From Risk Management to Action
Addressing Diagnostic Error

Dr. Terrance Borman
Dr. Joseph Britto
Overview of presentation

• Luther Midelfort and our risk management
• Making the case for diagnostic error as a significant quality issue
• Two actions to improve the diagnostic process
  – Incidental findings
  – Isabel software
Luther Midelfort
Mayo Health System

• Integrated health system
  – Central referral hospital
  – Three regional critical access hospitals
  – 11 clinic locations
  – 4000 employees
  – 225 employed physicians
  – In house legal staff
Luther Midelfort
Risk Management

- Committee composed of legal staff, patient safety specialist, chief nursing officer, medical director, assistant medical director and regional vice president
- Meets weekly
- Have worked hard to encourage reporting of unexpected outcomes – reporting is critical to effective risk management
  - About 200 events reported annually
- Medical Director meets with about 40 patient/families a year
Luther Midelfort
Risk Management

• Diagnostic issues recognized as a significant category
  – Delay or missed diagnosis
  – Failure to follow up on abnormal findings particularly “incidental” radiology reports

High level Care Model

Patient’s Environment And decisions → Access → Assessment → Treatment And Intervention → Follow up Care
What is the magnitude of diagnosis error?
Diagnosis Error: Frequency & Impact

- 2 recent studies of malpractice claims - diagnosis errors far outnumber medication errors as a cause of claims.
- Lodged (26% versus 12% in one study; 32% versus 8% in another study).
- Most medical error studies find 10–30% of errors are errors in diagnosis.
- A review of 53 autopsy studies found an average rate of 24% missed diagnoses.

Diagnosing Diagnosis errors: Lessons from a Multi-institutional Collaborative Project. Gordon D. Schiff MD. Cook County John H. Stroger Hospital & Bureau of Health Services, Chicago, USA. In Advances in Patient Safety (2); 255-278: 2005
“Patients die every day in the US with misdiagnosis... Physicians do get it right most of the time but ....

Robert Wachter MD, Chief of Medical Services at the UCSF. Co-author "Internal Bleeding, The Truth Behind America's Terrifying Epidemic of Medical Mistakes."
What are the factors that contribute to diagnosis error?
Diagnosis Errors – System & Cognitive Related

• 7 cases reflected no-fault errors alone. In the remaining 93 cases, we identified 548 different system related or cognitive factors (5.9 per case).

• System related factors contributed to the diagnostic error in 65% cases. Most common system-related factors involved policies and procedures, inefficient processes, teamwork and communication.

• Cognitive factors contributed to diagnostic error in 74% cases. Most common cognitive problems involved faulty synthesis. Premature closure, i.e. the failure to continue considering reasonable alternatives after an initial diagnosis was reached, was the single most common cause.

Diagnostic Error in Internal Medicine. Mark Graber MD. Dept of Veterans Affairs Medical Center, Northport, NY. Arch Intern Med. 2005;165:1493-1499
"Our reviewers selected “diagnosis” as the leading phase of work in which problems were noticed, consistent with results from other major studies, which is not unexpected, because diagnosis is at the heart of clinical work and is the foundation on which all other actions are predicated."

**Results:** Physician reviewers identified multiple problems and contributing factors in the majority of cases (92%). The diagnostic process was the leading phase of work in which problems were observed (71%). Three leading contributing factors were identified: clinical tasks (99%), patient factors (61%), and teamwork (61%). Despite imperfections in care, half of all patients received some benefit from their medical care compared with the likely outcome with no care.
Characteristics of Patient Care Management Problems Identified in Emergency Department Morbidity and Mortality Investigations During 15 Years

Karen S. Cosby, MD
Rebecca Roberts, MD
From the Department of Emergency Medicine, Cook County Hospital, Rush Medical School, Chicago, IL.

Table 2a. Association between contributing factors and primary outcome measures.

<table>
<thead>
<tr>
<th>Contributing Factors*</th>
<th>All Cases n=636</th>
<th>Death n=226</th>
<th>Permanent, n=24</th>
<th>Long Term, n=171</th>
<th>Short Term, n=178</th>
<th>None, n=37</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient</td>
<td>391 (61)</td>
<td>170 (75)</td>
<td>16 (67)</td>
<td>86 (50)</td>
<td>102 (57)</td>
<td>17 (46)</td>
</tr>
<tr>
<td>Triage</td>
<td>103 (16)</td>
<td>47 (21)</td>
<td>2 (8)</td>
<td>20 (12)</td>
<td>31 (17)</td>
<td>3 (8)</td>
</tr>
<tr>
<td>Clinical (all subsets)</td>
<td>632 (99)</td>
<td>225 (99)</td>
<td>23 (96)</td>
<td>171 (100)</td>
<td>177 (99)</td>
<td>36 (97)</td>
</tr>
<tr>
<td>Reasoning</td>
<td>595 (94)</td>
<td>212 (94)</td>
<td>21 (88)</td>
<td>164 (96)</td>
<td>169 (95)</td>
<td>29 (78)</td>
</tr>
<tr>
<td>Skill set</td>
<td>212 (33)</td>
<td>77 (34)</td>
<td>12 (50)</td>
<td>47 (27)</td>
<td>58 (33)</td>
<td>18 (49)</td>
</tr>
<tr>
<td>Task based</td>
<td>173 (27)</td>
<td>91 (40)</td>
<td>7 (29)</td>
<td>29 (17)</td>
<td>37 (21)</td>
<td>9 (24)</td>
</tr>
<tr>
<td>Affective Influences</td>
<td>38 (6)</td>
<td>11 (5)</td>
<td>2 (8)</td>
<td>9 (5)</td>
<td>14 (8)</td>
<td>2 (5)</td>
</tr>
<tr>
<td>Teamwork</td>
<td>387 (61)</td>
<td>155 (66)</td>
<td>13 (54)</td>
<td>92 (54)</td>
<td>100 (56)</td>
<td>27 (73)</td>
</tr>
<tr>
<td>System</td>
<td>261 (41)</td>
<td>103 (46)</td>
<td>9 (38)</td>
<td>79 (46)</td>
<td>60 (34)</td>
<td>10 (27)</td>
</tr>
</tbody>
</table>

*Contributing factors are not mutually exclusive; thus, percentages do not sum to 100.
“Every once in a while, I think it would be healthy for the patient to ask the doctor - OK, you think this is disease X. Is there anything else this could possibly be?”

Mark Graber MD, Chief of Medical Services at Department of Veterans Affairs Medical Center, Northport, NY 11768, USA
“Doctors fail to consider possibilities that contradict their mental templates of a disease, and thus attribute symptoms to the wrong cause.”
Diagnosis Error – Natural biases

Pat Croskerry has described 31 “Cognitive Dispositions to Respond that may lead to Diagnostic Error”

1. Aggregate bias
2. Anchoring
3. Ascertainment bias
4. Base-rate neglect
5. Commission bias
6. Confirmation bias
7. Diagnosis momentum
8. Feedback sanction
9. Framing effect
10. Fundamental attribution error
11. Gambier’s fallacy
12. Gender bias
13. Hindsight bias
14. Multiple alternative bias
15. Omission bias
16. Order effects
17. Outcome bias
18. Overconfidence bias
19. Playing the odds
20. Posterior probability error
21. Premature closure
22. Psych-out error
23. Representative restraint
24. Search satisfying
25. Sutton’s slip
26. Sunk costs
27. Triage cueing
28. Unpacking principle
29. Vertical line failure
30. Visceral bias
31. Yin-Yang out
Types of DIAGNOSIS ERROR

Representative diagnosis error:
We discount from our differential diagnosis, a disease or condition that does not fit with 'our' mental template of that disease [that we consider as not being representative of our template of the disease]

Availability diagnosis error:
We discount from our differential diagnoses, a disease or condition that we are not familiar with or have not seen recently. Our thinking is skewed by 'available data'.

Affective diagnosis error:
Errors we make influenced by our affective state.
Diagnosis error - patient safety / quality

Not easily understood
Obscure & hidden
Complicated
Difficult to identify

Not viewed as a systemic issue
Physician failure rather than organizational issue

Physicians do not perceive own error rates as problematic

Diagnosis Quality - Why now?
They represent the most frequently seen risk case type in our organization...

..... which account for medical-legal costs** of over $380 million from 2000 – 2004 (n= 856)

Risk cases that occurred between 1/1/2000 to 9/30/2005
Risk cases include: Sentinel Events/PCEs, Demands for Payment, and Legal Action Cases

** indemnity payouts + total legal costs

Source: PPL-RM
CRICO/RMF is the patient safety and medical malpractice insurance company owned by and serving the Harvard medical community since 1976.

**High Risk Areas**

Home > High Risk Areas

64% of claims come from these four high-risk areas.

For more than 20 years, CRICO/RMF has analyzed claims and suits to understand the causes of error. What we have learned is that the overwhelming majority of errors fall into four high risk areas: diagnosis, obstetrics, surgery and medication. Recent data shows medical treatment as a newly emerging risk area which we will continue to monitor.

**Diagnosis**

Diagnosis is at the heart of a quarter of the malpractice cases we see. Address the highest risk issues with these algorithms and guides.

**Medication**

Medication management is a complex process intertwined with assumptions and workarounds. Increase patient safety with a system of checks and double checks.

**Obstetrics**

OB claim frequency remains stable among CRICO participants, but claim severity has risen. Continued education improves care and can lower premiums.

**Surgery**

In the past 10 years, the second highest claim category faced by CRICO-insured providers has been surgical claims. Team training can help.
Diagnosis

64% of claims come from these four high-risk areas.
percentage of all claims asserted 2002-2006, N=1,164 claims

Missed, delayed, or incorrect diagnoses account for approximately one-quarter of all malpractice cases naming CRICO-insured providers. Colorectal and breast cancer cases are the most common type filed. Address the highest risk diagnostic issues by using these algorithms, guides and information.

Expand All / Collapse All

**Algorithms**

- Breast Care Management Algorithm
- Colorectal Cancer Screening Algorithm

**Cancer Screening Guidelines**

- Breast Cancer (Mammography)
- Cervical Cancer (Pap)
CRICO 2000-2004

“Diagnosis is at the heart of a quarter of the malpractice cases”

- 109 / 261 [42%] high severity cases alleged a missed or delayed diagnosis that impeded treatment &/or recovery
- 261 cases - nearly $125 million in actual & potential losses. CRICO paid out 479K on average per case
- Missed, delayed, or incorrect diagnoses account for approximately 25% of all malpractice cases
- “Physicians who overly rely on prior diagnoses, unconfirmed diagnoses, or intuition are especially susceptible to a narrow diagnostic focus that excludes appropriate tests and imaging study”
“In 2008, AHRQ intends to get a better understanding of incidence, cost, determinants & strategies for preventing or mitigating diagnostic errors.

Diagnostic error comprises a notable and costly fraction of all medical errors.

Diagnostic error encompasses a broad array of factors including cognitive, systems, education, training, setting-of-care, disease-specific, and domain-specific issues.”
“Already the feature of many state health care programs, the Deficit Reduction Act of 2005 DRA requires hospitals to begin reporting secondary diagnoses that are present on the admission of patients, beginning with discharges on or after October 1, 2007. Beginning in FY 2009, cases with these conditions would not be paid at a higher rate unless they were present on admission.”

CMS ANNOUNCES PAYMENT REFORMS FOR INPATIENT HOSPITAL SERVICES IN 2008-CMS press release Aug 1 2007

“So hospitals should expect that the standards for accreditation will keep getting harder to meet as we get better in identifying what the safe practices and high quality practices are that hospitals need to adopt”

Dr Mark Chassin- President of Joint Commission interviewed in Modern Healthcare Jan 31 2008
Diagnostic Error in Medicine

"Diagnostic error comprises a notable and costly fraction of all medical errors and has resulted in devastating consequences for patients, families, and health care professionals."*

* Excerpted from: AHRQ Special Emphasis Notice

Purpose and Scope
The ultimate goal of this conference is to improve patient safety by reducing the likelihood of diagnostic error in medicine. Minimizing diagnostic error is an essential, although relatively neglected, aspect of patient safety. This conference aims to summarize the current state of the field by reviewing research in the clinical and cognitive sciences, and to catalyze emerging ideas on the educational and research agenda that should be implemented to minimize diagnostic error in the future. This is the first national conference dedicated specifically to diagnostic error in medicine. The conference is co-sponsored by the Agency for Healthcare Research and Quality and the American Medical Informatics Association. The conference is co-sponsored by AMIA and the Agency for Healthcare Research and Quality (with a grant to the University of Alabama at Birmingham).

Objectives
To summarize the current state of the field and approaches to reducing diagnostic errors
Thought leaders will be featured as speakers to review the current understanding of the extent of diagnostic
IHI puts spotlight on diagnosis error

“You can put a little asterisk here. This is going to be like ‘I told you so’ because I bet, in this next year, we are going to see a huge focus across the US and around the world on diagnostic reliability…studies emerge that are all converging on the statistics show us we are not really good at making diagnoses - we think we are but we’re not.”
Taxonomy of where and when diagnostic errors occur

• From Gordon Schiff – “Diagnosing Diagnostic errors”

• 1 Access/presentation
  – Denied Care
  – Delayed presentation

• 2 History
  – Failure/delay in eliciting critical piece of history data
  – Inaccurate/misinterpretation of history
  – Suboptimal weighting information
  – Failure/delay to follow up on critical history
Taxonomy of where and when diagnostic errors occur

• 3 Physical exam
  – Failure/delay in eliciting critical physical exam finding
  – Inaccurate/misinterpretation of exam finding
  – **Suboptimal weighting of exam finding**
  – Failure/delay in follow up of exam finding
Taxonomy of where and when diagnostic errors occur

4 Tests: lab/radiology

- Ordering
  - Failure/delay in ordering needed test(s)
  - Failure/delay in performing ordered test(s)
  - Suboptimal test sequencing
  - Ordering of wrong test(s)

- Performance
  - Sample mix-up/mislabeled (e.g. wrong patient)
  - Technical error/poor processing of specimen/test
  - Erroneous lab/radiology reading of test
  - Failed/delayed transmission of results to clinician

- Clinician processing
  - Failed/delayed follow up action on test results
  - Erroneous clinician interpretation of test
Taxonomy of where and when diagnostic errors occur

• 5 Assessment
  – Hypothesis generation
    • Failure/delay in considering the correct diagnosis
  – Suboptimal weighting/prioritization
    • Too much weight to low(er) probability/priority dx
    • Too little consideration of high(er) probability/priority dx
    • Too much weight on competing diagnosis
  – Recognizing urgency/complications
    • Failure to recognize urgency/acuity of illness
    • Failure/delay in recognizing complications
Taxonomy of where and when diagnostic errors occur

- **6 Referral/Consultation**
  - Failure/delay in ordering needed referral
  - Inappropriate/unneeded referral
  - **Suboptimal consultation diagnostic performance**
  - Failed/delayed communication/follow up of consultation

- **Follow up**
  - Failure to refer to setting for close monitoring
  - **Failure/delay in timely follow up/rechecking of patient**
Luther Midelfort Actions

• 20-30 “incidental’ findings daily – mostly CT or MRI
• About 1 every 9 months identified after inappropriate delay
• Goal to develop redundant system that captured incidental findings and checked to see that they were addressed
Luther Midelfort Actions

- Worked with Radiology – common point of identification
- We have system wide PACS system
- Radiology supervisor found Primordial software that works with GE PACS
- Radiologist mark study as having an incidental finding and set date for follow up
- Studies marked go to a list that is managed in our medical records department.
- Studies are reviewed to see if follow up occurred
- System live for 3 months
Luther Midelfort Actions

- Identified Isabel Healthcare in literature search
- Belief in the future importance of decision support and knowledge mobilization
- Have system wide network and EMR
- Isabel added as a web based application
- Detailing of individual physicians – software most useful for primary care including ER and Urgent care
- Regular usage, developing “indications” for using Isabel
Why now?-IHI puts spotlight on diagnosis error

New Tools to “See” for Cognitive Errors

- Isabel (www.isabelhealthcare.com)
  - Developed in the UK by Jason Maude (in conjunction with physicians) after the near-fatal misdiagnosis of his three-year-old daughter Isabel
  - Symptoms are entered into a computer, and pattern recognition software queries current medical journals, textbooks, and databases such as the CDC’s. A list of differential diagnoses, bioterrorism diagnoses, and possible causative drugs is quickly produced to prompt the diagnostic process.
  - “Lessons Learned” section reviews pitfalls and errors associated with these diagnoses and symptoms.

“So diagnostic support, I think, is going to be a big focus for the year to come…if you want to get ahead of the game especially in terms of accreditation and payment, you might want to pick this tool up when you go back and start to think about the diagnostic process”
6. Diagnosis Support

• Why do we need this tool?
  – According to a 2003 JAMA review of autopsy studies, misdiagnoses occur between 8% and 24% of the time.
  – A 2005 AHRQ study found that diagnosis errors far outnumber medication errors as a cause of claims\(^1\).
  – Almost 75 percent of all mortality attributable to patient safety incidents was caused in part by failure to diagnose and treat in time\(^2\).


Diagnosis Support

- Cognitive reasons for misdiagnoses
  - A 2006 study showed that failures in judgment (79%), vigilance or memory (59%), and knowledge (48%) were the leading factors contributing to misdiagnoses.¹
  - An NPSF-funded Veterans Administration study found that premature closure (the failure to consider reasonable alternatives to an initial diagnosis) was the single most common cognitive factor.

The Culture of Diagnosis Decision Support & Knowledge Mobilization
What you need to do……

• Senior clinicians responsible for the introduction and uptake of DDSS. Introduce a culture of mitigating cognitive diagnosis failure.

• Senior physicians on morning rounds and ward rounds in ER, Internal Medicine and Pediatrics asking colleagues: “Have you labeled this patient?” “Are you sure you have thought of everything?” “What else might this patient have?” It is crucial that this practice percolates down from the top.

• In ER, Internal Medicine and Pediatrics for example senior colleagues perform a meta-calibration exercise on 1/2 patients of the previous week – we thought of diagnoses L, M, N. It turned out to be diagnosis Z. Why did we not consider X, Y, Z?

• Measure median time to diagnosis for sentinel diagnosis like PE, Aortic Dissection etc (list to be agreed) both retrospectively and prospectively after introduction of Isabel

• Look at closed claims due to cognitive failure contributing to missed, delayed & incorrect diagnosis both retrospectively and prospectively after introduction of Isabel

• Analyze the mismatch / gap between admitting and final diagnosis
‘What your physician does not know could kill you’

“Genius diagnosticians make great stories, but they don’t make great healthcare. The idea is to make (diagnosis) accuracy reliable not heroic.”

Don Berwick MD. President and CEO of the Institute for Healthcare Improvement (IHI), Boston, MA.
Hospitals using Isabel for 3 years

Generalized Report for University of Virginia Health System

User ID: 16422
User Name: UNIVERSITY OF VIRGINIA HEALTH SYSTEM
Total Isabel logins : 13354
Suggest Diagnoses component used: 4567
Report for all

All Suggest Diagnoses

Year:
- 2005
- 2006
- 2007
- 2008

Generalized Report for Loma Linda University School of Medicine and Child

User ID: 16966
User Name: LOMA LINDA UNIVERSITY SCHOOL OF MEDICINE AND CHILD
Total Isabel logins : 10858
Suggest Diagnoses component used: 3286
Report for all

All Suggest Diagnoses

Year:
- 2005
- 2006
- 2007
- 2008

Generalized Report for Seattle Children’s Hospital

User ID: 16955
User Name: SEATTLE CHILDREN’S HOSPITAL
Total Isabel logins : 11319
Suggest Diagnoses component used: 2853
Report for all

All Suggest Diagnoses

Year:
- 2005
- 2006
- 2007
- 2008

Generalized Report for Washington University School of Medicine, St. Louis, MO.

User ID: 16477
User Name: WASHINGTON UNIVERSITY SCHOOL OF MEDICINE, ST. LOUIS, MO.
Total Isabel logins : 21367
Suggest Diagnoses component used: 6991
Report for all

All Suggest Diagnoses

Year:
- 2005
- 2006
- 2007
- 2008
Isabel Client service program

- On-site visits to raise awareness & explain how Isabel system works and encourage utilization of the system among different stakeholders.

- Throughout partnership period, the Isabel clinical and other experts and staff are available to respond to any questions that you might have.

- When your institution’s EMR implementation is ready, we can work with your EMR vendor to integrate the Isabel system into the EMR, which will boost utilization even more.

- If desired, we will work together with your colleagues through the subscription period to carry out reasonably scoped evaluations and studies to demonstrate value, outcomes and ROI.
User ID: 16477
User Name: WASHINGTON UNIVERSITY SCHOOL OF MEDICINE, ST. LOUIS, MO.
Total Isabel logins : 1400
Total component used: 14541

Generalized Report for Washington University School of Medicine, St. Louis, MO.
<table>
<thead>
<tr>
<th>Suggest Diagnoses</th>
<th>5539</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick Consult - Textbooks</td>
<td>1052</td>
</tr>
<tr>
<td>quick consult 5MinPGSMed</td>
<td>731</td>
</tr>
<tr>
<td>Detailed Consult - Textbooks</td>
<td>647</td>
</tr>
<tr>
<td>quick consult 5MinAGSMed</td>
<td>633</td>
</tr>
<tr>
<td>detailed consult OskiMed</td>
<td>580</td>
</tr>
<tr>
<td>detailed consult OTMGMed</td>
<td>510</td>
</tr>
<tr>
<td>quick consult OskiMed</td>
<td>486</td>
</tr>
<tr>
<td>quick consult OTMGMed</td>
<td>388</td>
</tr>
<tr>
<td>quick consult OTM2GMed</td>
<td>381</td>
</tr>
<tr>
<td>detailed consult OTM2GMed</td>
<td>338</td>
</tr>
<tr>
<td>quick consult null</td>
<td>257</td>
</tr>
<tr>
<td>quick consult OTSGSur</td>
<td>218</td>
</tr>
<tr>
<td>detailed consult OTSGSur</td>
<td>196</td>
</tr>
<tr>
<td>Annotated Images</td>
<td>182</td>
</tr>
<tr>
<td>Lessons Learned - Journals</td>
<td>160</td>
</tr>
<tr>
<td>Read Up Textbook</td>
<td>159</td>
</tr>
<tr>
<td>Quick Consult</td>
<td>122</td>
</tr>
<tr>
<td>Click on a Heading - RHEUMATIC DISEASES</td>
<td>108</td>
</tr>
<tr>
<td>Click on a Heading - GASTROINTESTINAL DISEASES</td>
<td>95</td>
</tr>
<tr>
<td>Click on a Heading - INFECTIOUS DISEASES</td>
<td>91</td>
</tr>
<tr>
<td>quick consult OskiRAG</td>
<td>89</td>
</tr>
<tr>
<td>Related Diagnoses</td>
<td>85</td>
</tr>
<tr>
<td>Click on a Heading - METABOLIC DISEASES</td>
<td>71</td>
</tr>
<tr>
<td>Causative Drugs</td>
<td>71</td>
</tr>
<tr>
<td>Click on a Heading - NEPHROLOGY</td>
<td>65</td>
</tr>
</tbody>
</table>
User ID: 16477
User Name: WASHINGTON UNIVERSITY SCHOOL OF MEDICINE, ST. LOUIS, MO.
Total Isabel logins: 1400
Total component used: 14541

Report for 15 November 2006 and 15 November 2007 for WASHINGTON UNIVERSITY SCHOOL OF MEDICINE, ST. LOUIS, MO.
TOTAL COMPONENTS

Last one year
Total Isabel Components
Questions and Comments

Dr. Terrance Borman
Dr. Joseph Britto