



# How Do We Detect Error in Complex Systems?

## Methods Used to Measure Error and Adverse Events in Hospitalized Children

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# Methods to Detect Error and Adverse Events

- M&M/Autopsy conferences
- Traditional chart review
- Incident reports
- Direct observation
- Review of malpractice claims
- Review of ICD-9 codes
- Trigger tools



# M&M Conferences and Autopsy

## Advantages:

- Format familiar to health care providers and accreditation bodies



## Disadvantages:

- Hindsight bias
- Reporting bias
- Focus on diagnostic errors
- Infrequent (especially in pediatrics)
- Nonrandom
- Expensive/time-consuming
- Depends on quality of medical record

# Specifically:

- M&M processes
  - no proven benefit in improving care demonstrated
- Autopsy
  - may identify potentially fatal misdiagnoses in 20-40% of cases
- Combined
  - Too few cases discussed to detect incidence and prevalence of error/AE with this method

# Traditional Chart Review

## Advantages:

- Utilizes information available
- Random sample

## Disadvantages:

- Time-consuming/expensive
- Quality of medical record is critical
- Reviewer dependent
  - Judgments about AE unreliable
  - Hindsight bias
  - Reporting bias



# Review of Malpractice Claims

## Advantages

- Large pool of data
  - US are 110,000 claims received annually
- Provides multiple perspectives



## Disadvantages:

- Hindsight bias
- Selection bias
- Reporting bias
- Non-standardized data source
- Cannot be used to estimate prevalence of error or AE

# Incident Reports

## Types of Reporting Systems:



- **Mandatory**
  - AE must be reported by law, policy/regulation
- **Anonymous**
  - no identifiable details of patient/care providers included
  - Liberate less detailed report, as no follow-up possible
- **Confidential**
  - identifiable details included, then removed after investigation is complete
  - Allows for more complete information than anonymous systems

# Electronic reports are superior to paper

- Simplify process
- Decrease number of forms to complete
- Improve quality and quantity of data collected
- Improved response time
- Improve evaluation and follow-up
- Enhance quality, patient safety and work environment
- Allows for development of a database, and sharing of data with other organizations

**Table 7. Conditions Influencing Incident Reporting by Physicians and Nurses**

"I would be more likely to report an error if..."	Residents	Nurses	Significant Difference?
...if it were my own error	54%	91%	yes
...if a resident committed the error	4%	43%	yes
...if a nurse committed the error	38%	42%	no
...if I don't like the person who committed the error	25%	1%	yes
...if the patient was young and healthy	33%	19%	no
...if the patient had an intact mental status	29%	14%	no
...if the error had serious consequences	67%	72%	no

(Wild and Bradley 2005)

White JL. Adverse Event Reporting and Learning Systems: A Review of the Relevant Literature. 2007.  
Accessed at <<http://www.patientsafetyinstitute.ca/English/toolsResources/caerls/CAERLSConsultation/Documents/CAERLS%20Consultation%20Paper%20AppendixA.pdf>>May20, 2009

# Reporting and Learning Systems

- National databases have been developed in the US, Britain, and Japan that compile national data from mandatory and voluntary systems
- Canada is developing a database with the combined efforts of CPSI and PHAC - Canadian Adverse Event Reporting and Learning System (CAERLS)

# Reporting and Learning Systems



Purpose is to identify problems with delivery of care and health system  
NOT reprisal of individuals involved

# Ideal Reporting and Learning Systems

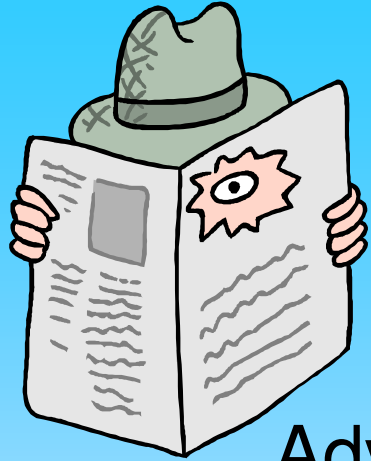


- Use independent organizations for analysis of data with expertise in medicine and safety
- Provide timely feedback to providers
- Suggest systems-oriented solutions
- Organization is responsive to suggested changes
- Confidential
- Non-punitive

# Pitfalls of Reporting and Learning Systems



- Only as good as data provided
- Consistent nomenclature/taxonomy when combining systems
- Compatible software across organizations
- No clear protection from legal system
- Timeliness of reporting and feedback



# Direct Observation of Patient Care

## Advantages:

- Accurate and precise data
- Detail otherwise unavailable
- Identifies more adverse events/active errors than other methods

## Disadvantages:

- Confidentiality concerns
- Time-intensive training of observers to ensure reliability
- Expensive
- Hindsight bias
- Focuses on “sharp-end” or providers, not on system
- Potential Hawthorne effect

# Review of ICD-9 Codes

## Advantages:

- Inexpensive
- Uses data readily available

## Disadvantages:

- Data may be incomplete/inaccurate
- Data and clinical context are separate



# Trigger Tools:



- Focus on detecting, quantifying and tracking adverse outcomes (not error) over time
- Methodology is related to actual clinical injury
- Can be used in all clinical environments to detect multiple types of AE (trigger list varies per environment)
- Inexpensive - can be introduced without significant technology (but helps!)
- Consistent and accurate way to measure AE

# What is a “trigger”?

- A word/event found as part of a health record (written or electronic) that can be associated with an adverse event
- This triggers a focused chart review to confirm if an adverse event has occurred or not

**TABLE 1** Final Trigger List Used in the Inpatient Pediatrics ADE Trigger Tool Study

Designation	Description
T <sub>1</sub>	Diphenhydramine use
T <sub>2</sub>	Vitamin K use
T <sub>3</sub>	Flumazenil use
T <sub>4</sub>	Antiemetic use <sup>a</sup>
T <sub>5</sub>	Naloxone use
T <sub>7</sub>	Sodium polystyrene use
T <sub>10</sub>	PTT • 100 s
T <sub>16</sub>	Rising serum creatinine <sup>b</sup>
T <sub>21</sub>	Oversedation/lethargy/fall/hypotension
T <sub>22</sub>	Rash
T <sub>23</sub>	Abrupt medication stop
T <sub>25</sub>	Serum glucose • 150 mg/dL
T <sub>26</sub>	Hyperkalemia <sup>c</sup>
T <sub>27</sub>	Called codes
T <sub>28</sub>	Laxative or stool softener use

# What is the process?

- Review team
  - Two primary record reviewers (RN, pharmacy, RT) to screen for triggers
  - Physician - authenticates if AE occurred, then rates severity, answers other queries of the reviewers
- Sampling patient records
  - 10 randomly selected records every 2 weeks of discharged patients (in/exclusion criteria exist)

# How good is this method?

- Superior to those previously described in identifying rates of AE/harm
  - Adult literature suggests AE rates measured are 50 times higher than other methods
  - Limited pediatric data available, but demonstrates success
- *Does not measure error* (as error may or may not result in harm); measures true AE/harm

# Pediatric Trigger Tools Do Exist!



- Canadian Association of Pediatric Health Centres (CAPHC) has developed one and is piloting June, 2009:

CAPHC Canadian Paediatric Trigger Tool

# Summary:

- Are pros/cons to each method
- Large databases are being developed that detect error and AE using incidence reports
- Trigger Tool methodology is superior in identifying AE/harm and is being used with increasing frequency
- Complimentary information can be generated by using a combination of approaches

