Diagnostic error in medicine

*Can we talk?*

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Director, Emergency Department
Royal Victorian Eye and Ear Hospital
June 2018 AIHI
• Background on Diagnostic Error in Medicine

• Eye and Ear Emergency Department

• Vision for the future
“Listen to your patient. He is telling you the diagnosis.”
William Osler
Inaugural

Diagnostic Error in Medicine June 2008 Conference

Phoenix, Arizona
Attitude change

1. “Physicians need to take time for deliberation”
   deliberation = not thinking harder, thinking of alternatives

2. Physicians should seek more consultations/ask for more 2\textsuperscript{nd} opinions

A. Elstein 2008
3. Feedback

• How good is the feedback physicians get once they are qualified?
  - Rapid feedback needed when you are right when you are wrong
  - Allows physicians to calibrate their performance

A. Elstein 2008
Diagnostic Error

“mistake or failure in the diagnostic process leading to a misdiagnosis, a missed diagnosis or a delayed diagnosis”

– Has received relatively little attention
– Hard to measure, hard to study
– Many diagnostic errors go undetected and unreported
– Estimated to be about 10-15% in day to day practice
– No decrease in rate with advances in technology
Diagnostic Error

• Diagnostic failure highest in ED, internal medicine and family medicine

• Higher morbidity than other types error

• High level of preventability

• Litigation

Models of clinical reasoning

Analytical
- Gathering of facts
- Hypothesis generation
- Hypothesis testing
- Hypothesis refinement
- Hypothesis verification

“System 2”

Intuitive
- Pattern recognition

“System 1”
“A diagnosis is a judgement characterised by uncertainty and probabilistic reasoning – it is seldom definitive at the initial point of care.”

Gurpreet Dhaliwal
“Absolute certainty in diagnosis is unattainable, no matter how much information we gather, how many observations we make, or how many tests we perform. A diagnosis is a hypothesis about the nature of a patient’s illness.”

Jerome Kassirer
Graber et al; Arch Intern Med. 2005;165:1493-1499

- No-fault errors
  - Masked or unusual presentation of disease
  - Patient-related error (uncooperative, deceptive)

- System-related errors
  - Technical failure and equipment problems
  - Organizational flaws

- Cognitive errors
  - Faulty knowledge
  - Faulty data gathering
  - Faulty synthesis
Systems contribution

• Teamwork/communication
• Coordination of care
• Inefficient processes
• Supervision/Training/Orientation
• Lack of access to expertise

ED systems issues
• High decision density
• Information gaps
• Interruptions/distractions
• Fatigue

= “Error – Producing Conditions”
Cognitive errors
Cognitive contribution

- **Premature Closure**: diagnosis accepted before it is fully verified

- **Overconfidence Bias**: tendency to believe we know more than we do, act on incomplete information

- **Confirmation bias**: tendency to look for confirming evidence to support a diagnosis, not disconfirming evidence to refute it

*Diagnostic Error: Is Overconfidence the Problem? AJAM May 2008*
Think about our thinking (metacognition)
Debiasing strategies
Strategies to reduce diagnostic error - Cognitive

- Consider alternatives “*Could this be something else?*”
- Metacognition “*a reflective approach to problem solving, step back, reflect on ongoing thinking process.*” (Croskerry et al., 2008, *Patient Safety in Emergency Medicine*)
- Directed training in critical thinking
- Develop insight /awareness of cognitive/affective dispositions to respond
- Debiassing strategies
- Clinical decision support
- Simulation
What makes diagnosis hard?

Robert Wears
“People do not operate in isolation, but instead are part of complex, joint cognitive systems – communities of practice composed of tools, procedures, artefacts, and coworkers, distributed over time and space and conditioned by organisational, professional and institutional contexts”

“We envision a world where diagnosis is accurate, timely, efficient, & SAFE; where no patients are harmed by diagnostic error”
The Patient Voice
Improving the diagnostic process is not only possible, but it also represents a moral, professional, and public health imperative.
New definition of diagnostic error!

“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”
The Diagnostic Process

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

The planned path of care based on the diagnosis

Learning from diagnostic errors, near misses, and accurate, timely diagnoses

Patient and System Outcomes

Communication of the Diagnosis

Treatment

Outcomes

Has sufficient information been collected?

Clinical History and Interview

Physical Exam

Referral and Consultation

Diagnostic Testing

Patient Experiences a Health Problem

Patient Engages with Health Care System

Information Gathering

Information Integration & Interpretation

Working Diagnosis

TIME

The National Academies of

SCiences • Engineering • Medicine

Diagnostic Team Members

- **Patient-Primary Care Partnership**
  - **Patient & Family Members**
  - **Primary Care**
    - Physicians
    - Advanced Practice Nurses
    - Physician Assistants
    - Nurses
    - Medical Assistants
    - Trainees

- **Radiology**
  - Radiologists
  - Radiology Technologists
  - Trainees

- **Pathology**
  - Pathologists
  - Laboratory Scientists
  - Trainees

- **Other Health Care Professionals**
  - Long Term Care Providers
  - Visiting Nurses
  - Therapists (PT, Occupational, Respiratory)
  - Social Workers
  - Psychologists
  - Pharmacists
  - And more

- **Specialist (e.g., Oncology)**
  - Medical Oncologists
  - Radiation Oncologists
  - Surgical Oncologists
  - Nurses
  - Trainees

*The National Academies of Sciences, Engineering, and Medicine.*

Role of the patient

”co producers of safer medical diagnosis”

Diagnosing Diagnostic Error, Schiff et al, AHRQ 2005

• Keep accurate records
• Ask for all test results
• Ask “what else could it be?”
Other Proposed Solutions
(systems/cognitive)

- Checklists /Clinical practice guidelines
- Health IT support diagnostic process
- Teamwork training
- Patient engagement, patients as teachers
- Education/training in diagnostic process
- Develop approaches to identify/learn from/reduce error
New Paradigm

- Well coordinated, distributed network of people, reliable processes
- Less reliance on human memory
- Judicious test ordering
- Appreciation test limitations –risks, incidental findings, false +/-
- Systematic, proactive surveiling high risk situations/diagnoses
- Systematic, proactive feedback and follow up

Schiff, G. BMJ Quality and Safety 2013
Night Shift
EMERGENCY DEPARTMENT

- EMERGENCY EYE REGISTRAR
- EMERGENCY REGISTRAR

MORNING CLINICAL HANDOVER STRUCTURE

1. PATIENTS SEEN OVERNIGHT EYE/ENT
2. WARD PATIENTS
3. EXPECTED PATIENTS

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The Royal Victorian Eye and Ear Hospital
ISBAR Clinical Handover
EMERGENCY NIGHTS - EMERGENCY REGISTRAR

<table>
<thead>
<tr>
<th>NIGHT DOCTOR:</th>
<th>DATE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification</td>
<td>Situation/Background</td>
</tr>
<tr>
<td>PATIENT STICKER</td>
<td>DIAGNOSIS/PROCEDURE</td>
</tr>
</tbody>
</table>

Please attach patient record or print patient name, DOB and UR Number.
Diagnostic Cross-checking

-a strong network of communication

Observer GP
Nurse
Junior ENT doctor
Eye Registrar
CEO
Night eye doctor
Night ED doctor
Medical student
Senior ENT doctor
ED Registrar
Ophthalmologist
Clerk
Nurse
2 recent quotes...

Night doctor
• “If it’s not the right diagnosis, someone will look into it”.

Morning senior (admitting officer)
• “Shall we revisit the diagnosis?”
• Cross checking to enhance diagnostic resilience
• Timely feedback on diagnosis
• Thinking out loud
• Cross fertilization between craft groups
• Modelling behaviour for medical students
• Storytelling ......listening
• Team building
• Discussing uncertainty and error
• Thanking / acknowledging night efforts
Connie (cleaner)
Preseptal and Orbital Cellulitis

SEE ALSO: dacryocystitis, chalazion

DESCRIPTION
Preseptal cellulitis is infection of the skin and subcutaneous tissues anterior to the orbital septum.

Orbital cellulitis (or "preseptal cellulitis") is infection of the soft tissues posterior to the orbital septum, and poses risk of vision and life-threatening complications.

BACKGROUND
- Preseptal and orbital cellulitis occur with higher frequency in children
- Often occurs in association with sinusitis and upper respiratory tract infection (URTI)
- Pathogens: Gram positive cocci (Staphylococcus and Streptococcus species), Haemophilus species, anaerobes

HOW TO ASSESS:

Red Flags:
- Urgent surgical intervention may be required in cases of orbital cellulitis with sinusitis, subperiosteal abscess, intraorbital abscess, or foreign body. Consult oculoplastics (OPAL) and ENT.
- Intracranial infection should be suspected in patients with headache, nausea and vomiting, altered conscious state, or multiple cranial nerve palsies.
- Children with preseptal and orbital cellulitis can rapidly deteriorate. Children <4 years of age have an incomplete orbital septum and are at risk of retrograde spread of infection from the preseptal to orbital space.
- Children who are systemically unwell requiring paediatrician input may need to be transferred to The Royal Children’s Hospital (RCH). All inter-hospital transfers to and from RCH must be made consultant to consultant, involving the oculoplastics team.
- If immediate transfer/retrieval to RCH is required call ambulance or PIPER (Paediatric Infant Perinatal Emergency Retrieval - 1300 137 650)
Consultant supervision

Mandated consultations/2\textsuperscript{nd} opinions for 6/12
Purpose of the checklist
This is a guide of things you may wish to discuss with the doctor who sees you in our Emergency Department (ED). We want to make sure that when you are discharged from our ED you have understood all parts of your care.

1. Medical Tests
   You might have some tests done today. Your doctor will explain any tests and results that may come back while you are in the ED. If any test results are not back before you leave, ask your doctor how these will be communicated to you and your GP.

2. Medication
   You may be given eye or ear drops or other medication. Please ask your doctor to further explain any of your medication, if you do not understand.

3. Medical Certificate
   If you need a medical certificate for your visit to the hospital today, please ask your doctor.

4. Review Appointment
   You may need a review appointment arranged for your condition. You could be referred to a specialist or optometrist closer to home, or one of our outpatient clinics. You and your doctor can decide which is the best option for you.

5. Letter to your GP/referrer
   We will send your GP (and/or the person who referred you) a letter about today’s visit. If you would like a copy, please let us know.

If your condition worsens, visit your local GP or ED immediately.
Garden terror – an increasing number of serious ear injuries caused by yucca plants

Vartanyan M, Orimoto K, Crock C, Dragovic A, Dobson M, O’Leary S

Introduction

The yucca is a ubiquitous plant whose long and sharp leaf spines are accountable for an increasing number of ear injuries in Melbourne. In view of an unprecedentedly high number of penetrating ear injuries between January 2012 and December 2016 we conducted a case series review and summarised the data.

The electronic search yielded 24 cases. Whereas most cases were straightforward to diagnose and patients recovered quickly, three cases of PLF were diagnostic dilemmas. In contrast to this data, we found only one report in the available literature. It described three cases of ear injury caused by yucca plants, one of which was a perilymphatic fistula (PLF) (Talini et al, 2009).

Case series report

The upward trend in the number of presentations to RVEEH Emergency Department is clearly evident.

![Diagram 1. Number of ear injuries caused by yucca plants in 2012-2016.](image)

Table 1. Number of ear injuries caused by yucca plants in 2012-2016.

<table>
<thead>
<tr>
<th>Year</th>
<th>No of injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>2</td>
</tr>
<tr>
<td>2013</td>
<td>3</td>
</tr>
<tr>
<td>2014</td>
<td>5</td>
</tr>
<tr>
<td>2015</td>
<td>10</td>
</tr>
<tr>
<td>2016</td>
<td>20</td>
</tr>
</tbody>
</table>

![Diagram 2. Ear injuries caused by Yucca plants in 2012-2016.](image)

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- Tympanic membrane perforation (TMP) alone, n=19
- TMP with perilymphatic fistula, n=3
- Non-penetrating injuries, n=2

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Discussion

This data echoes the known statistics of PLF outcomes – hearing improvement is less likely than resolution of balance disturbance after surgical repair of PLF. According to various authors, the bone conduction improvement occurs in 13-23% of cases, the most optimistic series reported by Seltzer and McCabe (1986), who observed 49% of patients.
RV EEEH ED - Methods to reduce

• Clinical Practice Guidelines
• Consultant Supervision
• Consultations/2nd opinions mandated
• Morning handover
• Results checking process (2 doctors)
• ED flow/streaming (eg fast track) – less chaos
• Review clinics
• Incident monitoring (monthly presentation) – recurrent error patterns
Welcome to the Emergency Medicine Events Register (EMER)

EMER is an adverse event and near-miss reporting system that is peer-led, online, anonymous and confidential. It is a means of supporting improvement in safety and quality in emergency medicine by understanding of contributing factors and how the risk of harm to patients can be minimized or prevented.

For more information please [click here](#) to watch the EMER video: “Learning from our errors - Emergency Medicine Events Register”.

The EMER is supported by ACEM and managed by the Australian Patient Safety Foundation (APSF). The College encourages members to enter incidents to the database. CPE points can be obtained for reports submitted.

**EMER will guide you to:**

- Identify
- Report
- Inform

[Learn more about EMER](#)
Diagnostic error in EMER

- Cardiovascular
- Fractures
- Sepsis
Diagnostic error: Missed fractures in emergency medicine

The following incident was submitted to the Emergency Medicine Events Register (EMER – http://www.emer.org.au). EMER is an anonymous, confidential and protected incident-reporting system that is supported by ACEM. Anyone working in emergency medicine can enter a near miss or AE by following the link from the website. It should only take 5 min and will help to inform practice and improve patient safety in emergency medicine.

The case presented in Box 1 demonstrates the failure of an ED registrar to correctly identify a triquetral fracture on X-ray. A diagnostic error is broadly defined as any mistake or failure in the diagnostic process leading to a misdiagnosis, a missed diagnosis or a delayed diagnosis. Failure to diagnose a fracture accounts for up to 80% of ED diagnostic errors,1 occurs in 1% of all ED visits in a Norwegian hospital2 (when 3% of fractures were missed) and is a leading cause of litigation.1 The rate of missed fractures in emergency radiology is highest in the extremities (foot, 7.6%; hand, 5.4%; wrist, 4.1%; ankle, 2.8%), the knee (6.3%), elbow (6.0%) and hip (3.9%).

This missed fracture highlights a system issue (lack of timely X-ray reporting) that could potentially result in significant patient harm. According to Reason (p. 768), a systems approach to error ‘concentrates on the conditions under which individuals work and tries to build defences to avert errors or mitigate their effects’.4 Such an approach is characteristic of high-reliability organisations, which

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**BOX 1. Data reported into EMER from an adverse event**

Clinical presentation – Injured wrist
Incident description – ED registrar interpreted XR as normal – missed the triquetral fracture
Contributing factors – Small fracture, inexperience, no ED consultant review of XR, delayed reporting of XR
Action taken – Patient phoned to come in, did represent for plaster and referral to fracture clinic
Factors that reduced the impact – XR reported 24 h later by radiology, results phoned through to ED consultant, patient presented for plaster
Prevention – Further education of ED registrars, supervision by ED consultant
Consequence or Outcome – 1-day pain
Time of Incident – 00.00–00.59 hours
Reporter – ED Physician
Specialty involved

Ambulance | General Surgery | Intensive Care | Imaging

Medical Specialty Involved (All vs Deaths)

Number of Incidents


Medical Specialty
Diagnostic Errors in EDs

Contributing factors

- Overcrowding = busy ED not safe
- Supervision (how we supervise/ratio junior to senior)
- Inexperienced / access to expertise
- Night duty + poor decision making

What conditions do we normalise, as a specialty?
Conclusions

• Systems and cognitive contributions to diagnostic error inextricably linked in ED environment

*Improved ED processes and teamwork are imperative to reducing diagnostic error in ED*
Visions for the future
Vision for the future

Community in Australia – creative collaborations

“...new thinking, theories, and techniques from other disciplines may be needed.” R. Wears
Areas for research

- Emotions and diagnosis
- Effect of sleep deprivation
- Patient role in medical education
- Teaching patients about diagnosis - tools
- Tone of voice
- Diagnosis as a conversation
- Narrative medicine
- Checklists / decision support in real world
- IT and automated feedback on diagnosis
- Diagnostic errors in disadvantaged patients
Diagnosis is relationship