“How did this happen?”

Medical Errors in EMS

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Tacoma Fire Department

MEDICAL ERRORS

250,000
FATAL ERRORS IN 2013

Source: Johns Hopkins University

MEDICAL ERROR

would be the 3rd leading killer in the U.S. per year

599,000 HEART DISEASE
565,000 CANCER
167,000 MEDICAL ERROR
122,000 CHRONIC LOWER RESPIRATORY DISEASE
122,000 STROKE
118,000 ACCIDENTS

ESCAPEFIREMOVIE.COM  source: cdc.gov; Health Affairs
“Few tools have as great a potential to cause harm as the laryngoscope, syringe, & the ink pen...”

“Human fallibility is like gravity, weather, and terrain... just another foreseeable hazard.”

–J.T. Reason
OBJECTIVES
✓ What are they?
✓ Who does them?
✓ Where do they occur?
✓ When do they occur?
✓ Why do they occur?
✓ Cases
✓ Solutions

“... it is virtually impossible for one mistake to kill a patient in the highly mechanized & backstopped world of a modern medicine. A cascade of unthinkable things must happen, meaning catastrophic errors are rarely a failure of a single person, and almost always a failure of a system.”

-Lisa Belkin
From How Can We Save the Next Victim?
NY Times Magazine, June 1997

Why is this important?
1) Patient care and safety
2) Patient satisfaction
3) Health care professional satisfaction
4) Financial ($17-29 billion/yr in hospitals nationwide)
5) Trust in the healthcare system & your organization
What are human errors?

1. Error of execution
2. Error of planning

Types of Human Error

- **Active**: “the sharp end”
- **Latent**: “the blunt end”
  - Often concealed & thus frequently unnoticed
  - Have the capacity to cause many types of active errors
  - More menacing because they lie dormant

Types of Human Error

- Procedural
- Affective
- Cognitive
Who makes errors?...

Innate human limitations of mind & body
- Limitations in memory capacity
- Limited ability to handle multiple competing demands
- Weakened mental abilities including decision making during fear & fatigue
- Influence from group dynamics & culture

When does it occur?

- **Complex systems**
  - Vehicles
  - Multiple personnel
  - Patient care equipment
  - Patients' physiology
- **Tightly coupled**
  - Time-dependent process
  - Invariant sequences

“Highly Complex, Tightly Coupled”

Unique obstacles in EMS

- Dynamic & potentially dangerous environment
- Fast paced... where speed is perceived as excellence
- Limited resources, personnel, & time
- Reliance on inferred indications...
- Actions have immediate consequences with little recovery time to stop sequential errors
Unique obstacles in EMS

- Frequent handovers of high acuity patients
- Pressure to perform with a high degree of scrutiny
- No dispatch is really the same

16,000,000

4 organizations with 272 incidents related to:

<table>
<thead>
<tr>
<th>Incident Category</th>
<th>No.</th>
<th>%</th>
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<tbody>
<tr>
<td>Harm documented in 59% of incidents with one death</td>
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Contributing factors were:
- System-based in 54%
- Human-based in 42%

Contributing factors:
- Haste (7.5%)
- Equipment mishap (7.2%)
- Equipment missing (5.5%)
- Failure to check (5.8%)
- Pressure to proceed (5.2%)

MEDICATION DOSING ERRORS IN PEDIATRIC PATIENTS TREATED BY EMERGENCY MEDICAL SERVICES
John D. Hoyte, Jr, MD, Alan T. Davis, PhD, Kevin K. Putman, EMT-P, Jeff A. Trybo, MS, William D. Bates, MD

- Retrospective look at 8 EMS agencies from 2004-2006
- Children < 11 years old
- Error defined as > 20% deviation from the weight appropriate dose determined by prehospital record
- Examined 6 medications
  - Albuterol
  - Atropine
  - Dextrose
  - Benadryl
  - Epinephrine
  - Narcan

2012

230 children underwent 360 medication administrations

**Dosing errors occurred in 34.7%**
Why do they occur?

- Depends on how you look at it...

<table>
<thead>
<tr>
<th>Modern “System”</th>
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<tbody>
<tr>
<td><strong>Main Focus:</strong></td>
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<tr>
<td><strong>Cause:</strong></td>
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<tr>
<td><strong>Foundation:</strong></td>
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<tr>
<td><strong>Counter Measures:</strong></td>
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<tr>
<td><strong>Conclusion:</strong></td>
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Swiss Cheese Model

- Person approach dominates medicine
- “Myth of Infallibility”
- Blaming individuals is more emotionally satisfying than targeting systems
- Uncoupling a person’s unsafe acts from institutional responsibility is potentially desirable…

How do YOU view error?
"What is striking about many accidents is that people were doing exactly the sorts of things they would usually be doing the things that usually lead to success & safety… Accidents are seldom preceded by bizarre behavior."

Sidney Dekker

Case 1- TRAUMA

Persistent failure to revise a diagnosis or plan in the face of evidence that suggest revision is necessary…

- “This and only this”
- “Everything but this”
- “Everything’s okay”

Affects all of us… even the wise and experienced

“First come, best preferred”

Fixation Errors
(anchoring)
Cognitive Errors

“Errors in how we think”

We should strive to understand why we have certain dispositions to respond in particular situations

Pat Croskerry, MD, PhD

“Most important strategy is to familiarize clinicians with various types of biases…”

Search satisfying: calling off the search for further abnormalities after achieving satisfaction from finding the first abnormality

Premature closure: when a dx is accepted before fully verified and other potential dx are not considered

Diagnostic momentum: “following the crowd”

Overconfidence Bias: over-reliance on the opinions of the expert that came before (officer, supervisor, etc.)

A Few Examples

- Aggregate bias
- Anchoring
- Ascertaintment bias
- Availability
- Base-rate neglect
- Commission bias
- Confirmation bias
- Diagnosis momentum
- Feedback sanction
- Framing effect
- Gamblers fallacy
- Gender bias
- Multiple alternative bias
- Omission bias
- Order effects
- Overconfidence bias
- Playing the odds
- Premature closure
- Psych-out errors
- Search satisfying
- Triage cueing
- Unpacking principle
- Vertical line failure
- Visceral bias

Debiasing Strategies

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Mechanism/Actions</th>
</tr>
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<tbody>
<tr>
<td>Develop weight-electrical</td>
<td>Private detailed descriptions and thorough characterization of relevant clinical scenarios, together with multiple clinical examples illustrating that adverse effects on diagnostic performance and diagnosis.</td>
</tr>
<tr>
<td>Consider alternatives</td>
<td>Establish frequent consideration of alternative possibilities, e.g., the generation and working through of a differential diagnosis. Encourage weighting the question: What else might this be? For a reflexive approach to problem solving, keeping in mind that we have to come up with a list of possible problems, and then nail down the best possible solution.</td>
</tr>
<tr>
<td>Elaboration</td>
<td>Enhance relevant memory</td>
</tr>
<tr>
<td>Specific training</td>
<td>Identify open for flavor and ideas in thinking and provide detailed training in overcoming their limitations, e.g., instruction in fundamental rules of probability, contrasting common and uncommon, into heuristic variability.</td>
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</tbody>
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Heuristics

“Unconscious ‘mental shortcut’ or ‘rule of thumb’ that allows humans to process a large amount of information in a short amount of time.”

- Annissimov M.

- We learn to ignore info that is not needed & to process only info that is vital at the moment
- Simplifies decisions
- Flourishes in uncertainty

Benefits of Heuristics

- Allows us to minimize mental effort
- Saves incredible time for the busy clinician
- Aides in rapid triage & treatment
- Leads to optimal resource utilization

“Heuristics are indispensable in medicine & clinicians, must often make quick judgments about how to treat a patient on the basis of a few, potentially serious symptoms.”

- Dr. Croskerry
In other words...

Because of past experience & training specific clusters of signs & symptoms trigger a “mental shortcut” that leads to a potential diagnosis

***A form of pattern recognition that is intuitive***

***Accuracy is dependent on the experience***

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Metacognition

Ability to stand apart from your own thinking in order to be aware of your own preferred heuristics & thinking biases

- “thinking about thinking”
- “hallmark of human intelligence”
- Allows us to ask…
  “What will I do differently next time?”

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Metacognition

Two Stage Process

1. Develop awareness of the cognitive demands in a particular situation
2. Able to specify a particular strategy for improving the decision making
A couple of tips…

• Summarize the patient in a single sentence
• Then ask yourself a few of these questions…

1. What was my first impression?
2. What information was I looking for?
3. How confident am I?
4. Could I be missing an alternative diagnosis?
5. Significant advantages or disadvantages of treatment?
6. If I was less busy, or tired would I do the same?
7. Clues to errors: disparities, repeat run, patient not improving

“Unfortunately, the implicit assumption in medicine is that we know how to think...

but the reality is we don’t…”

- Dr. Croskerry

Case 2- The Details
Communication Failures

- Communication problems in transport medicine are numerous & a leading cause for breakdown in patient care...
  - To Err is Human: 1999

  Root cause in over 70% of sentinel events reported to JACO
  Of these... 75% are associated with a patient's death

  - Studies document communication failure as cause for medical errors in all aspects of transport from dispatch to treatment

Communication Load
Short Term Memory

Communication Failures

- “Read-Back” Process
  - Active participation
  - Built in redundancy for clarity
  - Closed loop communication

  Ideal for efficient communication between fatigued or overwhelmed participants

  - Should NOT BE used for all communication

  - Should BE used in specific operational contexts
    1) Critical phase of operations
    2) Exchange of vital information

When things get really bad?

- Traditional “Hint and Hope model”
  - Founded in hierarchy
  - Perpetuates lack of a common mental model

- Appropriate Assertion
  - Stop and Listen… we may have a problem

- CUS Program
  - “I am concerned…”
  - “I am uncomfortable…”
  - “This is unsafe…”

Get person's attention
Propose action
Express Concern
State problem
Case 3 - Intubation

An act that could have caused harm but was prevented through a planned or unplanned recovery

- Do you recognize these events in your own clinical care?
- Do you acknowledge these events in your colleagues?
- Do you formally report these events?

Near Miss

- An act that could have caused harm but was prevented through a planned or unplanned recovery

- Do you recognize these events in your own clinical care?
- Do you acknowledge these events in your colleagues?
- Do you formally report these events?

Normalization of Deviance

- A gradual shift in thought during which a nonstandard or unacceptable change in behavior or standards becomes acceptable to us

- Have YOU done this?
- Have you ever seen this in your colleagues?
- What do you do about it?
Understand one thing...

We even make errors when looking at errors...
- Outcome Bias
- Hindsight Bias

Error Management

2 Big Goals:
1) Limiting the incidence of dangerous errors
2) Creating systems better able to tolerate errors

2 areas of focus:
- The person
- The team, the system, the institution
Error Management

The “Anti-personnel” approach has major problems

✓ People do NOT intend to commit errors
✓ Psychological precursors of an error are the least manageable links in the chain of events leading to error
✓ Accidents rarely occur as the result of single unsafe acts

High Reliability Organizations

Run high-risk operations for extended time periods with low rates of adverse events

✓ PREOCCUPATION WITH FAILURE
✓ Lack of complacency in down times
✓ Reluctance to simplify explanations
✓ Training to “assume less but notice more”
✓ Deferece to expertise and experience
Solution

- Treat medical errors like any other disease
  - Educate yourself on the disease
  - History & examination
  - Get diagnostic “tests”
  - Form a differential dx
  - Make a diagnosis
  - Provide treatment

Treatment

- Deal with latent factors & organizational culture
- Provide formal training on the nature of error & the limitations of human performance
- Develop error reducing processes
  - Read Backs
  - Time Outs
  - Check lists
  - Reduce Distractions
- Make error management a focus of recurrent training & data collection
June 2014
Shaughn Maxwell, EMT-P

Just Culture

- Founded in the belief that errors are caused by a complex array of factors including failures of systems as well as human factors.

- Well accepted in healthcare & aviation

- Embodies fairness & accountability.

- Encourages individuals to report mistakes so that the precursors to errors can be better understood to fix the system.
Just Culture

**Human Error**
Inadvertently completing the wrong action

**At-Risk Behavior**
Choosing to behave in a way that increases risk where risk is not recognized or is mistakenly believed to be justified

**Coach**
at-risk behavior

**Punish**
reckless behavior

...Regardless of Outcome

**Reckless Behavior**
Choosing to consciously disregard a substantial & unjustifiable risk

It is not if...

What would you want for your family?

It is when...

- 2001 TJC requires disclosure of “unanticipated outcomes”
- No national guidelines for the identification, reporting, & disclosure of medical errors in the transport environment
- Regardless, patients expect openness & disclosure, should an error occur

Reporting MUST occur...

- Receiving ED physician
- Immediate Supervisor
- Your Medical Director

***The patient & family***

How this occurs should vary by agency policy, local culture, and clinical situation
Disclosure for Patients

• Supports truth-telling, patient safety, & trust

• Consistent with patient preference...even when errors are small & the harm is minor

• Patients seek acknowledgement of the pain & suffering that was caused by the error

• Patients want reassurance that future errors will be prevented

Disclosure for Providers

• Beware of the “disclosure gap” and its causes

• Clinicians experience significant emotional distress & isolation after errors occur

• Disclosure helps reduce burnout

• The transport environment is often difficult for large institutions to understand

The Future...

❖ Training dedicated to understanding the causes of medical errors

❖ Confidential databases for reporting medical errors

❖ Research on minimizing error producing conditions

❖ Collaboration with industry to design equipment that is up to the task

❖ Policies guiding the disclosure of medical errors

❖ Publish our challenges & successes
Conclusions

• Error is part of the human condition but bad outcomes due to error don’t have to be…

• Faulty systems call forth error behavior in even the most skilled and experienced clinician

• With adequate leadership, attention, & resources, improvements can be made to these systems.

• Different types of errors require different methods of risk management

Conclusions

➢ The psychological factors involved in error are the last & least manageable links in the chain of error

➢ People do not act in isolation. Behavior is shaped by circumstances

➢ It may be part of human nature to err, but it is also part of human nature to create solutions, find better alternatives, & meet the challenges ahead….

“All men make mistakes, but a good man yields when he knows his course is wrong, & repairs the evil. The only crime is pride.” - Sophocles, Antigone
Myths about Errors

- Bad people make errors
- It is easier to change people than situations
- The errors of highly trained professionals are rare
- Nothing good comes from errors
- Practice makes perfect
- Errors are random & highly variable
- The errors of highly trained professionals are usually sufficient to cause bad outcomes

Case 1 - STEMI

Slips, Lapses & Mistakes

Errors

Execution failures: slips, lapses, trips & fumbles
Planning/problem solving failures: mistakes
Slipses & Lapses

- Recognition failures
- Attentional failures
- Memory failures
- Selection failures

Examples of Slips
- Sequence Error
- Description Error

Most commonly occur during some routine task in familiar surroundings

Mode of Error

Mistakes

- Rule Based: Preprogrammed solutions
  1) Misapplication of a good rule
  2) Application of a bad rule
  3) Non-application of a good rule

- Knowledge Based: No preprogrammed solutions
  - Occur in novel situations
  - Solution to a problem must be worked out on the spot
  - Inaccurate or incomplete "mental mode"

Errors versus Violations

Violations are deviations from safe operating practices or rules.

Violations are different than errors

<table>
<thead>
<tr>
<th>Errors</th>
<th>Violations</th>
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<tbody>
<tr>
<td>Informational Problems (forgetting, inattention)</td>
<td>Motivational problems (low moral, lack of concern etc)</td>
</tr>
<tr>
<td>Explained by what goes on in the mind of an individual</td>
<td>Occur in a regulated social context</td>
</tr>
<tr>
<td>Reduced by improving the delivery of information</td>
<td>Require motivational and organizational solutions</td>
</tr>
</tbody>
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Our environment... full of risk & uncertainty

• “Jack of all trades” expected to be good at everything
• Make multiple critical decisions rapidly & simultaneously
• Perceived to be an action-oriented profession with procedures being the most important skill set...
• Reality is that the majority of our time is spent engaged in cognitive behavior

Errors versus Violations

Factors that promote violations are less well understood than conditions producing errors

<table>
<thead>
<tr>
<th>Error Cause</th>
<th>Frequency</th>
</tr>
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<tbody>
<tr>
<td>Complex systems</td>
<td>High</td>
</tr>
<tr>
<td>Human error</td>
<td>Medium</td>
</tr>
<tr>
<td>Equipment failure</td>
<td>Low</td>
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• Complex study design using focus groups, interviews, & event reporting.
• Examined adverse events, near-misses, and errors
• 61 events from an EMS region serving an urban, suburban, and rural population of 795,000
"Backboard everyone to save your ass."

"Training is not the same all over"

"With all the different pieces of equipment, half know & half don’t"

- A culture of “blame and shame” was evident
- Weak or confusing protocols
- Unrealistic expectations = perceived errors
- Inadequate training and experience with pediatrics
“ALS delayed due to local politics...”

“...When you ask for an attending.. You get an attitude.”

“A good paramedic wouldn’t need to pull out a cheat sheet

“Next time why don’t you call me to the scene to do your intubations for you?”

“Adverse events & near-misses were common among EMS providers who participated in this study but the culture discourages sharing of this information.

Participants attributed many events to system issues & to inadequacies of other provider groups.”