carlos, the nurse manager. Another important addition to the team is an executive sponsor. This is an individual in a top management position with whom the team leader(s) has open communication. The executive sponsor is generally in a position to provide resources or remove barriers that the team may experience.

As of now, most health care improvement groups are venture groups. While we know these teams can be effective, there is an inherent weakness to this approach: "Project work" remains outside

the scope of usual daily tasks and often is considered to be additional work. The influenza vaccine team tried to incorporate improvement into its daily routine but realized that its efforts were limited because of the composition of the team. Improvement exercises in health care will remain project group exercises until work groups are upgraded. Neonatal ICUs and outpatient inter professional spine centers have demonstrated that this transformation is possible. As health care improvement becomes part and parcel of providing care, improvement activities will become a core function of clinical work teams.

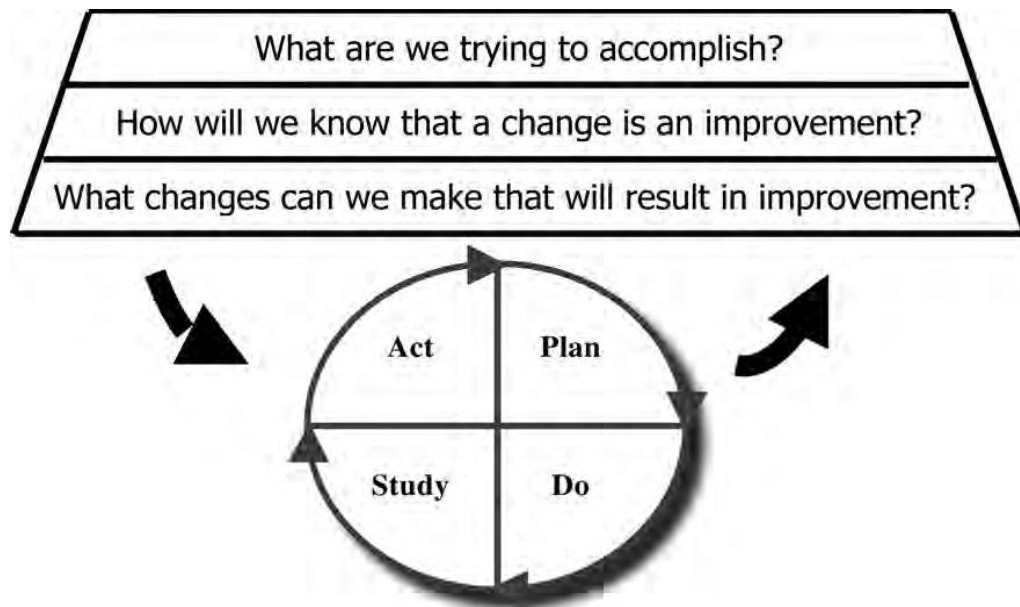
Chapter4: Targeting an improvement effort

An integral component of improving health care is to target the improvement efforts. The Model for Improvement (see Figure 4-1 below) is a useful guide to ensure success of these efforts. This chapter addresses the first question in the Model for Improvement: “What are we trying to accomplish?” To answer this question, it is helpful to go through a three-step process:

1. Identify a general area to improve.
2. Narrow the focus.
3. Create an aim statement to guide the project.

Step 1: Identifying an Improvement Area

FIGURE 4-1. *The Model for Improvement.*



So how do you find potential areas to improve? One way is to start by looking at the systems you are a part of. As you will learn in Chapter 5, a system is a set of interdependent elements working together to achieve a common aim. Anywhere systems and processes exist, they can be improved, and identifying opportunities to improve is an important first step. Identifying improvement areas in clinical care requires that you reflect on the care delivered, viewing it through an “improvement lens” of mindfulness (being aware of how your practice is impacting the patient) and system thinking (looking beyond what you do and considering all the factors that impact the quality of your patient care). Improvement areas can be identified in your personal performance within the clinical care system as well as at the micro- and macro system levels of practice. While it is easy to think about personal performance areas for improvement, identifying improvement areas at the clinical system level is more difficult.

Approaches to Identifying Improvement Areas

The following approaches will help you identify an improvement area at the system level:

Examine point-of-care issues:

At the system level, think about what you see in practice. Are there any procedures being carried out that do not follow policy? Are there gaps between evidence-based practice and what you see happening every day?

Review data:

Opportunities for improvement must be informed by knowledge of the needs of the people served. The best way to examine these needs is to use data that are often collected for regulatory requirements. In the acute care setting, for example, each unit has data that indicate the quality of care delivered; unit- and hospital-level data are available for many issues, such as pressure ulcers, falls, infections, and incident reports. Fulfillment scores and criticism outlines are likewise accessible and may help guide you to progress openings.

Discuss and reflect on frustrations:

Still another way idea may arise is from discussions with colleagues about their frustrations with the system. To identify an improvement area, frequently all you need to do is ask yourself, “What

is the one process that frustrates me the most?” Often your frustrations reflect the needs of the patients you serve.

These methodologies likely will create numerous potential improvement thoughts. It is important to prioritize the list you generate by considering the population served, best practices, and the greatest patient needs.

After you have identified the general area in which you would like to make improvements (for example, ensuring evidence-based treatment of urinary tract infection), the second step is to narrow the focus.

Step 2: Narrowing the Focus of the Improvement Work

For example, an improvement team might begin with the goal of improving care for patients with diabetes in a primary care practice, including glycemic control, hypertension, and lifestyle changes. While each of these is worthy of the team’s attention, creating an improvement project that is too broad is a common pitfall. A team that doesn’t appropriately narrow the focus of its goals may endure many iterations and travel several paths without ever achieving real improvement in any area. This leads to wandering work, unclear priorities, and frustration.

Criteria to Focus Improvement Goals

If you’ve done research, you’ve learned how important it is to narrow the focus of a research question. Hulley and colleagues describe a strong research question as having five characteristics: feasible, interesting, novel, ethical, and relevant (FINER). We can use these criteria to focus improvement goals.

Feasible

Your improvement project should be feasible within the practical limits of your position. A project that you choose to do as a student might be very different from a project you would lead as an attending physician or a registered nurse.

Interesting

The topic for an improvement project should be interesting to you and to your organization. If you are working on a personal improvement project, you should be passionate about the topic. For example, it may be important for you to work on something you have experienced as problematic, such as on-time starts for patient appointments or remembering to wash hands. If a group of students are working to improve an educational topic, they should check with the school administration to see what's on the radar.

Novel

An improvement project should be novel. In Chapter 1, we discussed the fact that improvement work is the act of implementing the best practice in a local setting. Improvement work generally does not generate new, generalizable knowledge in the same way that research does, but it provides an opportunity to learn about local systems and make changes that are important to the people served by those systems. Improvement work will generate new local knowledge about a system, and it allows you to optimize the performance and outcomes of local processes.

Ethical

Your improvement project should be ethical. This is an essential up-front consideration when choosing a project. There should be assurances that the project poses no threat of physical or psychological harm to individuals and that there will be no invasion of privacy.

Relevant

An improvement project needs to be relevant. For clinical improvement projects, it is important that the topic be relevant to patients, staff, and administration.

Step 3: Creating an Aim Statement

After narrowing the focus of the improvement work, your third step is to create an aim statement. Starting improvement work without a clear aim statement is akin to conducting research without a clear hypothesis. Absence of clear direction often leads to wasted time and

effort. A clear aim will keep a project on track, help identify the process, and aid in identifying proper measures.

Using S.M.A.R.T. Criteria to Define a Clear Aim Statement

In many ways, the aim statement for an improvement project reads like the first sentence of a newspaper article. In one sentence of a newspaper article, you know what happened where, who was involved, when it occurred, and perhaps even how it transpired. The aim for improvement work should be equally descriptive. Components of an effective aim statement can be described with the S.M.A.R.T. criteria. The first criterion is that an aim needs to be specific (S) and can be sharpened by including the who, what, where, when, and why components. Next, an aim needs to be measurable (M) and include concrete criteria for assessing progress toward attainment of the goal. The aim should also be attainable (A) and reasonable (R), and it must represent an objective that is achievable and that you are willing and able to work toward. Finally, an aim needs to be grounded within a time frame (T).

Chapter 5: process Literacy

Process Analysis

Many processes are embedded in health care. Processes in health care are not inherently good or bad, but each has developed for a reason. Sometimes a process develops because it is the most efficient way to provide care to patients; sometimes processes develop because of patient or family feedback; some processes exist because they are convenient for billing purposes; and some processes help an organization comply with rules and regulations.

The Importance of Process Analysis

Why is knowing a process and how it operates important for the improvement of care? Process analysis—including the measurement of key steps of the process—is crucial to improvement for three reasons.

Process analysis provides a common picture—a shared model—for an improvement team.

Each member of the team experiences processes differently. The administrative staff, the front-desk staff, nurses, physicians, medical assistants, and the pharmacist all have information about what actually occurs. Describing the process of care from the patient and family's point of view with input from all the stakeholders—including patients and families—creates a shared model, one that can be used and understood by everyone. This model is an important tool for keeping the patient experience at the center of the conversation about improvement.

Process analysis helps identify which parts of the system are important to measure in order to understand and improve the care system. When a process is depicted, the team can identify several different measures. For example, a team working to improve care for patients with myocardial infarctions may consider measuring pain management in the emergency room.

Process analysis helps generate hypotheses for change. When a team starts its work to improve a system, many participants on the team think they know how to make the system better. These individuals may be on the right track, but a common model of the process helps to generate a greater number of possible approaches to improving the system. This process model helps a team see redundancy and waste in the system and figure out whether there are places to rearrange the steps or combine steps in the process. Similar to creating a list of possible diagnoses when a patient

first presents for care, a process model is the key for generating a comprehensive list of possible changes.

Culture, Context, and Systems:

A process in health care is intimately related to the culture of a clinical setting, the context of clinical care, and the health care system.

Culture

Culture has been defined in many different ways. In a general sense, culture is used to denote a historically transmitted pattern of meanings and symbols by which people communicate and develop their knowledge and attitudes about life. This definition reflects the social aspect and development of culture. Culture also refers to a pattern of learned, group-related perceptions—including both verbal and nonverbal language—that is added to values, the belief system, and the disbelief system. This definition is important because in it, culture tells you what is true and what is not true about the system in which you work.

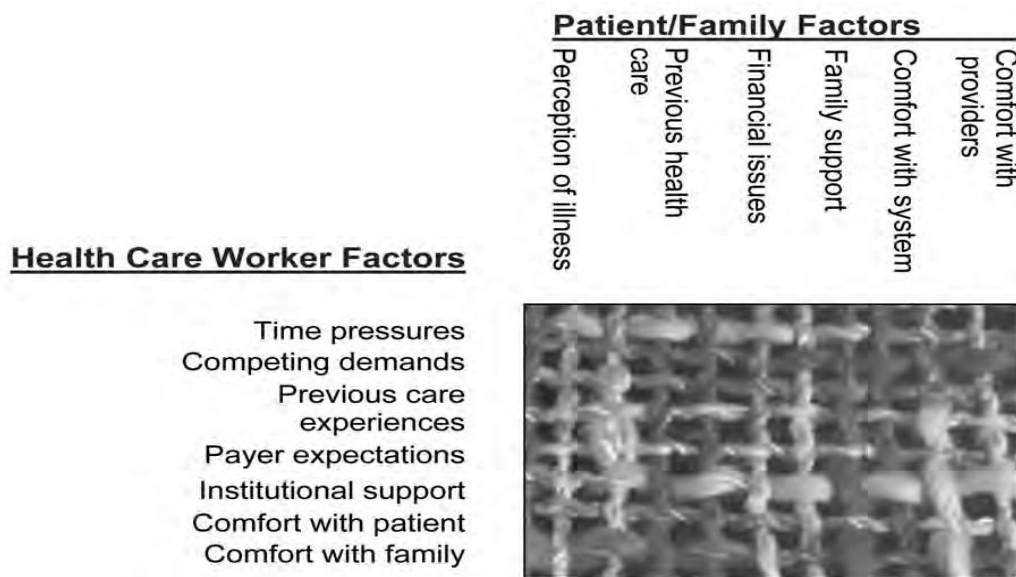
Context

Culture is generally an accumulation over time of the actions, reactions, and artifacts within an organization. A complimentary concept to culture in an organization is context of care. Context refers to the circumstances in which a particular event or situation occurs. Context derives from the Latin *contexere*, which means “to weave together.” Just as context is important for understanding a story in literature, the context of clinical care processes provides a framework. Context is a local occurrence at a particular place and point in time that overlies the culture, which is the underlying and more stable part of the organization. One way to conceptualize this relationship is to think of the cross-weaving of context with an underlying culture.

The complex interaction of culture and context. While identifying an organization’s culture and context might seem simple on the surface, it quickly becomes quite complex. A health care system has many connections and interactions among its multitude of stakeholders: the patients and families, the nurses, the technology and information systems, the physicians, pharmacists, and the administrative staff. When we consider the different ways to view culture and context, these factors, and particularly the interactions between them, become numerous. The important point

here is to appreciate the complexity and depth that culture and context play in the delivery of care; a specific culture and context are not inherently “good” or “bad” but must be—and can be—recognized and described. Illustrating the processes, structures, and patterns of care is immensely helpful in making changes that are important, effective, and stable.

FIGURE 5-1. *Interwoven Elements of Context in a Clinical Care System.*



Systems

Culture and context exist within the different levels of a health care system. Identifying the levels of the system helps us to understand the context. A system is a set of interdependent elements working together to achieve a common aim. These elements may be both human and nonhuman (for example, technology, equipment, information).

Process Modeling

Thus far in this chapter, we have discussed why understanding the culture, context, and system is important and how these concepts are related to one another. Next, we will explore a few of the methods that are available for creating process models.

Depending on the size and scope of an improvement project and the process to be understood, one or more methods may be needed. Becoming familiar with the methods discussed here (as well as other methods to model processes) provides a range of options to describe and understand processes of care. We present several of these tools, identify their strengths and limitations, and explore an example of each related to this chapter's opening vignette (see Table 5-1 below).

TABLE 5-1.

Strengths and Limitations of Basic Process Modeling Techniques⁸

Modeling Technique	Strengths	Limitations
Brainstorming	• Enlists input from many individuals • Can be an important starting point • Generates a wide range of ideas and possibilities	• Brainstorming in a group must be facilitated • must move beyond generating possibilities • Be wary of getting “stuck” on Barriers
Cause-and-effect diagram	• Standard way to identify barriers in a system • Clearly identifies the end product of the system in the “head” • Stems and leaves identify specific aspects of the process	• no time aspect to the diagram (cross-sectional analysis tool) • might be limited by the domains on the stems
Flow diagram	• Shows all parts of the process • Free flowing, so can represent all parts of the process • Standard symbols make interpretation easier	• no clear link to individual or professional responsibilities • Can become cluttered by annotations

	• Can be annotated	
Deployment flowchart	• Same symbols as standard flow diagram • Shows people who perform each step • Columns for measures and change opportunities	• Challenging to fit on one sheet of paper • often difficult to represent complex process with many stakeholders
Workflow diagram	• uses a diagram of the physical layout to map the workflow pattern • Can show flow of people, information, or materials • Can often identify areas of duplication, waste, and handoffs in a process	• Challenging to show multiple patterns or variations in flow • need accurate depiction of the physical layout of an area • nonstandard processes might not show a consistent pattern

Chapter 6: Measurement part 1: Data Analysis for Improvement

The Importance of Data for the Improvement of Health Care

Unfortunately, the attending physician's attitude in the above vignette is still too common. For many years, the public entrusted health care workers—particularly physicians—with providing good-quality care. This was seen as their professional duty and was assumed to occur based on the extensive education and training each had received. The public, and more specifically patients, believed that because clinicians gained knowledge and skills from school and clinical training, they were capable of providing reliable and high-quality care. Care was directed at each individual patient, and outcomes were determined by how each patient fared. Health care will always be directed to each individual patient, but over the past 25 years, there has been a shift to evaluating outcomes of groups of patients and providers. This shift in perspective is rooted in outcomes research and data evaluation; using data to evaluate outcomes is necessary for the improvement of health care.

Building Measurement Knowledge

While the act of measuring health care processes and outcomes has increasingly become an integral part of the health care experience, most health care professionals (clinical as well as administrative) are not given sufficient grounding in measurement methods and statistical applications to cope adequately with the growing demands being placed on them to collect and analyze data for improvement. At some point, most health care professionals likely have learned about statistics, but overall there is relatively shallow knowledge in measurement principles and statistical methods, particularly those that are used in health care improvement.

There are many challenges along the measurement journey and it is not particularly an easy journey. Measurement can be time-consuming and can feel like added work. It can be challenging to make sure data are accurate and consistent. Often, we feel there are too many indicators or not the appropriate indicators for the work we do. On top of this, measurement can feel threatening if it is used against you. If data are gathered and not used—particularly not used to inform decision making—then people become disillusioned with the measurement process. The best of intentions around measurement can frequently become muddled.

There are also some tremendous benefits of measurement for improvement of care. When done right, it can help you make decisions and make you feel more confident about your decisions. Measurement allows you to keep tabs on what is going on and thus sets the stage for improvement of systems. For discussions with clinical and management colleagues, it can provide a common frame of reference and help focus on what is important. Finally, measurement moves us away from anecdotes ($N = 1$) and one person's view to a more comprehensive view of the functioning of the system.

Chapter7: Measurement part 2: using run Charts and Statistical Process Control Charts to Gain Insight into Systems

Run Charts and Statistical Process Control Charts:

Run charts and statistical process control (SPC) charts (sometimes simply called control charts) use the principle of replication for analysis to demonstrate whether a change has occurred from pre intervention (baseline phase) to post intervention (implementation phase). These charts are within the family of time series analyses that plot multiple points, with each point representing the operationally defined unit of measurement (such as a daily, weekly).

How Run Charts Work

A run chart displays data in a time-ordered sequence and can easily be constructed with graph paper and a pencil. Time is plotted along the x-axis, and the appropriate scale for the data is used for the y-axis. The time on the x-axis may be days, months, or quarters, or it may consist of consecutive measurements (for example, blood sugar, blood pressure) taken over some time period, even if not done at regularly spaced intervals. The body of the run chart contains the values in consecutive order, connected by a line. As the data are plotted on the run chart, a measure of central tendency is also added. For a run chart, the measure of central tendency is the median, the point at which half of the data points are above the line and half of the data points are below the line. For example, in a run chart with 25 data points, the median line would be drawn at a location where 12 data points are above the line and 12 data points are below it . Run charts can be used for any process and with any type of data: whole numbers, percentages, proportions.

How Control Charts Work

A statistical process control chart uses point-to-point variation in data to derive control limits. The most essential type of SPC is an XMR chart that uses the average as the measure of central tendency. The upper control limits (UCL) and lower control limit (LCL) represents boundaries that are about three standard deviations on each side of the average. These are calculated using a formula that includes the average of the data points ($\bar{x}$), the average of the difference between each data point (R), and a constant (2.66). It is represented as follows:

$$UCL = \bar{x} + 2.66 \cdot R$$

$$LCL = \bar{x} - 2.66 \cdot R$$

Thus, as each new point is added to the chart, the average, UCL, and LCL are updated. This is the important dynamic characteristic mentioned earlier in the chapter. Because these calculations change with each point that is added, control charts are often constructed with the help of computer software.

The basic anatomy of a control chart is similar to that of a run chart. Time is represented on the x-axis, and the data values are on the y-axis. Individual data points are plotted in the body of the figure. The average and the control limits are derived from the data.

Common Cause Variation and Special Cause Variation

Whether using run charts or control charts to represent data, determining the type of variation present in data is a vital step in taking the correct action. There are two types of variation to understand: common cause variation and special cause variation. Common cause variation is considered inherent in a process and due to regular, natural, or ordinary causes. It usually affects all the outcomes and steps of a process and results in a stable process that is predictable. Sometimes this is called random, or unassignable, variation.

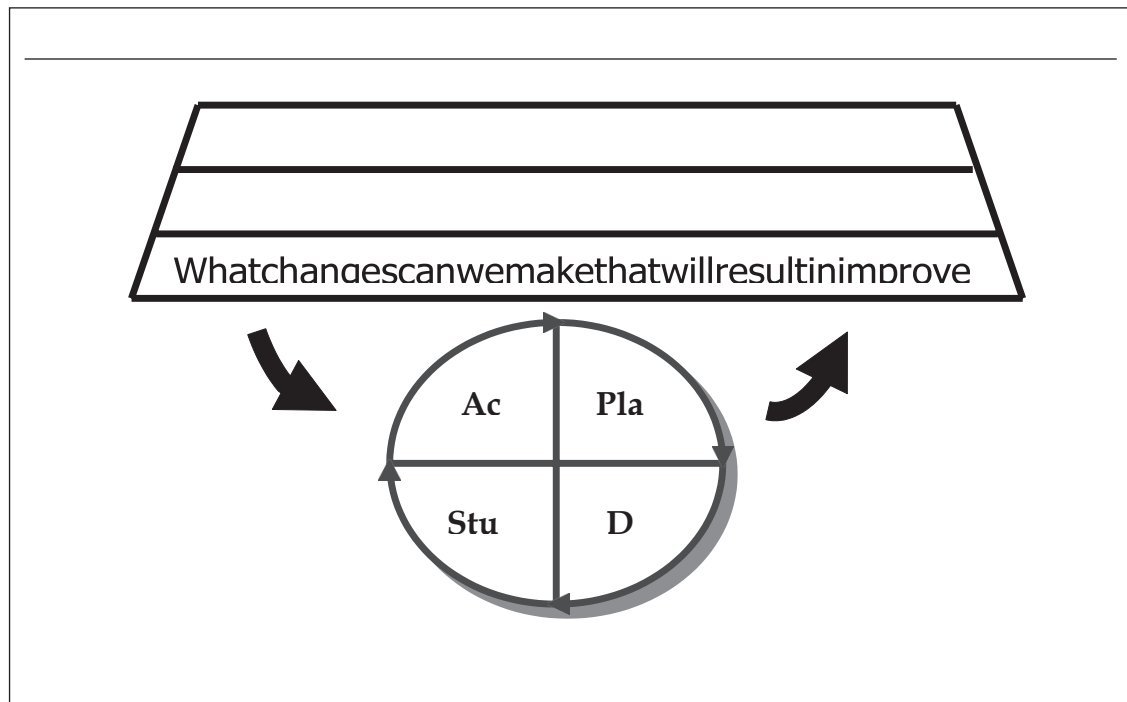
A special cause may represent a very good result, which you might want to enhance. Special cause merely means that something has affected the process to make it unstable and unpredictable. For example, imagine that you are seeing a patient with high blood pressure who is measuring his pressure at home every day. Over the course of two weeks, his systolic blood pressure ranges from 158 to 173 mmHg. This two-week block of data would indicate entirely common cause variation. The blood pressure is stable and predictable, and the data contain only common cause variation; however, the results are entirely unacceptable because the goal of systolic blood pressure is less than 140 mmHg. You introduce an antihypertensive medication to this patient. Over the course of several days, his systolic blood pressure drops to between 125 and 140 mmHg. This would be considered a special cause variation as it is a significant disruption to the system, but it is a good special cause variation. The blood pressure system for this patient at this point in time is considered unstable and unpredictable, even though it has been moved closer to the clinical goal.

Chapter 8: Understanding & making changes in a system

Complex Adaptive Systems

A complex adaptive system (CAS) is defined as “a collection of individual agents who have the freedom to act in ways that are not always predictable and whose actions are interconnected such that one agent’s actions change the context for the other agents.”⁴ The study of CASs has been ongoing for more than 40 years, in fields as diverse as immunology, biology (an ant colony is an example of a biological CAS), economics (the stock market is an example of an economic CAS), and sociology. Similarly, health care systems (at all levels) follow the principles of CASs. The “agents” in a CAS may be human or nonhuman, for the technology that is prevalent in health care also influences the system. Each agent’s actions influence the context of the system, so understanding the context, culture, and processes of care are vital to understanding the nature of the CAS.

FIGURE8-1. *The Model for Improvement*



Complex Adaptive Systems (CAS) Properties:

There are eight principal properties of CASs that enable us to identify the components and interactions within the system. We will examine each of these and apply some of them to the self-care example from the opening vignette:

1. Adaptable elements: In simple systems, machines and components must be changed by external forces; in CASs, the individual elements (whether antibiotic-resistant organisms or groups of people) can change on their own. The elements within a CAS have the internal capacity to change themselves.

2. Simple rules: The underlying norms that occur in a system may or may not be written down, but these norms act as rules that guide individual actions.

Although usually not lengthy, these rules provide guidance about how to act (and react) in relation to the other agents in the system.

3. Nonlinear: Because of interactions with the system, small changes may have very large effects, and large changes may have very small effects. For example, a hospital may initiate a new program with comprehensive training sessions for all its employees. Although this may be a massive effort, very little change might occur. In contrast, what initially seems like a small incident may have a large impact on how people perform their daily work.

4. Novel: Continual creativity is inherently part of the system. In a mechanical system such as an assembly line, actions are repetitive and predictable. In a CAS, the agents often try new ways to perform tasks.

5. Unpredictable in detail: Predicting the future is always challenging. The laws and rules that govern the movement of weather are helpful, but the interaction of those elements is complex, so accurate long-term forecasting is difficult. A complex system, such as weather, must be observed and monitored continually. This is the advantage of monitoring data over time, as discussed in Chapter 7. Run charts and statistical process control charts provide continual monitoring and display a degree of predictability in the systems.

6. Inherently ordered: Self-organization is a key idea in complexity science. For instance, there are no distinct rules that tell birds how and where to fly within a flock, yet birds are able to maintain a safe distance from one another and travel safely together.

7. Contextual and embedded: As we saw in the target diagram in Chapter 5, systems exist within systems and relate to other systems. In Chapter 5 we also discussed the importance of context and culture in a system for identifying the underlying elements that influence the functioning of the system. Although it is possible to identify the individual parts of a CAS, the reductionist approach is not as helpful as considering the fundamental wholeness of the system.

8. Co-evolving: The seven elements just described all contribute to a CAS moving forward through constant tension and then achieving a new balance. As a system is perturbed by change, the system achieves a new steady state. This holds true for single-celled organisms and also for large health care organizations. The tension, uncertainty, and anxiety that come with change are considered healthy elements in complex systems to achieve greater performance.

Managing Changes to a System

Now that you have an understanding of how systems respond to change, how do you start managing these changes? There are multiple theories of making change. Here we present a scenario about reducing falls and injuries due to falls on a hospital unit. We use this scenario to describe the basic elements of change theory, introduce one technique to identify possible changes based on the process diagram, and discuss the PDSA methodology.

Intentional and Emergent Changes

Intentional change: Change that is planned and championed by the leader of a system is sometimes termed intentional change. It is often accompanied by a rational case that is made for the changes. Intentional change usually comes from outside the system and occurs after a planning period. Intentional change is sometimes required to create a large shift in the processes and patterns within a clinical unit.

Emergent change: Emergent change contains no a priori implemented plan. Rather, emergent change is an adaptive response of a complex system. For emergent change to occur, it has to be driven from within the system itself. Outsiders and consultants may hinder emergent change.

Patterns of Responses to Change/Innovation

In his theory of “diffusion of innovation,” Everett Rogers developed a classification for considering how change is taken up and disseminated within a system. choosing the right starting place for change depends on identifying the characteristics of the people and system that will be changed.

Classifying the responders.

Rogers identified five different patterns of responses to innovation or change. The classification of responders is based on these patterns:

Group 1—Innovators: Change often starts with innovators. The innovators are the smallest subgroup and often are the creative and passionate individuals.

Group 2—Early adopters: The next group is the early adopters, who are often respected opinion leaders within the system and are role models for others. As shown in Figure 8-3, early adopters are positioned on the initial upslope of accepting and incorporating a change. These individuals (or the systems in which they work) are willing to try changes and work out the bugs to identify what works and what does not work.

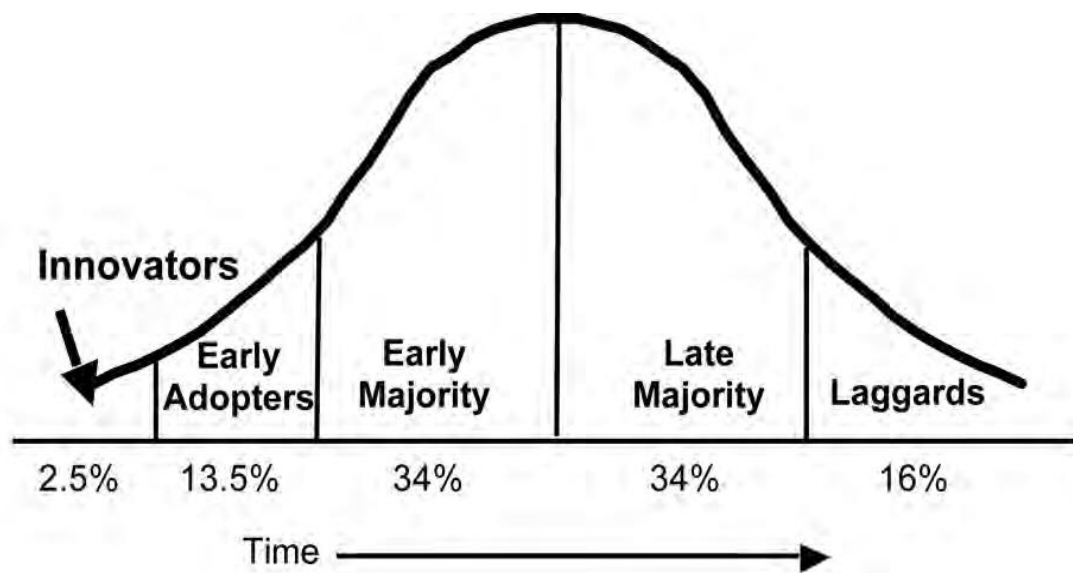
Group 3—Early majority: The next type of responders is the early majority, who represent a critical stage for widespread acceptance of a change. This is the group that, when successfully adopting a change, is able to bring the change to the peak rate of acceptance. The early majority considers the pros and cons of the change and will discuss the changes with others to get a feel for the situation. Once the early majority adopts a change, more generalized acceptance likely will follow.

Group 4—Late majority: The fourth innovation responder category is the late majority. Those in this group often require a bit of friendly peer pressure to take up an innovation.

Group 5—Laggards: The laggards are the final group. Although this term may seem pejorative, the laggards perform an important cross-checking role. They may be suspicious of a new idea and often look to the past instead of the future. For laggards, resistance to an innovation is rational

because they must be certain that important things they value about the current state of affairs will not be lost in the new way of operating.

FIGURE 8-2.*Everett Rogers's Time-Adopter Categories of Change*



Chapter 9: Spreading improvements

Spread: Overview and Definition

Spread is defined as the process by which new ideas are communicated over time through a social system, with the intended outcome being the adoption of the new ideas. Spread is part of an overall process of improvement—a process that involves first testing and refining new ideas or processes on a small scale, such as in a single medical/surgical unit in a hospital or one primary care clinic, and then ensuring that the new processes are embedded in the daily work of the clinicians and staff in those initial units (that is, ensuring that they are implemented). After the improvements have been implemented in the initial units, they are ready for broader adoption across the organization and/or to other organizations. The preceding vignette describes the adoption of the Teach Back method developed in one unit by others within the hospital.

The steps in the approach include the following:

Step 1—Setting a Foundation for Spread

Step 2—Developing an Initial Plan for Spread

Step 3—Carrying Out and Refining the Spread Plan

Step 1: Setting a Foundation for Spread

One of the biggest mistakes that leaders make with spread initiatives is to not plan early enough for how they will spread an improvement that is developed in a pilot site. While it is often said that in order to spread, one needs something to spread, it is also the case that spread does not happen without planning and preparation. There are several recommended steps to consider in establishing a solid foundation for spread, including establishing a team to lead the spread effort and ensuring alignment between the strategic goals of the organization and the spread effort. It is important to note here that the primary responsibility for planning and organizing spread rests with the leadership of the organization or system. Frontline staff play an important role in spread; they are members of teams where the improvements are tested and refined so that they can be easily shared

with others. The support structure needed to actually spread changes across a system must be established, supported, and maintained by the leadership.

Step 2: Developing an Initial Plan for Spread

The spread plan addresses the question of how the organization will reach the goals outlined in the spread aim. There are a number of methods that can be used to organize spread activities, including everything from large-scale campaigns (for example, the Institute for Healthcare Improvement's 100,000 Lives Campaign and 5 Million Lives Campaign) to the use of extension agents working locally. The appropriate method depends on the level of resources (time and money), the characteristics of the organizational structure (such as centralized or decentralized), and the expected reception of the new ideas (resistant, skeptical, and so on).

Step 3: Carrying Out and Refining the Spread Plan

It is the responsibility of the spread team to gather information about the spread process as it unfolds in the organization. The spread team plays an important role in monitoring the process and recommending adjustments, as needed, to ensure that the spread goals are met. Communication plans, materials and information, support and mentorship, infrastructure issues, and social system issues all may need attention during a spread effort.

To gather information about how the campaign was progressing, the leaders of the IHDM spread team visited the units, identifying issues with the monitoring process and barriers that surfaced. For example, the spread leaders followed up with unit managers and physician leaders when the data indicated either a lack of awareness or other issues contributing to low monitoring scores.