INSIGHTS ON MEASUREMENT AND IMPROVEMENT OF DIAGNOSTIC ERRORS IN HEALTH CARE

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- Collaborators across the globe
Objectives

- Describe types and origins of diagnostic errors in healthcare
- Discuss why measurement is key first step to reduce diagnostic errors
- Identify potential solutions & frameworks for mitigating patient safety risks related to diagnostic errors
An Infection, Unnoticed, Turns Unstoppable

By Jim Dwyer  Published: July 11, 2012

For a moment, an emergency room doctor stepped away from the scrum of people working on Rory Staunton, 12, and spoke to his parents.

“Your son is seriously ill,” the doctor said.

“How seriously?” Rory’s mother, Orlaith Staunton, asked.

The doctor paused.

“Gravely ill,” he said.

How could that be?

Two days earlier, diving for a basketball at his school gym, Rory had cut his arm. He arrived at his pediatrician’s office the next day, Thursday, March 29, vomiting, feverish and with pain in his leg. He was sent to the emergency room at NYU Langone Medical Center. The doctors agreed: He was suffering from an upset stomach and dehydration. He was given fluids, told to take Tylenol, and sent home.

Partially camouflaged by ordinary childhood woes, Rory’s condition was, in fact, already dire. Bacteria had gotten into his blood, probably through the cut on his arm. He was sliding into a septic crisis, an avalanche of immune responses to infection from which he would not escape. On April 1, three nights after he was sent home from the emergency room, he died in the intensive care unit. The cause was severe septic shock brought on by the infection, hospital records say.
Early Work

- Evaluated evidence of ‘errors’ in integrated system
- Detailed review of comprehensive EHR to evaluate diagnostic process in the patient’s journey across the continuum of care
  - Data available from primary care, specialty (secondary) care, ER, hospital, diagnostics (lab/imaging/pathology), procedures
High Level Findings

- Common conditions missed in outpatient settings despite clear red-flags (5% or 1 in 20 US Adults/year)

- About half had potential for clear harm
The Battle Against Misdiagnosis

American doctors make the wrong call more than 12 million times a year.

By HARDEEP SINGH

Aug. 7, 2014 7:16 p.m. ET

There are times when a single, unexpected death sparks a change in medical practice. In 2012 a 12-year-old boy named Rory Staunton died after being misdiagnosed in a New York City emergency room. Multiple physicians missed the symptoms, signs and lab results pointing to a streptococcal bacterial infection that led to septic shock and overwhelmed Rory's body. The tragedy introduced "Rory's rule," which directs doctors to follow up on unusual results and adds an extra layer of checks and balances to reduce the risk of similar incidents in hospitals.

Comparable initiatives exist on the state and local level—but there might be opportunities for improvement at the federal level.

New research my colleagues and I recently published in the journal Medical Care shows the extent of the problem among emergency and outpatient care seeking outpatients can be truly staggering. Each year, millions of people see a doctor for a condition that turns out to be something else, and this leads to critical mismanagement of their health.

Misdiagnosed: Docs' Mistakes Affect 12 Million a Year

By JONEL ALECCIA

At least one in every 20 adults who seeks medical care in a U.S. emergency room or community health clinic may walk away with the wrong diagnosis, according to a new analysis that estimates that 12 million Americans a year could be affected by such errors.

Of those misdiagnosis mistakes, about 6 million could potentially cause harm, according to patient safety expert Dr. Hardeep Singh, who is the first to provide robust population-level data on the impact of the problem in outpatient settings.

That means patients with conditions as varied as heart failure, pneumonia, anemia and sepsis have potentially walked away from their doctors' offices and hospital emergency rooms without getting the right treatment. They could be left untreated or undergo unnecessary procedures, and their health care can be disrupted.
<table>
<thead>
<tr>
<th>Specialty</th>
<th>Discrepancy Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiology</td>
<td>2 – 4% discrepancies on 2nd readings</td>
</tr>
<tr>
<td>Pathology</td>
<td>1.4% major discrepancies on 2nd readings</td>
</tr>
<tr>
<td>Dermatology</td>
<td>2% discrepancy rate on pigmented lesions</td>
</tr>
</tbody>
</table>

## Estimates in Other Settings

<table>
<thead>
<tr>
<th>Source</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Surveys</td>
<td>1/3(^{rd}) of patients relate a diagnostic error that affected themselves, a family member, or close friend</td>
</tr>
<tr>
<td>MD Surveys</td>
<td>45% of pediatricians reported diagnostic errors that harmed patients at least once or twice per year</td>
</tr>
<tr>
<td>Look backs</td>
<td>30% of subarachnoid hemorrhage <strong>misdiagnosed</strong>; 39% of dissecting AAA <strong>delayed diagnosis</strong>;</td>
</tr>
<tr>
<td>Autopsies</td>
<td><strong>Major unexpected discrepancies</strong> that would have changed management found in 10-20%</td>
</tr>
<tr>
<td>Expert guess</td>
<td>Arthur Elstein: 10-15%</td>
</tr>
</tbody>
</table>
Safety Begins with Measurement

We cannot improve what we cannot measure!

We cannot measure what we cannot define!
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
What are Diagnostic Errors?

- Case analysis reveals evidence of a missed opportunity to make a correct or timely diagnosis.

- Missed opportunity is framed within the context of an “evolving” diagnostic process.

- The opportunity could be missed by the provider, care team, system, and/or patient.
Defining Preventable Diagnostic Harm

- **A**: Missed opportunities in diagnosis due to system and/or cognitive factors
- **B**: Preventable diagnostic harm
- **C**: Delayed/wrong diagnosis associated with patient harm but no clear evidence of missed opportunities
- **D**: Delayed/wrong diagnosis but no clear evidence of missed opportunities

Adapted from *Singh Jt Comm J Qual Patient Saf 2014*
The diagnostic process involves more than just what’s in the doctors head.

Five “process” dimensions of diagnosis.
Patient-Provider Encounter

- Problems with history, physical exam or ordering diagnostic tests for further work-up
Health & Science

What a doctor may miss by reaching for the MRI first

By Sandra G. Boodman and Kaiser Health News, Published: May 19  E-mail the writer

Doctors at a Northern California hospital, concerned that a 40-year-old woman with sky-high blood pressure and confusion might have a blood clot, order a CT scan of her lungs. To their surprise, the scan reveals not a clot but large cancers in both breasts that have spread throughout her body. Had they done a simple physical exam of the woman’s chest, they would have been able to feel the tumors. So would the doctors who saw her during several hospitalizations over the previous two years, when the cancer might have been more easily treated.

A middle-aged man admitted to a Seattle emergency room for the third time in six weeks displays the classic signs of liver cirrhosis for which he has been repeatedly treated, including swollen legs and a distended abdomen. But a veteran doctor spots a telltale indicator of a different disease: rapid inward pulsations just beneath the man’s right ear. The patient’s problem is not his liver but his heart: he has constrictive pericarditis, a serious condition that requires surgery.
Diagnostic Tests: Lab/Path/Imaging

- Problems with ordered tests either not performed or performed/interpreted incorrectly
Follow-up and Tracking

- Problems with follow-up of abnormal diagnostic test results or scheduling of follow-up visits
If you think your doctor will automatically tell you if you have an abnormal test result, think again. Researchers studying office procedures among primary care physicians found evidence that more than 7 percent of clinically significant findings were never reported to the patient.

The scientists, led by Dr. Lawrence P. Casalino, an associate professor at Weill Cornell Medical College, reviewed the records of 5,434 patients at 19 independent primary care practices and four based in academic medical centers. They extracted records that contained abnormal results for blood tests or X-rays and other imaging studies, and then searched for documentation that the patient had been properly informed of the problem in a timely way.

Then they surveyed the doctors with uninformed patients. Some told them that the patient had been informed, even though there was no documentation, while
Referrals/Specialty Consultations

- Lack of appropriate actions on requested consultation or
- Communication breakdown from consultant to referring provider
Patient Behaviors/Adherence
What Types of Conditions Affected?

- **US**
  - Pediatrics survey: Viral illnesses diagnosed as bacterial, medication side effects, psychiatric disorders, and appendicitis
  - Adult primary care chart review study: Pneumonia, decompensated CHF, symptomatic anemia

- **Netherlands hospitals**
  - Chart review study: PE, sepsis, MI, appendicitis

References:
- Singh et al Pediatrics 2010
- Singh et al JAMA Intern Med 2013
- Zwaan et al Arch Intern Med 2010
<table>
<thead>
<tr>
<th>Diagnosis</th>
<th># cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary embolism</td>
<td>26</td>
<td>4.5%</td>
</tr>
<tr>
<td>Poisoning, ADR, overdose</td>
<td>26</td>
<td>4.5%</td>
</tr>
<tr>
<td>Lung cancer</td>
<td>23</td>
<td>3.9%</td>
</tr>
<tr>
<td>Colorectal cancer</td>
<td>19</td>
<td>3.3%</td>
</tr>
<tr>
<td>Acute coronary syndrome</td>
<td>18</td>
<td>3.1%</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>18</td>
<td>3.1%</td>
</tr>
<tr>
<td>Stroke</td>
<td>15</td>
<td>2.6%</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>13</td>
<td>2.2%</td>
</tr>
<tr>
<td>Fracture</td>
<td>13</td>
<td>2.2%</td>
</tr>
<tr>
<td>Abscess</td>
<td>11</td>
<td>1.9%</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>10</td>
<td>1.7%</td>
</tr>
<tr>
<td>Aortic aneurysm/dissection</td>
<td>9</td>
<td>1.5%</td>
</tr>
<tr>
<td>Appendicitis</td>
<td>9</td>
<td>1.5%</td>
</tr>
<tr>
<td>Depression</td>
<td>9</td>
<td>1.5%</td>
</tr>
</tbody>
</table>

Schiff et al 2009
Contributing Factors

- Premature closure
- Overconfidence
- Faulty data gathering
- Faulty synthesis
- Process failure
- Sample mix-up
- Failure to detect physical finding
- Perception error
- Wrong estimate of pretest probability
- Failure to follow-up abnormal test
- Misinterpretation of test
- Inadequate follow-up
- Failed heuristic
- Knowledge deficit
- Unintended consequence of policy
- Communication failure
- Limited access
- Language barrier
- Uninformed patient
- Faulty triggering

Cosby K, DEM
Diagnostic Accuracy and Confidence

- 118 Physicians assessed 4 clinical vignettes (2 easy & 2 difficult) based on real-world cases

- Goals
  - Assess how diagnostic accuracy is aligned with perception of confidence in that accuracy

Meyer et al JAMA Intern Med 2013
Diagnostic Accuracy and Confidence

Chief Complaint & History
1-3 Diagnoses + Confidence
Add Physical Exam Data
1-3 Diagnoses + Confidence
Add Basic Labs and Imaging
1-3 Diagnoses + Confidence + Resource Questions
Add Additional Labs and Imaging
1 Diagnosis + Confidence
Diagnostic Accuracy and Confidence

Case Difficulty

A  Easier

Mean Proportion of Cases Diagnosed Correctly or Mean Confidence Level

Phase

History  Physical  General Lab and Imaging  Definitive Lab and Imaging

B  More Difficult

Mean Proportion of Cases Diagnosed Correctly or Mean Confidence Level

Phase

History  Physical  General Lab and Imaging  Definitive Lab and Imaging

Accuracy

Confidence
Significance

- Physicians’ diagnostic accuracy and confidence not aligned
- Higher confidence related to decreased requests for additional diagnostic tests
- Physicians did not seek help when they most needed it
Research Reveals Lots to Fix!

- Failure to elicit key history or exam finding
- Overlooking critical information
- Poor calibration
- Chaotic clinical settings
- Interruptions and inadequate time
- Workload and administrative burden
- Lack of feedback systems for improvement

Schiff et al Arch IM 2009; Singh et al JAMA IM 2013; Sarkar et al BMJQS 2012
Fixing Isn't so Easy!

- No magic bullet for improving cognition
- No single system fix
- The fine balance between system issues and personal responsibility and accountability
- How many diseases to focus on?
Principles of Solutions

- Learning from other systems/Safety Culture
- Measurement
- Communication and Teamwork
- Technology
- Cognitive skills/psychological precursors
- Patient Empowerment
Our goals are to use health IT to measure and reduce diagnostic errors and harm, but ..

Current Reality: Trying to ensure health IT itself is being used ‘safely’

Divyy K. Upadhyay, Dean F. Sittig and Hardeep Singh*

Ebola US Patient Zero: lessons on misdiagnosis and effective use of electronic health records

Abstract: On September 30th, 2014, the Centers for Disease Control and Prevention (CDC) confirmed the first travel-associated case of US Ebola in Dallas, TX. This case exposed two of the greatest concerns in patient safety in the US outpatient health care system: misdiagnosis and ineffective use of electronic health records (EHRs). The case received widespread media attention highlighting failures in disaster management, infectious disease control, national security, and emergency department (ED) care. In addition, an error in making a correct and timely Ebola diagnosis on initial ED presentation brought diagnostic decision-making vulnerabilities in the EHR era into non-technical factors will be needed. Ebola US Patient Zero reminds us that in certain cases, a single misdiagnosis can have widespread and costly implications for public health.

Keywords: cognition; decision-making; diagnostic error; Ebola; electronic medical records; health information technology; human factors; misdiagnosis; patient safety.

DOI 10.1515/dx-2014-0064
Received October 15, 2014; accepted October 17, 2014
Communication of Test Results

- Evaluation of 1,163 outpatient abnormal lab & 1,196 abnormal imaging test result alerts
  - 7% abnormal labs lacked timely follow-up
  - 8% abnormal imaging lacked timely follow-up

- Why abnormal test results continue to get missed in health IT-based settings

Ambiguous Responsibility a Huge Issue
Too many electronic health record alerts may be leading doctors to skip them

Your doctor may be more likely to ignore your test results if they come electronically.

A new study published in the JAMA Internal Medicine on Mar. 4 revealed that doctors receive about 63 electronic health record (EHR)-based alerts each day, which are supposed to let them know about abnormal patient results. And, almost one-third of the doctors surveyed -- about 30 percent -- admitted that they had missed some results because of too many alerts.

"If you're getting 100 emails a day, you are bound to miss a few. I study this area and I still sometimes miss emails. We have good intentions, but sometimes getting too many can be a problem," Dr. Hardeep Singh, chief of health policy, quality, and informatics at the Michael E. DeBakey Veterans Affairs Medical Center, in Houston, told TIME.
And More Digital Data Is on the Way

- **Smartphone**
  - *The Wall Street Journal* - The Saturday Essay
  - *HuffPost Tech* - The Blog

- **Wearables**
  - "Patients can now continuously monitor their data real-time and send it to their docs"
A Helpful 8-dimension Sociotechnical Model

Organizational Policies, Procedures, & Culture

Workflow & Communication

User Interface

Content

Hardware & Software

Personnel

Measurement & Monitoring

External Rules & Regulations

Sittig and Singh QSHC 2010
Measurement Ready for Real-time?

- Limited data—few health systems
- Road to measurement, accountability and transparency is not easy, but...
- ...we must find and fix diagnostic errors reliably and consistently
To Enable Rigorous Measurement

- Missed opportunity measurement must reflect real-world practice
  - more than just what’s in “the doctors head”
  - systems, team members, and patients, all inevitably influence clinicians’ thought processes

Singh BMJQS 2013
Safer Dx Framework for Measurement & Reduction

Sociotechnical Work System*

Diagnostic Process Dimensions

- Patient-provider encounter & initial diagnostic assessment
- Diagnostic test performance & interpretation
- Follow-up and tracking of diagnostic information
- Subspecialty consultation/referral issues

Measurement of diagnostic errors
- Reliable
- Valid
- Retrospective
- Prospective

Changes in policy and practice to reduce preventable harm from missed, delayed, wrong or over diagnosis

Safer Diagnosis
- Collective mindfulness
- Organizational learning
- Improved calibration
- Better measurement tools and definitions

Feedback for improvement

* Includes 8 technological and non-technological dimensions

Singh & Sittig BMJQS 2015
The Diagnostic Process

- Patient Experiences a Health Problem
- Patient Engages with Health Care System
- Information Gathering
- Information Integration & Interpretation
- Working Diagnosis
  - Clinical History and Interview
  - Physical Exam
  - Referral and Consultation
  - Diagnostic Testing
- Has sufficient information been collected?

- Communication of the Diagnosis
  - The explanation of the health problem that is communicated to the patient
- Treatment
  - The planned path of care based on the diagnosis
- Outcomes
  - Patient and System Outcomes
    - Learning from diagnostic errors, near misses, and accurate, timely diagnoses

TIME
What is a Diagnostic Error?

THE WORK SYSTEM
- Diagnostic Team Members
- Tasks
- Technologies and Tools
- Organization
- Physical Environment
- External Environment

THE DIAGNOSTIC PROCESS

INFORMATION GATHERING

INFORMATION INTEGRATION & INTERPRETATION

WORKING DIAGNOSIS

The explanation of the health problem that is communicated to the patient

Communication of the Diagnosis

The planned path of care based on the diagnosis

Treatment

Outcomes

Patient Experiences a Health Problem

Patient Engages with Health Care System

Patient and System Outcomes Learning from diagnostic errors, near misses, and accurate, timely diagnoses

Failure of Engagement

Failure in Information Gathering

Failure in Information Integration

Failure in Information Interpretation

Failure to Establish an Explanation for the Health Problem

Failure to Communicate the Explanation

TIME
Some early reflections on the IOM report from the SIDM listserv (used with permission)
A "diagnosis" is not a static, fixed conclusion; it is a fluid, evolving conclusion based on serial observation and hypothesis building; One moves from less certainty to more certainty more or less quickly depending on a number of factors (amount and accuracy of collected data, duration of observations, natural history of the disease, disease complexity, comorbid confounders, disease rarity, provider experience, patient response to treatment, patient compliance etc etc)

A "diagnosis" at time "X" is not finalized until further time and observational data evolve allowing the clinical situation to "play out" with or without therapeutic intervention
We might want to be careful about this one. From a research perspective, analyzing time to diagnosis would indeed be interesting and productive. But if in the process we give regulators, payers and attorneys new ways to punish delays at an individual physician level, it could amplify premature closure and overdiagnosis.

Many of the complications introduced by both medicolegal and quality improvement efforts come from treating diagnosis as a black and white situation. As much as I like the current news coverage of the IOM report, it’s reinforcing that black/white perspective.
What Do We Do Now?

- Measurement ready for Quality Improvement (QI), Learning & Research purposes
- Not ready for public reporting, performance measurement or penalties
- Still need more evidence and research in measurement
  - Good data, standards and operational definitions
- We need to go beyond the few institutions doing this
  - Others should start measuring for transparency
Example of a High Priority Area

- Missed/delayed Cancer Diagnosis a safety concern

- Major reason: Lack of timely follow-up of cancer-related abnormal test results
Missed Opportunities to Initiate Endoscopic Evaluation for Colorectal Cancer Diagnosis

Hardeep Singh, MD, MPH, Paakhi Datta, MD, Laura A. Peterson, MD, MPH; Clyde Collins, MD; Nancy J. Petersen, MD; Amiya Sethia, MBAA; and Harshad B. El Sarraj, MD, MPH

OBJECTIVES: Delayed diagnosis of colorectal cancer (CRC) is among the most common reasons for ambulatory diagnostic malpractice claims in the United States. Our objective was to describe missed opportunities to diagnose CRC before endoscopic referral, in terms of patient characteristics, nature of clinical clues, and types of diagnostic-process breakdowns involved.

METHODS: We conducted a retrospective cohort study of consecutive, newly diagnosed cases of CRC between February 1999 and June 2007 at a tertiary health-care system in Texas. Two reviewers independently evaluated the electronic record of each patient using a standardized pretested data collection instrument. Missed opportunities were defined as care episodes in which endoscopic evaluation was not initiated despite the presence of one or more clues that warrant a diagnostic workup for CRC. Predictors of missed opportunities were evaluated in logistic regression. The types of breakdowns involved in the diagnostic process were also determined and analyzed.

RESULTS: Of the 513 patients with CRC who met the inclusion criteria, both reviewers agreed on the presence of at least one missed opportunity in 161 patients. Among these patients, there was a mean of 4.2 missed opportunities and 5.3 clues. The most common clues were suspected or confirmed iron deficiency anemia, positive fecal occult blood test, and hematochezia. The odds of a missed opportunity were increased in patients older than 75 years (odds ratio [OR] = 2.3; 95% confidence interval [CI] 1.3–4.1) or with iron deficiency anemia (OR = 2.2; 95% CI 1.3–3.6), whereas the odds of a missed opportunity were lower in patients with abnormal flexible sigmoidoscopy (OR = 0.06; 95% CI 0.01–0.51) or imaging suspicious for CRC (OR = 0.3; 95% CI 0.1–0.9). Anemia was the clue associated with the longest time to endoscopic referral (median = 383 days). Most process breakdowns occurred in the provider–patient clinical encounter and in the follow-up of patients or abnormal diagnostic test results.

CONCLUSIONS: Missed opportunities to initiate workup for CRC are common despite the presence of many clues suggestive of CRC diagnosis. Future interventions are needed to reduce the process breakdowns identified.

J Clin Oncol 28:3307-3313. © 2010 by American Society of Clinical Oncology

INTRODUCTION

Delayed diagnosis of colorectal cancer (CRC) is among the most common reasons for ambulatory malpractice claims related to missed and delayed diagnosis in the United States (1,2). Several randomized controlled trials (3,4) have shown that survival in patients with CRC is significantly longer when the diagnosis is made at a more localized early stage, making a compelling case for early detection through screening programs (5). However, most patients with colorectal cancers are diagnosed after the onset of cancer-related symptoms (6) and...
‘Trigger’-based Measurements

- More Patient-Provider Encounters
- Consultations to Sub-specialists
- Diagnostic Tests
- Correct Diagnosis

Certain Diagnosis
Uncertain Diagnosis
Why Triggers Are a First Step?

- Algorithms to select high-risk patient records for further reviews to look for missed opportunities
  - Picking up ‘needles in a haystack’ by making the haystack smaller

- Application retrospective or prospective surveillance

Singh et al JAMA IM 2013
Creating a Trigger-Based Safety Net

- Electronic health record (EHR)-based triggers look for follow-up actions on clues (or red flags) to detect delays prospectively.

- Basic versions:
  - + hemoccult or microcytic anemia with no subsequent colonoscopy in 60 days
  - suspicious chest-x ray with no follow-up CT scan in 30 days

Murphy et al BMJQS 2013
Electronic health record-based triggers to detect potential delays in cancer diagnosis

Daniel R Murphy,1,2 Archana Laxmisan,1,2 Brian A Reis,1,2 Eric J Thomas,3 Adol Esquivel,4 Samuel N Forjuoh,5 Rohan Parikh,6 Myrna M Khan,1,2 Hardeep Singh1,2

ABSTRACT

Background Delayed diagnosis of cancer can lead to patient harm, and strategies are needed to proactively and efficiently detect such delays in care. We aimed to develop and evaluate ‘trigger’ algorithms to electronically flag medical records of patients with potential delays in prostate and colorectal cancer (CRC) diagnosis.

Methods We mined retrospective data from two large integrated health systems with comprehensive electronic health records (EHR) to iteratively develop triggers. Data mining algorithms identified all patient records with specific demographics and a lack of appropriate follow-up of abnormal clinical findings suspicious for cancer.

BACKGROUND

Identifying and preventing delays in cancer diagnosis have proved elusive and challenging to overcome.1 2 For certain cancers, delays are common and lead to poor outcomes and increased malpractice litigation.3–8 While root causes of such delays are multifactorial,2 9–11 many delays arise when abnormal cancer screening results or other ‘red flags’ are missed by providers.3 5 12–21 These missed opportunities can result in delays...
Development and Validation of Electronic Health Record–based Triggers to Detect Delays in Follow-up of Abnormal Lung Imaging Findings

To develop an electronic health record (EHR)–based trigger algorithm to identify delays in follow-up of patients with imaging results that are suggestive of lung cancer and to validate this trigger on retrospective data.

The local institutional review board approved the study. A “trigger” algorithm was developed to automate the detection of delays in diagnostic evaluation of chest computed tomographic (CT) images and conventional radiographs that were electronically flagged by reviewing radiologists as being “suspicious for malignancy.” The trigger algorithm was developed through literature review and expert input. It included patients who were alive and 40–70 years old...
Randomized Control Trial Results

- Intervention reduced delays in diagnostic evaluation of colorectal and prostate cancer

- More diagnostic evaluation by final review

Murphy et al. J Clin Oncology 2015
Creating ‘intelligence’ related to diagnostic safety needs resource and time investment

- Institutions/practices have too many competing priorities
- Will it give bang for the buck outside of research?

Unintended consequences need to be monitored

- More testing/treatment could occur
Ten Strategies to Improve Management of Abnormal Test Result Alerts in the Electronic Health Record

Hardeep Singh, MD, MPH,†† Lindsey Wilson, MA,† Brian Reis, BE,‡

The Joint Commission Journal on Quality and Patient Safety

National Patient Safety Goals

Eight Recommendations for Policies for Communicating Abnormal Test Results

Hardeep Singh, M.D., M.P.H.; Meena S. Vij, M.D.

Improving Test Result Follow-up through Electronic Health Records Requires More than Just an Alert

Dean F. Sittig, PhD and Hardeep Singh, MD, MPH

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DOI: 10.1007/s11606-012-2161-y
© Society of General Internal Medicine 2012

A recent American Medical Association report highlighted failures in communication of abnormal test results as an important but understudied facet of improving safety in ambulatory care.1 Because many outpatient test results are communicated by alerting clinicians to abnormal findings, it is essential that these alerts are communicated accurately and timely. However, errors in test result communication occur frequently and can lead to adverse outcomes. 

Failures of diagnostic test result communication have been linked to missed clinician visits, delayed or incorrect treatment, and increased healthcare costs. A recent study of electronic medical records identified 7% of abnormal test results that were not followed up within 30 days.2 We also found that the average number of test results generated by diagnostic laboratories is approximately 120 per day, some of which may be urgent or emergent. Therefore, it is essential to prioritize and follow-up on these results promptly.

Implementing electronic health records (EHRs) has the potential to improve test result communication by providing real-time access to patient information and alerting clinicians to abnormal results. However, several studies have shown that EHRs are not consistently used to follow-up on abnormal test results.3,4

In this article, we present eight recommendations for policies for communicating abnormal test results. These recommendations focus on improving the communication of test results to clinicians and patients, ensuring timely follow-up, and reducing missed results.

1. Establish a standard procedure for communicating abnormal test results.
2. Ensure that test results are communicated to the appropriate practitioner in a timely manner.
3. Implement an electronic alerting system to notify clinicians of abnormal test results.
4. Develop a system to prioritize test results based on the urgency of the findings.
5. Establish a protocol for follow-up on abnormal test results.
6. Conduct regular audits to assess the effectiveness of the communication system.
7. Provide training to clinicians on how to interpret and respond to abnormal test results.
8. Establish a feedback mechanism to improve the system and address issues as they arise.

By implementing these recommendations, healthcare organizations can improve the communication of abnormal test results and reduce the risk of missed diagnoses and adverse outcomes.
The Checklist is structured as a quick way to enter and print your self-assessment. Your selections on the checklist will automatically update the related section of the corresponding recommended practice worksheet.

The Recommended Practice(s) for the topic appear below the associated Phase.

The Worksheet provides guidance on implementing the Practice.

Select the level of implementation achieved by your organization for each Recommended Practice. Your Implementation Status will be reflected on the Recommended Practice Worksheet in this PDF.
Take Away Points

- Diagnostic error affects 1 in 20 US adults annually and now a national priority
- Challenging issue to tackle due to complex cognitive and systems issues
- Multifaceted and multiple interventions needed—stay tuned for more
Thank you and Acknowledgements

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  - Agency for Health Care Research & Quality

- **Multidisciplinary team at VA Health Services Research Center for Innovation**

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