

IMPROVING DIAGNOSIS IN MEDICINE



DIAGNOSTIC ERROR *CHANGE PACKAGE*



ACKNOWLEDGEMENTS

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How to Use this Change Package

Improving Diagnosis in Medicine is a tool to help reduce patient safety incidents caused by actions during the diagnostic process. Developed through clinical practice sharing, organization input, and contributions from subject matter experts, patients, and families, this change package is designed to help users identify the circumstances under which diagnostic errors can occur and engage all team members, especially patients and families. This change package includes a menu of strategies, change concepts, and specific actionable items that any hospital can implement. It includes case studies that will guide users in adapting tested interventions and building the infrastructure and support necessary to develop a learning organization capable of responding to adverse events related to diagnosis, thus reducing the risk for harm to patients. This change package is intended to be complementary to literature reviews and other evidence-based tools and resources.

PART 1: WHY THIS MATTERS

> **CAROLYN**

Carolyn came to the emergency department with chest pain, nausea, sweating, and radiating pain through her left arm, which are often considered classic symptoms of a heart attack. The Emergency Department (ED) clinicians ordered an electrocardiogram, blood tests, a chest X-ray, and a treadmill stress test; all of these test results were normal. The ED clinician diagnosed her as having acid reflux, noting Carolyn was in the right demographic for this condition. When Carolyn asked the ED doctor about the pain in her arm, he was dismissive of the symptom. Privately, a nurse in the ED told Carolyn to stop asking the doctor questions, noting that he was a very good doctor and didn't like to be questioned. Carolyn was released from the hospital less than 5 hours after the onset of her symptoms, feeling embarrassed about making a "big fuss" over a relatively common condition. Over the next two weeks, she developed increasingly debilitating symptoms, which prompted her return to the ED where she received a diagnosis of significant heart disease. Carolyn had a myocardial infarction caused by a 99 percent blocked artery.

> **SUE AND HER FAMILY**

Sue's son, Cal, was born healthy in a large hospital, but jaundice appeared soon afterward. Jaundice, or yellowing of the skin, occurs when many red blood cells break down and release a chemical called bilirubin into the bloodstream. Cal's father, Pat, and Sue were informed that treatment for newborn jaundice isn't usually necessary. Unfortunately, because of an incorrect entry of the family's blood types in Cal's medical record, the hospital's clinicians had not recognized that a common blood incompatibility existed and could lead to serious elevations in Cal's bilirubin levels. Within 36 hours, Cal's jaundice had deepened and spread from head to toe. Nevertheless, without measuring his bilirubin level, the hospital discharged Cal and provided Pat and Sue with reassuring information about jaundice, never mentioning that high levels of bilirubin in the blood can cause damage to the brain. Four days later, Cal was more yellow, lethargic, and feeding poorly. His parents took him to a pediatrician, who noted the jaundice but did not do a bilirubin test and advised them to wait 24 more hours to see if Cal improved. The next day, at the request of his parents, Cal was admitted to the hospital, and a blood test showed that the bilirubin level in Cal's blood was dangerously high. Over the next few days while Cal was in the hospital, Pat and Sue reported to staff that he was exhibiting worrisome new behaviors, such as a high-pitched cry, respiratory distress, increased muscle tone, and arching of the neck and back. They were told not to worry. Later it became clear that Cal was experiencing kernicterus, a preventable form of brain damage caused by high bilirubin levels in the blood of newborns. As a result, Cal grew up having significant cerebral palsy, with spasticity of his trunk and limbs, marked speech impairment, difficulty aligning his eyes, and other health and developmental challenges.

> **JEFF**

Jeff was driving home from work when he started experiencing sharp chest pains. Because he was close to the local hospital, he decided to drive directly to the emergency department. Jeff entered the ED stating that he believed he was having a heart attack. He was immediately provided aspirin and nitroglycerin. An electrocardiogram (EKG) was performed, with normal results. Jeff continued to have chest pains and because of his ongoing symptoms, the clinicians told Jeff that they would ready the hospital's helicopter in case he needed to be quickly transported to another hospital for heart surgery. Jeff then started complaining of pain in his leg to his wife, who had arrived at the hospital, and she told the nurse that something must really be wrong because Jeff rarely complained of pain. Upon further examination, clinicians found that Jeff's left foot and leg were swollen, and a computed tomography (CT) scan of Jeff's chest was performed. The CT scan showed that Jeff had an aortic dissection, "a serious condition in which there is a tear in the wall of the major artery carrying blood out of the heart" (MedlinePlus, 2015). His clinicians immediately put him in a helicopter and flew him to another hospital, where he underwent extensive surgery to repair the aortic dissection and repair damage to his leg. Jeff cited the willingness of his clinicians to listen to him and his wife and to continue investigating his symptoms, despite his normal EKG results, as major contributors to his rapid diagnosis. Because aortic dissections are life-threatening events that require urgent treatment, the quick action of the ED to get Jeff to surgery also contributed to the successful outcome. Before his aortic dissection, Jeff was in good health.

To hear these stories told by the patients and family members that experienced them, view the video at <https://www.youtube.com/watch?v=fStBWT6fa3E>.

Diagnostic Error and the Diagnostic Process

Diagnostic error is a leading cause of patient harm and a contributing factor to patient safety events in the health care system. The National Academies of Sciences, Engineering, and Medicine (NASEM) published a seminal report, *Improving Diagnosis in Healthcare*, which explains:

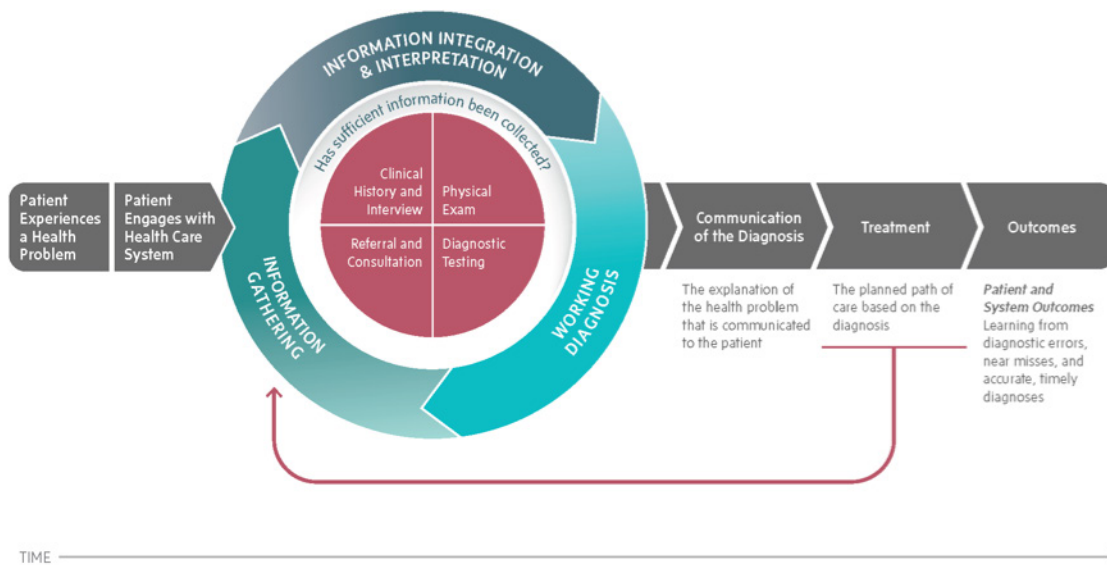
“Delivery of health care has proceeded for decades with a blind spot: Diagnostic errors – inaccurate or delayed diagnoses – persist throughout all settings of care and continue to harm an unacceptable number of patients. ... Without a dedicated focus on improving diagnosis, these errors will likely worsen as the delivery of health care and the diagnostic process continue to increase in complexity.”¹⁹

Though these errors do not always manifest in discernable patient harm, they can result in or be associated with death or significant patient morbidity including loss of function and mental distress. Diagnostic error is also associated with increased health care costs because of delayed or inappropriate treatment, inappropriate testing, delayed diagnosis leading to avoidable disease progression, and litigation by patients and families.

Diagnostic error is defined as “the failure to (a) establish an accurate and timely explanation of the patient’s health problem(s) or (b) communicate that explanation to the patient.”¹⁹ The key variables in this definition are accuracy, timeliness, and communication.

Diagnosis is a process, and like any process, it is susceptible to error. The process is particularly complex because it typically includes many handoffs of information or materials, involves uncertainty, and the underlying diagnosis may evolve over time or present in many different ways. The process also involves large numbers of participants, including health care providers, patients, and family members.

Diagnostic error may occur at any point along the diagnostic process. To reduce the risk of a diagnostic error, it must be understood within the context of the process.¹⁹ To do so and account for the complexity of the process, the NASEM report proposed a conceptual model that is consistent with the multifaceted aspects of diagnosis. Developing a diagnosis may require multiple iterations of information gathering from a variety of sources, including the diagnostic team, patients, family members, diagnostic tests, and consultations, as well as high-level cognitive reasoning to gain a sufficient understanding of the patient’s symptoms, eliminate possibilities, and ultimately to determine the cause of the patient’s health issue (see Figure 1 and Box A).

FIGURE 1. The Diagnostic Process

Source: National Academies of Sciences, Engineering, and Medicine. 2015. *Improving Diagnosis in Health Care*. Washington, DC:

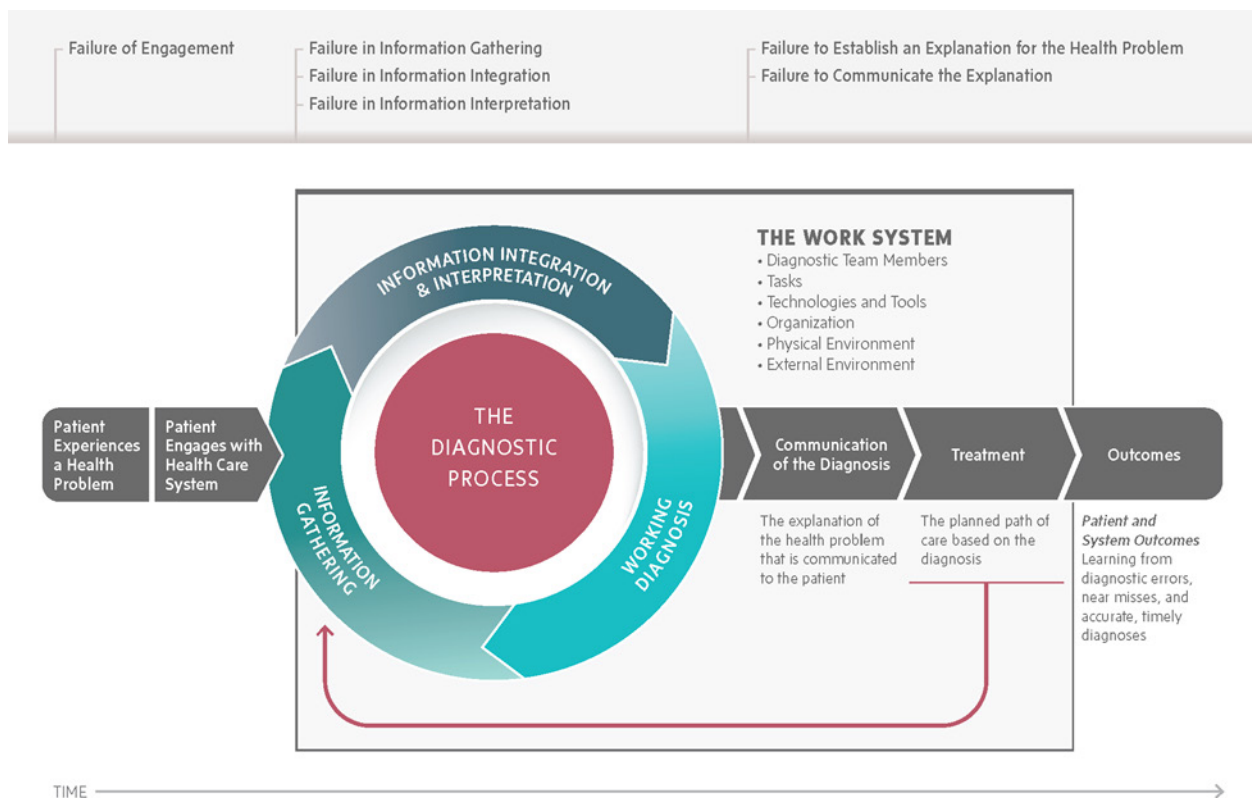
A *diagnostic team* comprises, at a minimum, clinicians, patients, and their families. Depending on the issue, the team may be expanded to include other members, such as representatives from management/administration, information technology, and/or environmental services.¹⁹ Inherent in the definition of *diagnostic error* are two suppositions: first, an appropriate diagnosis could have been made earlier in the diagnostic process, or a patient or family member or both could have been better informed of or involved in the process, leading to improved outcomes; second, the patient and family were actively engaged, referred to as patient and family engagement (PFE) (see Box A).

Box A: Patient and family engagement

(PFE) is defined as “patients, families, their representatives, and health professionals working in active partnership at various levels across the health care system – direct care, organizational design and governance, and policymaking – to improve health and health care.”^{7, 11}

Most diagnostic errors are the result of a combination of system-based issues, environmental or contextual issues, and cognitive issues.¹⁹ Diagnostic errors with a single cause are relatively uncommon (see Figure 2).¹⁹ Environmental or contextual issues refer to aspects of the physical environment, such as lack of equipment or an appropriate space, to examine patients, which affect a provider's ability to perform cognitive tasks required of the diagnostic process. A system-based issue can manifest as a communication or documentation error occurring during the handoff or transfer of care, which can affect the amount or type of information a provider has at the time of diagnosis and thus the diagnosis itself. A cognitive error involves the provider's thought process, such as prematurely latching on to a diagnosis based on evidence at hand and abandoning the search for new or contradictory evidence, or not actively engaging and listening to patients and families about persistent or worsening symptoms.

FIGURE 2. Places in the diagnostic process where errors can occur



Source: National Academies of Sciences, Engineering, and Medicine. 2015. Improving Diagnosis in Health Care. Washington, DC: The National Academies Press

Partnering with Patients and Families to Reduce the Risk of a Diagnostic Error

To reduce the risk of diagnostic error, health care organizations must raise awareness among health care providers; engage patients and family members in direct care, organizational design, governance, and policymaking; embed patients or family members or both in the safety and quality culture; and build an infrastructure that better supports the diagnostic team and process. Organizational goals related to identifying diagnostic quality issues and improving diagnostic accuracy and timeliness should be included in quality improvement activities, and the organization should invest in patient safety incident reporting systems. Health care organizations must develop a cadre of physician, patient, and family member champions dedicated to improving performance in diagnosis. Diagnostic error can no longer remain a hidden patient safety issue.

There is much to learn and improve related to the health care provider relationship and communication with patients in the diagnostic process as well as in patient and family member participation in co-developing diagnostic improvement efforts. According to NASEM report recommendations, care professionals and organizations should partner with patients and their families as diagnostic team members to facilitate patient and family engagement in the diagnostic process, aligning needs, values, and preferences.¹⁹ (See Box B)

BOX B: Recommended methods to engage patients and families:

1. Provide patients and their families with opportunities to learn about the diagnostic process.
2. Create environments in which patients and their families are comfortable engaging in the diagnostic process and sharing feedback about diagnostic errors and near misses.
3. Ensure patients and family members have access to electronic health records, including clinical notes and diagnostic testing results, to better engage patients and their families in their care and allow them to review their health records for accuracy.
4. Identify opportunities to include patients and their families in efforts to improve the diagnostic process by learning from diagnostic errors and near misses.

The Centers for Medicare & Medicaid Services (CMS) has advanced a vision of a safer, more equitable, and person-centered health care system transformed by meaningful person and family engagement²⁵ (see Box C). They offer the opportunity for involvement which can be adapted to the diagnosis.

Box D highlights additional examples of patient-reported or patient-related actions that can be used to improve the diagnostic process.² Ideally, patients and their family members should be involved in all diagnostic activities; but legally and ethically, it is the patient's right to limit access to their own information, provided the patient is not a minor and is competent and coherent. Thus the health care organization should strive to include family members while respecting the patient's decision regarding granting access to family members.

BOX C: Five Patient and Family Engagement Strategies from CMS Partnership for Patients:

1. Use preadmission planning checklists.
2. Shift change huddles and bedside reporting with patients and families.
3. Assign a designated PFE leader.
4. Create a patient and family advisory committee or engage patient and family representatives on hospital committees.
5. Provide patient representation on boards of directors.

BOX D: Patient and Family Engagement Change Ideas

1. Create opportunities for patients and family members to use tools and learn about and participate in the diagnostic process (SIDM Toolkit, preadmission checklist, shared decision making, teach-back, Patient Activation Measure survey [PAM] discharge planning).
2. Provide patient and family member access to their electronic health records, including clinical notes and test results, to facilitate review of their own health records for accuracy.
3. Develop processes and systems so patients and their families can share feedback and concerns about diagnostic errors and near misses.
4. Provide orientation and training regarding diagnostic safety and quality to support patient and family participation in governance activities (PFACs, Practice Improvement Teams, board representatives, etc.).
5. Provide understandable discharge information to patients about serious symptoms to report, to whom to report it, and how to escalate.
6. Develop organizational tools to assess and measure patient and family member understanding of their diagnosis.
7. Develop a rapid response system that patients can activate when a serious change in the patient's medical condition occurs (Code HELP).

PART 2: MEASUREMENT

A key component to making patient care safer is to measurably track improvement. There is ongoing work to create national consensus based measures for diagnostic quality that can be used to compare performance across providers and track national improvement. Such nationally validated and tracked measures do not exist as of the publication date of this change package. However, the narratives in event reports and the qualitative results of surveys currently being used in specific research projects, such as those described in the case studies, can be used to assist with improvement efforts internal to hospitals and health systems. This includes unanticipated consequences and other factors influencing outcomes while nationally validated outcome and process measures are validated.

Although **outcome measures** are traditionally the most important in patient safety because they reflect the results of patient care, such measures are difficult in the realm of diagnostic error. Health care organizations currently are not able to accurately describe population rates of diagnostic error for trending or comparison purposes. Some researchers have done labor-intensive comprehensive chart reviews to define the basic epidemiology of diagnostic error.¹² Others have used electronic data mining to identify groups of patients at high risk for diagnostic error. Notwithstanding the significant challenges of using outcome measures for diagnostic error, hospitals can consider using several outcome measures to provide contextual information for their own internal improvement efforts. Such outcome measures include:

- > Number and rates of disease-specific diagnostic errors (i.e., missed stroke in the ED identified through admit and discharge diagnosis discrepancy, delays in diagnosis of abdominal aortic aneurysm through chart review of all cases)
- > Number of self-reported diagnostic error cases on a clinical service
- > Anatomic pathology discrepancy rate for second-opinion cases
- > Radiology overread discrepancy rate
- > Survey data, such as HCAPHS, asking patients if they know and understand their diagnosis after clinical encounters
- > Number of readmissions due to diagnostic errors
- > Number of diagnostic errors reported by patients, nurses, or physicians

Process measures are important to follow when implementing any change ideas. The following are examples of process measures that can be used with improvement efforts:

- > Percentage of patients for whom diagnostic protocol was followed (i.e., pulmonary embolism, sepsis, spinal epidural abscess)
- > Percentage of patients with referrals for which the referring provider receives a report from the provider to whom the patient was referred [CMS eCQI ID:CMS50v3]¹⁰
- > Turnaround time for final read of anatomic pathology specimens
- > Percentage of cases that document differential diagnosis in the patient record
- > Number of team members who completed diagnostic safety-related training
- > Number of cases where specialty referral was correctly sought
- > Percentage of patients for whom interpreter services were used when need was correctly identified
- > Percentage of patients for whom teach-back communication was used regarding diagnosis
- > Number of root cause analyses completed per month for diagnostic error cases
- > Time between actionable screening result and diagnosis

Structural measures are important to use to ensure the infrastructure needed to successfully improve diagnosis is in place. Basic elements of a program to improve diagnosis in a health care system include:

- > A safety or error classification system with a unique category for diagnosis
- > Use of a leadership dashboard with measures related to diagnostic performance
- > Designated organizational leader or committee or both with dedicated time focused on improving diagnosis
- > Patient and family advisory council with diagnostic error on the agenda and work plan
- > Electronic health record with specific diagnostic clinical decision support
- > Feedback mechanisms on diagnostic performance for clinicians, departments and service lines, organizations, health care systems
- > Capability to measure turnaround time on tests from order to result retrieval

The measurement options described above should be used in conjunction with the next section, Part 3 – Suggested Tools to Investigate the Problem and Implement Best Practices, to determine the impact of interventions designed to reduce patient incidents resulting from the diagnostic process.

PART 3: SUGGESTED TOOLS TO INVESTIGATE THE PROBLEM AND IMPLEMENT BEST PRACTICES

DRIVER DIAGRAM

A driver diagram is an applicable tool for many contexts, from improving process reliability, to redesigning a service, to creating new products, to generating enhanced user experience.⁴ The tool visually represents a shared theory of how things might be better, building upon knowledge gleaned from research, observation, and experience. The primary and secondary drivers from which the tool derives its name are intended to identify the elements in the system that are necessary and sufficient for achieving the intended aim—in this case, improving diagnosis to reduce harm.

Driver Definitions

Key Leverage Points: The driver diagram is applicable to each step in the theoretical model for diagnosis. The primary and secondary drivers identify elements in the system that are necessary and sufficient to strengthen in order to achieve the intended aim.

- > The **Effective Teamwork Driver** refers to the skills and competencies of an interdependent, multidisciplinary team typically organized under the leadership of a physician; each member of the team has specific responsibilities, and the entire team contributes to patient care. The key change ideas or descriptions associated with the Effective Teamwork Driver are actionable changes known or with potential to improve the system, processes, or culture, which can be tested *by the diagnostic team*.
- > The **Reliable Diagnostic Process Driver** describes all steps involved in attempting to achieve an accurate, timely, and communicated diagnosis in partnership with the patient and family members, and the environment in which this takes place. The key change ideas or descriptions associated with the Reliable Diagnostic Process Driver are actionable changes known or with potential to improve the system, processes, or operating norms, which can be evaluated *by all involved in and directly or indirectly affected by implementing the change*.
- > The **Engaged Patients and Family Members Driver** refers to actions taken by the patient and family members working in active partnership with people at various levels across the health care system — direct care, organizational design, governance and policy making — to improve health and health care. The key change ideas or descriptions associated with the Engaged Patients and Family Members Driver are actionable changes known or with potential to improve the system, processes, or operating norms, which can be tested *by patient and family members in collaboration with health care providers and organizations*.

- > The **Optimized Cognitive Performance Driver** refers to the process of clinical reasoning: how the diagnostician integrates their own knowledge and the information derived from the patient, family, other members of the care team, and the medical record to arrive at appropriate diagnostic considerations. Cognitive performance also includes the use of technological and other aids to augment human cognition. The key change ideas or descriptions associated with the Optimized Cognitive Performance Driver are actionable changes known or with potential to improve the system, processes, or operating norms, which can be tested *by diagnosticians*.
- > The **Robust Learning Systems Driver** describes the structure and processes of creating, retaining, and transferring knowledge within a team to support organizational learning. An organizational team improves over time as it gains experience and receives and incorporates feedback from patients and families regarding experience and outcomes. The key change ideas or descriptions associated with the Robust Learning Systems Driver are actionable changes known or with potential to improve the system, processes, or operating norms, which can be tested *by those who work within or manage the system*.

AIM	PRIMARY DRIVERS	SECONDARY DRIVERS
IMPROVE DIAGNOSIS TO REDUCE HARM	Effective Teamwork	Diagnostic teams include diverse health care disciplines and patients and families
		Diagnostic teams model PFE and culture of safety principles and practices
	Reliable Diagnostic Process	Organizational structures optimized for diagnostic safety
		Clinical operations and information flow effectiveness
		Accessible specialty expertise
	Engaged Patients and Family Members (PFE)	Patient and family members on diagnostic team
		Patient and family partnership in diagnosis improvement, Governance, policy, and in error reporting and follow-up
	Optimized Cognitive Performance	Effective clinical decision support
		Clinical reasoning abilities
		Reflective practice
	Robust Learning Systems	Diagnostic error identification
		Diagnostic performance feedback
		Continuous learning about diagnosis

Primary Driver: Effective Teamwork

PRIMARY DRIVER	SECONDARY DRIVERS	KEY CHANGE IDEAS OR DESCRIPTIONS
EFFECTIVE TEAMWORK	Diagnostic teams include diverse health care disciplines and patients and families	<ul style="list-style-type: none"> • Work in diagnostic teams (including patients and family members) as defined in the NASEM Report on Improving Diagnosis in health care ⁵ • Identify structure of diagnostic team • Implement pathology clinical diagnostic services ²⁰ • Create structures that ensure communication between primary care and specialist providers (i.e., radiology rounds) • Promote diagnostic teaming through periodic case reviews • Teach the diagnostic process to all disciplines, patients, and families • Routinely discuss diagnosis and expected clinical course with all team members • Enhance information exchange for transitions (handoff) utilizing standardized tools (e.g., I Pass the Baton) • Use effective team meeting structure and process to support communication and coordination • Educate team members, including patients and family members, about their roles in the diagnostic process and their diagnostic responsibilities • Identify opportunities for patient family engagement (e.g., bedside huddles)
	Diagnostic teams model PFE and Culture of Safety principles and practices	<ul style="list-style-type: none"> • Offer team leadership skills development (TeamSTEPPS, CUSP, Psychological Safety, Crucial Conversations, other) • Conduct multidisciplinary team training for team communication skills (TeamSTEPPS, CUSP, SBAR, conflict management, other) • Include explicit questions in multi-disciplinary team rounding regarding increased information gathering (e.g., influences differential and recognition of typical clinical course) • Provide learning opportunities for patients, families, and caregivers to learn about the diagnostic process (e.g., diagnostic toolkit, diagnostic uncertainty questions) • Improve processes to support team-based debate on diagnosis (e.g., Red Team/Blue Team) • Encourage use of diagnostic timeouts by all team members • Engage in shared decision making about goals related to diagnosis and care • Teach patients and families the importance of accuracy and thoroughness when giving health history and physical information • Develop communication tool for patients and families identifying risk of diagnostic error (e.g., a diagnostic charter or consent for clinical care) • Teach clinicians to actively engage in informed decision-making process • Teach empathy to members of the diagnostic team using an established or locally developed curriculum • Teach and monitor active listening to members of the diagnostic team • Implement full transparency to patients, families, and caregivers for clinical documentation (e.g., OpenNotes) ³

Primary Driver: Reliable Diagnostic Process

PRIMARY DRIVER	SECONDARY DRIVER	KEY CHANGE IDEAS OR DESCRIPTIONS
RELIABLE DIAGNOSTIC PROCESS	Organization structures optimized for diagnostic safety	<ul style="list-style-type: none"> • Leaders create a culture, structure, and process that encourage and support patient and family engagement in the diagnostic process as well diagnostic improvement efforts and governance • Use data mining and surveillance tools for early identification and mitigation of diagnostic error (i.e., Kaiser Permanent SureNet Program) ²⁷ • Develop an early warning system to support clinical deterioration (e.g., PEWS, MEWS) • Provide data access and analytic support to monitor diagnosis
	Clinical operations and information flow effectiveness	<ul style="list-style-type: none"> • Use forcing functions to help manage results (e.g., alerts for out-of-range results, incomplete testing, or delayed or canceled high-risk referrals) • Clearly define escalation path for deteriorating clinical conditions • Improve follow-up (lab/radiology/clinical process management systems); closing the loop; design process for connecting and reporting test results that return after discharge (e.g., D/C summary contains list of pending test results) ⁹ • Optimize how staff are aligned and work to improve diagnosis (e.g., care tracks; preplanned workflows; how to minimize patient trips, “swarming” – the whole team meets the patient at the onset of care) • Improve ED follow-up process • Use and evaluate patient communication devices such as whiteboards, iPads, OpenNotes, and patient portals to improve communication with patients and their families • Create systems for patients and families to give ongoing feedback during the course of illness • Increase interoperability of EHR data • Implement standard templates for requesting specialty referrals
	Accessible specialty expertise	<ul style="list-style-type: none"> • Explore electronic or telemedicine curbside/consultant documentation and infrastructure • Clarify who comprises the diagnostic team and the most effective ways to share expertise across the team • Implement processes that ensure specialty expertise is available when patients present for care (e.g., neurologist in the ED, concurrent radiology reads overnight, etc.) • Improve resident supervision of diagnostic process • Create environment and processes that make patients and family members feel comfortable requesting specialty expertise

Primary Driver: Engaged Patients and Family Members

PRIMARY DRIVER	SECONDARY DRIVER	KEY CHANGE IDEAS OR DESCRIPTIONS
ENGAGED PATIENTS AND FAMILY MEMBERS	Patient and family members on diagnostic team	<ul style="list-style-type: none"> Facilitate patient and family engagement in the diagnostic process, aligned with their needs, values, and preferences Adapt PfP preadmission checklist to orient patients to diagnostic process (inviting them to participate in the diagnostic process) Provide relevant patient education materials and access to credible resources (i.e., SIDM The Patient's Toolkit for Diagnosis, medical libraries, trusted websites) ²⁴ Ensure processes and culture support patients and their families to share feedback and concerns about diagnostic errors and near misses Ensure patients have access to electronic health records, including clinical notes and diagnostic testing results, to facilitate their engagement in the diagnostic process and their review of health records for accuracy Adapt shift change huddles / bedside reporting with patients and families for improving diagnosis Provide understandable discharge information informing patients of symptoms to report and to whom and when Implement a rapid response system for patients to activate when a serious change in their medical condition occurs (Code HELP) Create processes that make patients and family members feel comfortable requesting specialty expertise and second opinions Adapt Patient Activation Measure (PAM) or similar tool to measure patient activation and motivation Implement teach-back for diagnosis and diagnostic uncertainty Engage in shared decision making about goals related to diagnosis and care throughout the informed consent process Develop communication tool for patients and families identifying risk of diagnostic error (e.g., diagnostic charter or consent for clinical care) Clarify health literacy and language preference; use translator or advocate when necessary in clinical encounters
	Patient and family partnership in diagnosis improvement, governance, and policy	<ul style="list-style-type: none"> Incorporate diagnostic errors work on patient and family advisory councils, quality improvement teams, and governance Include patients, families, and/or representatives from patient and family advisory council in root cause analysis of diagnostic error cases Provide orientation and training about diagnostic safety and quality to health care personnel, patients, and family members that enables their participation in governance (patient and family advisory councils, practice improvement teams, board representatives) Adapt PfP Health Equity Roadmap methods to ensure equity in health care quality and safety

Primary Driver: Optimized Cognitive Performance

PRIMARY DRIVER	SECONDARY DRIVER	KEY CHANGE IDEAS OR DESCRIPTIONS
OPTIMIZED COGNITIVE PERFORMANCE	Effective clinical decision support	<ul style="list-style-type: none"> • Provide the local prevalence of specific diseases at a specific point in time (i.e., local influenza rates) • Implement process of conveying the degree of diagnostic uncertainty a clinician has for a specific diagnosis in a patient • Require documentation regarding differential diagnosis • Develop forcing functions in EHR to support desired behaviors (e.g., documentation of differential diagnosis) • Implement and test differential diagnosis generators • Explore forcing function of including “Not Yet Diagnosed” as a convention in EHR to enhance communication and convey uncertainty of diagnosis to care providers • Implement and test artificial intelligence tools for diagnosis as guided by available evidence ²³
	Clinical abilities	<ul style="list-style-type: none"> • Provide education to all members of the team (including patient and family member representatives on PFACs, quality improvement committees, and boards), guided by emerging evidence, on: <ul style="list-style-type: none"> • the mechanics of clinical reasoning • common cognitive causes of diagnostic error • the role of uncertainty in the diagnostic process • common biases • potential methods of reducing cognitive error, including cognitive debiasing, checklists, and timeouts ^{8, 13} • Provide education on evidence-based approaches for improving clinical reasoning abilities in undergraduate, graduate, and continuing medical education programs • Create forums for mentorship on clinical reasoning abilities
	Reflective practice	<ul style="list-style-type: none"> • Implement and monitor use of locally developed diagnostic timeouts ¹⁸ • Implement and monitor use of locally developed diagnostic checklists ^{15, 17} • Implement tools to promote reflective processes (e.g., Take 2 – Think, Do; Crystal Ball) • Provide protected forum for discussing favorable and unfavorable diagnostic outcomes • Create forums for debriefing and discussing clinical reasoning

Primary Driver: Robust Learning Systems

PRIMARY DRIVER	SECONDARY DRIVER	KEY CHANGE IDEAS OR DESCRIPTIONS
ROBUST LEARNING SYSTEMS	Diagnostic error identification	<ul style="list-style-type: none"> • Perform root cause analysis using diagnostic error fishbone diagram ²⁶ • Include diagnostic errors review in peer review discussions • Review cases of potential diagnostic error using Safer DX Tool to identify errors ^{1, 17} • Follow metrics for number of diagnostic error cases identified and reviewed per month and per year • Review number of cases of diagnostic error from existing sources such as malpractice claims cases, autopsy reviews, radiology overreads, etc. • Create a process for simple and anonymous reporting of diagnostic errors by all members of the diagnostic team, including patients and clinicians outside of the specific health care system • Experiment with measuring diagnostic errors using Symptom-Disease Pair Analysis of Diagnostic Error (SPADE) methodology ²¹
	Diagnostic performance feedback	<ul style="list-style-type: none"> • Develop reliable and routine timely feedback processes for communicating diagnosis to ED, patient and family members, providers, and diagnostic team (e.g. murmurs) • Develop methods to provide reliable, routine, and timely feedback on diagnostic performance to individual clinicians, practice groups, departments, service lines, organizations, and other relevant groups (e.g., diagnostic error index) • Aggregate and make transparent existing sources for diagnostic information, such as medical malpractice data, radiology overreads, pathology second opinions, inpatient discharge vs. admit diagnoses, etc. • Create and disseminate diagnostic errors dashboard • Develop a process for obtaining and reviewing patient experience feedback in order to assess diagnostic performance • Implement a patient-centered approach for early disclosure of adverse events and also a method to achieve an amicable and fair resolution for the patient, family, and involved health care providers (e.g., CANDOR)
	Continuous learning about diagnosis	<ul style="list-style-type: none"> • Increase awareness of diagnostic harm and errors through grand rounds, board of trustee and senior management education, visiting professors rounds, faculty development conferences, etc. • Incorporate clinical reasoning, diagnosis, and cognitive debiasing curriculum into medical schools, nursing schools, residencies, and continuing medical education programs • Engage patients and families in Diagnostic improvement efforts, including offering grand rounds and co-developing new processes, policies, and Diagnostic materials • Create expectation that departments, health care organizations, and other relevant clinical groups regularly report diagnostic errors and efforts to mitigate incidence and harm

PART 4: CASE STUDIES

- > **CONTINUOUS LEARNING ABOUT DIAGNOSIS IN A HOSPITAL MEDICINE PROGRAM**
AVERA CREIGHTON HOSPITAL AND UNIVERSITY OF CALIFORNIA SAN FRANCISCO (UCSF)
MEDICAL CENTER
- > **THE KAISER PERMANENTE SURENET PROGRAM: MAKING SURE PATIENTS WHO NEED FOLLOW-UP DON'T FALL THROUGH THE CRACKS**
KAISER PERMANENTE
- > **DEVELOPING EDUCATIONAL AND ORGANIZATIONAL PROGRAMS TO IMPROVE CLINICAL REASONING AND DIAGNOSIS**
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CONTINUOUS LEARNING ABOUT DIAGNOSIS IN A HOSPITAL MEDICINE PROGRAM

AVERA CREIGHTON HOSPITAL AND UNIVERSITY OF CALIFORNIA SAN FRANCISCO (UCSF) MEDICAL CENTER

Avera Creighton Hospital found that most of its clinical programs do not systematically identify diagnostic errors; thus, there was a missed opportunity to learn and improve diagnostic reliability. To address this issue, Avera Creighton Hospital and the UCSF Department of Medicine instituted a process that ensures a timely root cause analysis occurs for cases involving diagnostic error. As a result, the Department of Medicine incorporates multiple processes to systematically assess and learn from its diagnostic process.



Intervention

Members of the hospital medicine program identified cases to include in this intervention using seven-day hospital readmissions, autopsy results, inpatient mortality data, and patient self-report as triggers. Two hospital medicine physicians reviewed these cases using the Safer Dx tool ^{1, 16}, classifying each as either “diagnostic error” or “no diagnostic error.” All diagnostic error cases were reviewed using a diagnostic error fishbone diagram ⁸ to identify root causes and contributing factors. The hospital medicine physician group as well as primary care physicians received feedback on the cases and trends; Providers were contacted by email and invited to a discussion of diagnostic process that focused on systems improvement.



Results

From January through March 2018, there were 1,978 discharges from the hospital medical service with 85 seven-day readmissions (4.3%). Seventy-seven seven-day readmissions were reviewed. Nine (12%) were found to contain diagnostic errors, representing a span of diagnoses including organ systems of gastrointestinal (GI) (subcapsular hepatic hematoma, cholangitis, liver abscess, malignancy-related Gastrointestinal bleeding (GIB), GIB due to antral ulcer), renal (hypernatremia, Syndrome of Inappropriate Antidiuretic Hormone Secretion (SIADH)), rheum (lupus flare with ITP/serositis) and head, eyes, ears, nose, and throat (peritonsillar abscess). Eight had a moderate impact, such as short-term morbidity, increased length of stay, or invasive procedure, and one had a mild impact. Reviewers initially agreed that a diagnostic error was present in four of these nine cases prior to the adjudication process. The most common categories of root cause included laboratory/radiology tests and assessment. The most common subcategories were failure or delay in ordering needed test(s), erroneous clinician interpretation of test, and failure or delay to recognize or weigh urgency.



Lessons Learned

This work confirmed that it is possible to sustain a review of 20 to 30 cases per month. The main lesson learned was that despite physicians remaining hesitant to report their own or colleagues' diagnostic errors, there are individuals within the organization interested in analyzing diagnostic error. The hospital and medical center now have created a network of interested clinicians and staff wanting feedback on diagnostic error cases.



Key Milestones

Key milestones include:

- > developing electronic seven-day readmissions, autopsy, and in-hospital mortality triggers;
- > engaging and training providers to use Safer Dx and DEER taxonomy tools to perform chart reviews; and
- > sharing case and contributing factor data at a variety of forums, such as case review committee meetings, faculty meetings, and morbidity and mortality conferences.



Overcoming Challenges

The main challenges encountered include:

- > the complexity of the diagnostic error review, specifically identifying events in cases as diagnostic errors;
- > incomplete and/or ambiguous chart documentation not capturing the nuances of the diagnostic process and root causes of error; and
- > the breadth of diagnoses as well as underlying etiologies identified as errors, which highlighted the challenge of applying a generalized system solution.

These challenges were addressed by:

- > ensuring two or three cases per month are analyzed by the entire review team to ensure consistency of assessment, which more routinely engages providers in using the DEER taxonomy analysis;
- > creating visibility around the work, including adding diagnostic error cases on the provider-level performance dashboard; and
- > tailoring solutions to specific chief complaints or diagnoses.

**Next Steps**

Next steps include ongoing testing and modification of a structure for peer-to-peer feedback, engaging primary care providers and subspecialists in reporting cases and case review/feedback, and continuing to collect data to describe local epidemiology of diagnostic error in hospital medicine and evaluate a cohort of cases for predictors of diagnostic error.

THE KAISER PERMANENTE SURENET PROGRAM: MAKING SURE PATIENTS WHO NEED FOLLOW-UP DON'T FALL THROUGH THE CRACKS

KAISER PERMANENTE

The Kaiser Permanente SureNet (KP SureNet), is an EHR safety net program which focuses on categories of outpatient risk—diagnosis detection and follow-up, care coordination, and medication safety. The KP SureNet helps clinical teams identify potential vulnerabilities so they can intervene and prevent a diagnostic error from emerging and potentially harming a patient, making sure patients do not “fall through the cracks.”



Intervention

The KP SureNet program is led by a centralized team dedicated to systematically identifying inadvertent lapses in care and intervening before a patient is affected. KP SureNet leverages the complete care philosophy of establishing reliable care processes to ensure region-wide consistency, measurability, accuracy, and complementary support to front-line care. This work has significantly helped improve patient outcomes by providing clinicians with resources to ensure proper care is delivered across the care continuum. Currently, the program includes more than 50 initiatives and is used in eight regions served by Kaiser Permanente, covering more than 12 million patients, and at Brigham and Women's and Boston Children's Hospital.



Results

The KP SureNet connects with more than 100,000 patients per year. Under the program, more than 50 initiatives are aimed at diagnosis detection to identify lapses in care and intervene before a patient is affected. Projects include:

- > Gross hematuria screening, which ensures patients with gross hematuria on urine specimens have appropriate diagnostic follow-up with an urologist. In the past year, KP SureNet has referred 980 patients to urology, and 37 cases of cancer were detected.
- > Abdominal aortic aneurysm screening ensures the patients with the condition have appropriate follow-up testing. In four years, KP SureNet has ordered 2,625 ultrasounds and sent 1,464 vascular surgery referrals. Following intervention from the program, 185 patients have had surgical intervention for abdominal aortic aneurysms.
- > Hepatitis C. screening ensures persons at risk for infection are screened. In three years, KP SureNet ordered 2,667 confirmatory tests for patients who initially tested positive for Hepatitis C but did not have confirmatory testing. In three years, 615 patients were found positive for Hepatitis C.



Lessons Learned

Developing and maintaining a centralized process to systematically follow patients is an effective method to ensure appropriate and timely care is provided.



Key Milestones

Key milestones include:

- > patients with sickle cell disease or with post-splenectomy do not miss immunizations,
- > patients taking amiodarone do not miss routine lab testing,
- > patients testing positive for chlamydia receive treatment,
- > patients with Down syndrome have annual thyroid tests and ophthalmology and audiology screening, and
- > patients with iron deficiency anemia have follow-up appointments with gastroenterologists.



Overcoming Challenges

Challenges include:

- > collecting reliable and valid data that can be used to set up efficient systems for ordering necessary tests or communicating effectively with patients;
- > creating a culture in which clinicians are willing to receive notices of possible care lapses in their practice, which may point to errors, and building tolerance that the system will not be 100% effective; and
- > developing a system that enhances use by smaller teams and physicians managing the program.

To overcome these challenges, the IT team spent a significant amount of time working on the EMR to create layers of data verification and ensure the information is accurate. In addition, qualified and compassionate individuals were hired and trained in how to engage in thoughtful and respectful conversations with patients on techniques to maintain their health.



Next Steps

The program has been effective in supporting the health of patients, including vulnerable patient populations. A next step is to continue creating additional KP SureNet programs that include not only physicians but also nurse practitioners and physician assistants.

DEVELOPING EDUCATIONAL AND ORGANIZATIONAL PROGRAMS TO IMPROVE CLINICAL REASONING AND DIAGNOSIS

MAINE MEDICAL CENTER

Maine Medical Center provides clinicians and administrators with a comprehensive educational program that focuses on clinical reasoning, systems factors, and patient-related factors that can increase the risk of diagnostic error. This program was complemented by initiatives led by educational partners that focus on improving the diagnostic abilities of individuals at the undergraduate and graduate medical education level.



Intervention

The intervention consisted of:

- > Organizing instructional sessions with patient safety and risk mitigation teams on the incidence and impact of diagnostic error, and identification and analysis of diagnostic error.
- > Developing a diagnostic error reporting system, which allows for easy and anonymous reporting of diagnostic errors to patient safety staff.
- > Forming a multidisciplinary Diagnostic Error Work Group, chaired by the vice president for patient safety, to oversee the organizational response to diagnostic errors, including the educational components. The group will provide frequent presentations to leadership (department chairs, quality and safety committees, boards) on the concept of diagnostic error and the role of nonclinical factors in the genesis of such errors.
- > Conducting an undergraduate course, Introduction to Clinical Reasoning, focused on improving clinical reasoning and identifying and mitigating diagnostic errors.
- > Providing a development program for educational leaders that focuses on the mechanics of clinical reasoning with an emphasis on system-based factors that affect clinical reasoning and diagnostic safety.
- > Instructing medical residency leadership on how to use a diagnostic error fishbone diagram and facilitating discussion of the multiple contributors to errors.
- > Creating an extensive faculty development program, for group meetings, department or divisional meetings, and grand rounds, explicitly to identify diagnostic error as a patient safety issue, to discuss the role of cognitive errors in diagnostic errors, and methods of mitigating the impact of a diagnostic error.

**Results**

The results of the intervention were difficult to quantify as they pertained largely to an increased appreciation and formal reframing of the impact of diagnostic error as a discrete patient safety issue. Clinicians and administrators at Maine Medical Center acknowledge diagnostic error as a complex interplay between patient, clinician, and environment, rather than solely a cognitive error. This is evident by staff and clinical teams identifying adverse events as diagnostic errors; completing root cause analyses using diagnostic error fishbone diagrams; designing and delivering education programs targeted to all levels of medical education; and establishing faculty development programs.

**Lessons Learned**

Perhaps the most salient lesson learned is that practitioners, although well aware of diagnostic errors from their clinical practice, had not considered these errors as discrete patient safety events, similar to other familiar patient safety issues such as medication errors or the presence of nosocomial infections. By presenting the concept of diagnostic error as one of ensuring diagnostic and patient safety, most clinicians became substantially engaged, perhaps more so than with other patient safety initiatives. More importantly, framing diagnostic decision making as a process that is influenced by many factors outside an individual's control resonated with clinicians. Similarly, the educational programs helped administrators recognize that although cognitive errors may contribute to a diagnostic error, they are rarely the sole cause of an error. Factors such as the environment of care, clinician support, and workload have a great impact on the likelihood of a diagnostic error.

**Key Milestones**

The medical center as a whole has embraced the importance of improving diagnostic safety. More staff are using the diagnostic fishbone diagram during analyses when a diagnostic error has been identified by patient safety and risk management teams. Another key milestone was convening residency programs, morning reports, morbidity and mortality conferences, and work groups that offered education on clinical reasoning.



Overcoming Challenges

Challenges included:

- > Curricular time in undergraduate and graduate educational programs;
- > Meeting time for continuing medical education;
- > Individuals with content expertise, resulting in overloading responsibility for the initiative on a small number of people; and
- > Knowledge regarding the concept of diagnostic error.

To address these challenges:

- > Curricular time was added to the educational programs, meetings were held with educational leadership explaining the importance of identifying diagnostic error and improving clinical reasoning as well as distribute details of the proposed interventions
- > Meetings were held with practice group, departmental, and organizational leadership.
- > The National Academies report on diagnostic error was disseminated.



Next Steps

The program's patient and family centeredness could be enhanced by inviting patients and families, Patient and Family Advisor Council (PFAC), and/or Patient and Family Advisory Program (PFA) in diagnostic error improvement efforts to present at grand rounds; create and deliver instructional sessions to faculty, leadership, and medical students; and assist in developing new processes, policies, and diagnostic materials. Maine Medical Center is designing, implementing, and testing initiatives that improve diagnostic reliability and decrease harm related to diagnostic error.

THE MEDSTAR HEALTH SEPSIS COLLABORATIVE

MEDSTAR HEALTH SYSTEM

The MedStar Health Sepsis Collaborative began two and a half years ago with a small team, including senior leaders and a patient advocate from the health system's Patient and Family Advisory Council for Quality and Safety.

More than 1.5 million Americans get sepsis each year, resulting in approximately 250,000 deaths. The collaborative worked to increase awareness of the common signs and symptoms of sepsis and help patients obtain the critical care necessary to achieve the best possible health outcome.



Intervention

The PFACQS members worked collaboratively with MedStar physicians to develop educational materials. An educational video for patients highlights the signs and symptoms of sepsis and features two families that were affected by sepsis. A patient information brochure includes "say the words: I suspect sepsis." The video and brochure are distributed and shared with clinicians and medical residents across the MedStar system and with the general public through social media messages on MedStar buses. Currently, the focus is on improving emergency department triage processes, such as having a technician at the front desk take patients' vitals, to help recognize and initiate earlier treatment for patients with sepsis symptoms. In addition, providers are educated on the elements of the severe sepsis three- and six-hour resuscitation care bundles, detailed in the 2016 International Guidelines for Management and Septic Shock.



Results

This initiative focused on organizational quality improvement, such as attaining new skills and implementing new processes via a standard improvement structure, awareness, and care outcomes. The patient, family, and interdisciplinary collaboration and quality improvement skills learned are foundational to this work and will enable and accelerate progress on other quality and safety improvement initiatives. Based on workflow analyses, sepsis treatment processes at each MedStar hospital are being modified to align with a systemwide improvement strategy. Sepsis education for new physicians is now standardized across the system, and training for PFACQS members is available to support them as they engage with clinical teams and with their communities.

Efforts to raise public awareness about sepsis have involved distributing printed materials, such as posters and brochures, and using social media. The sepsis social media campaign engaged 115,381 individuals and received a total of 18,470 post-engagement comments. More than 27,000 brochures were distributed to patients across the region.

This work also is improving care outcomes. Between October 2016 and October 2017, MedStar's rate of compliance with national standards for sepsis treatment improved by 23%.

Significant improvements have been made in the corporate health IT system. The electronic health record includes a single, standardized sepsis-bundle compliance dashboard available to all organizations in the system and to quality and safety leaders. The system also uses automated orders and real-time surveillance tools, including an automated alert to ensure timely initiation of sepsis treatment bundles.



Lessons Learned

Two main lessons were learned. First, the passion, dedication, and creativity of patients and their families can drive change. Second, leadership buy-in and financial support are essential to implement change.



Key Milestones

Dissemination of sepsis information by the MedStar Visiting Nurses Association and via social media and a systemwide Sepsis Day was very effective and marked a new level of transparency and collaborative practice improvement. This in turn strengthened the engagement of patients in the MedStar Health Sepsis Collaborative.



Overcoming Challenges

Initial challenges included lack of overarching leadership "buy-in" and limited financial resources to develop the patient brochures and video. These challenges were addressed by seeking support from a physician and champion leader, presenting at senior leadership meetings, and expanding the team to include the director of nursing, sepsis collaborative nurse lead, director of clinical quality, and director of clinical performance improvement.



Next Steps

MedStar will continue expanding its sepsis campaign at the state and national levels, working with PFACQS to sponsor legislation that establishes a task force to fight sepsis. The health system also will continue to engage patients as spokespeople in the Centers for Medicare & Medicaid Services' (CMS) Hospital Improvement Innovation Network (HIIN) and at regional continuum of care provider meetings.

STANDARDIZED TEACH-BACK SCRIPT TO EXPLORE PATIENTS' UNDERSTANDING OF THEIR DIAGNOSIS

NORTHWELL HEALTH

Northwell focused on improving diagnostic outcomes by measuring patient engagement statistics and empowering the patient as part of the team, to better understand and resolve their symptoms. This intervention was designed to improve provider-patient communication, in writing and verbally, in order to provide a more accurate diagnosis earlier in the diagnostic process.



Intervention

Providers used a standardized teach-back script and incorporated input from Patient and Family Advisory Council representatives to explore the depth of patients' understanding of their diagnosis. The teach-back script was modeled after the ARTS framework—Ask, Reply, Teach, Synthesize—and technique included the provider's level of certainty of the working diagnosis and plans to improve certainty in the future. Providers were instructed to make every effort to facilitate a dialogue with the patient on diagnostic efforts, including the rationale for future testing, therapeutic trials, and timing contact for the provider to follow-up. Patients were asked to complete an exit survey that measured the effectiveness of the teach-back intervention. Written in patient-friendly language, the survey was designed to capture the percentage of patients who received the information, responded positively to the intervention, and demonstrated an understanding of their diagnosis.



Results

The intervention required an average of less than three minutes per patient in the outpatient setting and seven to ten minutes in the in-patient setting. Results of the exit survey indicated that 83% of patients responded positively to the teach-back intervention. Overall, 88% of patients demonstrated an accurate understanding of their diagnoses: 100% of patients in the ambulatory and emergency department demonstrated an understanding, and 83% of patients in adult and pediatric inpatient settings. Qualitative results confirmed the overall positive quantitative results for providers. Providers involved in the project reported improved satisfaction with the enhanced patient-physician relationship that took place during the intervention, especially in the emergency department and ambulatory setting.



Lessons Learned

The teach-back intervention can improve the satisfaction of patients, families, and providers during the diagnostic process. It establishes a foundation to obtain a perceived mutual understanding of the patient's symptoms, diagnosis, and treatment plans. The teach-back method has the potential to serve as a strategy for a "diagnostic time-out."



Key Milestones

As providers became more comfortable with the teach-back script, they also internalized the philosophy behind it. This enabled more fluid discussions between the providers and patients. As a result, the intervention was extended to all patients, regardless of their chief complaint.



Overcoming Challenges

The main challenges included:

- > low volume of patients that fit the inclusion criteria;
- > the mechanical feel of the initial teach-back script;
- > provider difficulty in generalizing the intervention to all patients;
- > lack of time to engage in the intervention due to pressure to discharge the patient;
- > the presence of engaged family members who inadvertently made assessing the patient's understanding of the diagnosis or future plan more challenging;
- > initial difficulty developing sensitive measures to detect quantitative and qualitative impact of the intervention.

These challenges were overcome by

- > expanding the inclusion criteria so that more patients could be included in the study;
- > eliminating the standardized teach-back script which, while still ensuring the touch points were covered, provided flexibility to implement the intervention to a wider number of patients;
- > educating all providers and volunteers who work with providers on how to implement the intervention;
- > instituting a formal pause in between the discharge discussion and administration of the survey to enable the patient to think about the discussion, allowing the provider to properly assess whether the patient understood the information and the patient had time to ask questions; and
- > involving members of the Patient and Family Engagement Committee in developing process, outcome, and balancing measures as well as structured open-ended questions for qualitative analysis.

**Next Steps**

The teach-back intervention helps patients and families better understand and retain information on their diagnosis. This in turn empowers patients and improves their ability to relay important information to their providers. At Northwell, the next step is to study a patient's actual comprehension of the information so the patient becomes an informed and engaged decision maker and partner in the diagnostic process.

USING DIAGNOSTIC MANAGEMENT TEAMS TO DETERMINE APPROPRIATE USE OF MEDICAL LABORATORY TESTS

UNIVERSITY OF TEXAS MEDICAL BRANCH

Most pathologists and clinical laboratory scientists are quick to agree that overutilization of medical laboratory tests is a major problem in health care but that underutilization of medical laboratory tests is an equally significant problem. Diagnostic management teams are used to determine appropriate utilization of medical laboratory tests necessary to diagnose a patient's health issue.



Intervention

Diagnostic management teams (DMTs) are groups of internal experts focused on patients with presumed diagnoses. DMTs exist for multiple clusters of diagnoses. The coagulation DMT puts together the diagnostic puzzle and generates a diagnosis or short list of diagnostic options and provides the information to the treating health care provider. In each evaluation, history, physical findings, and other relevant information to the diagnosis of a bleeding or thrombotic disorder is presented along with the ordered laboratory tests, and an interpretation and recommendations are presented at a level of complexity understood by all health care providers.

The DMT is designed to improve diagnosis through improved communication and access to diagnostic specialists; it offers participating health care professionals assistance in selecting appropriate diagnostic tests and interpreting diagnostic test results. DMT consultations consider a patient's clinical information to provide a context for the test result, and they ensure that a clinically valuable interpretation is included in the test result report. Clinicians who participate in this process report a favorable view of DMTs, and although perceived high initial costs are a potential barrier, there is some evidence that DMTs can lower overall costs.



Results

Establishing the coagulation DMT at Vanderbilt University Medical Center in 2010 can be attributed for much of the 25% reduction that year in average hospital lengths of stay for pulmonary embolism. Establishing the hematopathology DMT in 2011 is credited with a large decrease in omissions of recommended tests because of the use of a newly instituted bone marrow testing algorithm; bone marrow tests decreased by 25% overall in terms of total charges, representing a savings of approximately \$1.1 million in charges per year. An equivalent drop in 2010-2011 national rates for this testing saved an estimated \$399 million in charges. Further, oncologists saved 10 to 15 minutes per patient when ordering and reviewing results of bone marrow test panels.

**Lessons Learned**

It is difficult to determine the critical factors for the successful compilation and implementation of a DMT. As a result, each DMT will need to define roles and responsibilities and establish training and communication strategies consistent with the local organizational culture, to easily navigate within the environment.

**Key Milestones**

Key milestone include:

- > how DMT cases are identified (interaction with the laboratory, review of medical records, or request of a treating physician)
- > what to include in DMT reports for the medical records (placement of interpretative comments, recommendations for further testing, therapeutic options, organization of information for efficient retrieval, prewritten comments from commercial entities)
- > how the DMT interacts with the laboratory to ensure the appropriate use of testing (avoid overuse, misuse and underuse of testing) and appropriate methods of ordering future tests
- > how billing of interpretative reports are optimized
- > how to create an “impact statement” that proves the value of the DMT to hospital administrators.

**Overcoming Challenges**

Challenges have mainly come from pathologists and nonphysician laboratory experts. These include not being comfortable making a final diagnosis, worrying about not being considered an expert by the legal system, being concerned that participating in a DMT would limit research or compensation or both, feeling uncertainty about how the DMT process works, and being unable to comfortably communicate with on call physicians.

To address these challenges, each individual organization started its own DMT for the group of patients it was most comfortable treating, using the latest technology, and recognizing the work of pathologists and nonphysician laboratory experts which increased interaction with primary care physicians.

**Next Steps**

Next steps include creating a University of Texas system wide group of experts in all major areas of clinical and anatomic pathology and to develop DMTs for clinical areas that bring diagnostic experts electronically to the bedside of all patients in Texas. The goal is for pathology practices to be connected to expert-driven DMTs. This has the potential for pathology practices to gain expert information from a DMT within a short period of time for any complex patient, which will improve the safety and quality of care.

PART 5: CONCLUSION AND ACTION PLANNING

The diagnostic process involves and affects patients, family members, health care providers, and health care organizations. Understanding and implementing the strategies described in this change package will accomplish the aim of decreasing risk of harm from diagnostic errors. These recommendations should be used with the case studies, driver diagram, and additional tools included in this change package.

Core Elements of a Diagnosis Improvement Program

There is no single template for a program to reduce the risk of harm to patients from diagnostic error. Program elements must be embedded into existing patient safety, leadership, and operational structures of an organization. The complexity of medical decision making related to this issue and the variability in the size of and types of care provided by health care facilities require flexibility in implementation. Despite this, programs to improve diagnosis can be implemented effectively in a variety of health care settings. Success is dependent on leadership and a coordinated multidisciplinary approach across the organization that includes patients and families.

The core elements of successful diagnostic programs include:

- > **Leadership Commitment.** Dedicating necessary resources, such as time, money, and infrastructure, and creating conditions favorable to the development, maintenance, and growth of an overall organizational patient safety and quality improvement culture.
- > **Accountability.** Appointing a single leader responsible for the implementation, evaluation, and maintenance of the diagnostic program and enabling that leader to work with and be supported by key governance teams and stakeholders, including health care providers, patients, and families.
- > **Action.** Implementing all five primary drivers described in this change package: ensuring effective teamwork, developing a reliable diagnostic process, engaging patients and family members, optimizing cognitive performance, and creating robust learning systems. Working on one or two drivers alone is unlikely to achieve the success an organization seeks; therefore, it is important to focus on multiple drivers simultaneously.
- > **Evaluation.** Measuring or tracking impact of the implementation.
- > **Communication.** Providing feedback to all key governance and care delivery teams and stakeholders on a regular and timely basis.

Appendix I: Diagnostic Error Top Ten Checklist



1. Provide and promote patient access to electronic health records (EHRs), optimally including real-time clinical notes and diagnostic testing results.



2. Evaluate patient and family engagement practices, organizational structure, clinical operations, and access to care, including patient access to EHRs, to support the diagnostic environment and diagnostic process.



3. Implement clinical decision support tools that improve cognitive performance and reflective self-practice.



4. Provide regular education and training on clinical reasoning and decision pitfalls.



5. Establish a learning environment, inclusive of patients and family members, with an infrastructure based on safety culture, transparency, quality improvement, and education.



6. Measure and report diagnostic errors regularly for greater transparency and visibility.



7. Provide orientation and training on diagnostic safety and quality to support patient and family participation in governance, including on patient and family advisory councils, practice improvement teams, and boards.



8. Provide tools and credible resources for patients and family members and use engagement methods to optimize participation in the diagnostic process. Tools and methods include Society to Improve Diagnosis in Medicine tools, shared decision making, teach-back, patient activation strategies (PAM), and discharge checklists.



9. Adapt the Partnership for Patients preadmission checklist to orient patients to the diagnostic process, which effectively invites them to participate in the process.



10. Develop systems for seeking out and studying diagnostic errors, including using the diagnostic error fishbone diagram for root cause analyses.

APPENDIX II: ADDITIONAL TOOLS AND METHODS

In addition to the driver diagram and case studies in this change package, the tools and methods listed here can help health care organizations evaluate the problem of diagnostic error and implement best practices.

Accessing Lab Results and Clinician Notes

- > My Care (Patient Portal) – Dignity Health Hospitals
<https://www.dignityhealth.org/arizona/patients-and-visitors/for-patients/mycarepatientportal>

Board Representatives

- > A Roadmap for Patient + Family Engagement in Health Care Practice and Research – Gordon and Betty Moore Foundation
<https://patientfamilyengagement.org/sites/default/files/WebinarSlidedeck.pdf>
- > Harnessing the Evidence and Experience to Change Culture: A Guiding Framework for Patient and Family Engaged Care – National Academy of Medicine
<https://nam.edu/wp-content/uploads/2017/01/Harnessing-Evidence-and-Experience-to-Change-Culture-A-Guiding-Framework-for-Patient-and-Family-Engaged-Care.pdf>
- > Summary of the Health Equity Roadmap Addendum: How Person and Family Engagement Can Help Hospitals Achieve Equity in Health Care Quality and Safety
<https://www.haponline.org/Portals/0/docs/Downloads/HEN/PFE-Equity-Addendum-Summary-Mar2017.pdf?ver=2017-03-20-100114-213>

Clinical Reasoning

- > Society to Improve Diagnosis in Medicine (SIDM) Clinical Reasoning Toolkit for Educators
<https://www.improvediagnosis.org/page/clinicaleducation>

Diagnostic Teams

- > Pathology Clinical Diagnostic Services
<http://www.archivesofpathology.org/doi/full/10.5858/arpa.2015-0499-ED?code=coap-site>
- > TeamSTEPPS (CUSP, SBAR)
 - » <https://www.ahrq.gov/teamstepps/curriculum-materials.html>
 - » <https://www.ahrq.gov/professionals/systems/long-term-care/resources/facilities/ptsafety/lcmod2ap.html>
- > OpenNotes
<https://www.opennotes.org/>

Handling a Serious Change in a Patient's Medical Condition

- > Code HELP or Code/Condition H
 - » <https://www.sharecare.com/health/managing-your-health-care/what-is-code-help>
 - » http://www.marylandpatientsafety.org/html/collaboratives/condition_h/toolkit/documents/Lessons_Learned/OneHospitalsJourney_Alvarez.pdf
- > Understanding Second Opinions
<https://www.patientadvocate.org/download-view/understanding-second-opinions/>

Measuring Patient Willingness and Capacity to Manage Their Own Health and Health Care

- > Patient Activation Measure (PAM)
<https://www.insigniahealth.com/products/pam-survey>
- > Patient Health Engagement Scale
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4376060/>

Patient and Family Advisory Councils

- > Forming a Patient and Family Advisory Council – AMA Steps Forward
<https://www.stepsforward.org/modules/pfac>
- > Working with Patient and Families as Advisors – AHRQ Implementation Handbook
https://www.ahrq.gov/sites/default/files/wysiwyg/professionals/systems/hospital/engagingfamilies/strategy1/Strat1_Implement_Hndbook_508_v2.pdf
- > Communication and Optimal Resolution (CANDOR)
<https://www.ahrq.gov/professionals/quality-patient-safety/patient-safety-resources/resources/candor/index.html>
- > Partnership for Patients Strategic Vision Roadmap for Person and Family Engagement
<http://www.hret-hiin.org/Resources/pfe/16/FINALPFEStratVisionRoadmap.pdf>

Practice Improvement Teams

- > Cambridge Health Alliance's Practice Improvement Team
<http://mcaap.org/wp2013/wp-content/uploads/2015/06/CHA-Practice-Improvement-Team-Toolkit.pdf>
- > Creating Quality Improvement Teams and QI Plans – AHRQ Practice Facilitation Handbook
<https://www.ahrq.gov/professionals/prevention-chronic-care/improve/system/pfhandbook/mod14.html>
- > Tips for Patient Engagement in Patient Safety and Quality Committees
<http://www.patientsafetyinstitute.ca/en/toolsResources/pages/pfp-sc-patient-engagement-in-safety-committees.aspx>

Preparing for Diagnosis

- > SIDM Patient Toolkit
<https://www.improvediagnosis.org/page/PatientToolkit>
- > Safer DX Instrument
<https://link.springer.com/article/10.1007/s11606-016-3601-x>
- > Symptom-Disease Pair Analysis of Diagnostic Error (SPADE)
<https://qualitysafety.bmj.com/content/27/7/557>
- > Fishbone Diagram
<https://www.degruyter.com/view/j/dx.2014.1.issue-2/dx-2013-0040/dx-2013-0040.xml>
- > Checklist for Getting the Right Diagnosis
<https://cdn.ymaws.com/www.npsf.org/resource/collection/930A0426-5BAC-4827-AF94-1CE1624CBE67/Checklist-for-Getting-the-Right-Diagnosis.pdf>
- > Diagnosis Error Evaluation and Research (DEER) taxonomy
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3786650/>
- > The Patient is in: Patient Involvement Strategies for Diagnostic Error Mitigation
<https://cdn.ymaws.com/www.npsf.org/resource/collection/0716DBAD-99BB-460E-9837-1E357423C51C/BMJ-The-patient-is-in.pdf>
- > Choosing Wisely: 5 Questions to Ask Your Doctor Before You Get Any Test, Treatment, or Procedure
http://www.choosingwisely.org/wp-content/uploads/2018/03/5-Questions-Poster_8.5x11-Eng.pdf
- > What You Need to Know About Sepsis – from MedStar Sepsis Collaborative
<https://vimeo.com/265621288>

Reporting Symptoms

- > Symptom Trackers
<https://www.freeprintablemedicalforms.com/category/diaries>
- > Symptom Checkers
 - » <https://www.mayoclinic.org/symptom-checker/select-symptom/itt-20009075>
 - » <https://symptomchecker.isabelhealthcare.com/>
- > Patient-Reported Outcomes and Quality of Life Questionnaires – PROMIS Tools
<https://nexusipe.org/informing/resource-center/promis-patient-reported-outcomes-measurement-information-system>

Understanding Lab Results

- > Labs Tests Online
<https://labtestsonline.org/>

Working as a Team with Care Providers

- > How to Prepare for a Safe Hospital Stay (preadmission checklist adapted for improving diagnosis) – Partnership for Patients PFE tool
 - » <http://www.wsha.org/wp-content/uploads/RoadmapMetric-1-508.pdf>
 - » https://www.haponline.org/Portals/0/docs/Downloads/HEN/PfP_Admissions_Checklist_111717.pdf
- > ISHAPED Patient-Centered Approach to Nurse Shift Change Bedside Report
<http://www.ihl.org/resources/Pages/Tools/ISHAPEDPatientCenteredNurseShiftChangeBedsideReport.aspx>
- > Patient-Centered Diagnosis: Sharing Diagnostic Decisions with Patients in Clinical Practice
<https://www.bmj.com/content/359/bmj.j4218.long>
- > AHRQ Teach-back Tools
<https://www.ahrq.gov/professionals/quality-patient-safety/quality-resources/tools/literacy-toolkit/healthlittoolkit2-tool5.html>
- > Discharge Planning Checklist
<https://www.medicare.gov/pubs/pdf/11376-discharge-planning-checklist.pdf>
- > Including Patients on Root Cause Analysis Teams: Pros and Cons
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PART 7: REFERENCES

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