

Journal Club



Incident Reports And Trigger Tools

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Incident Reports

- Evaluation of an Anonymous System to Report Medical Errors in Pediatric Inpatients
 - Taylor et al. Journal of Hospital Medicine 2007;2:226-233

BACKGROUND



Incident Reports

- Voluntary or involuntary
- Limited use in understanding issues
- Significant underreporting
 - Ease of use
 - Culture, Embarrassment, job sanctions, litigation



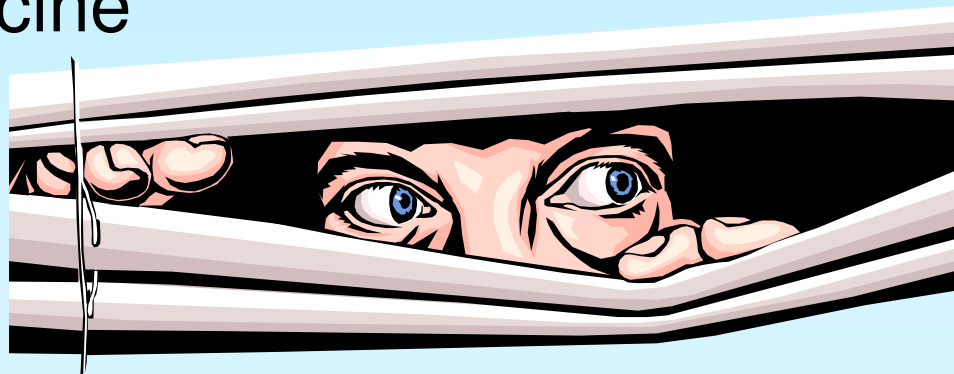
Anonymous Reporting

- Aviation Industry 1976
- Increase in reporting
- Analysis of near-miss events has improved aviation safety



Anonymous Reporting of Medical Error

- Limited number of publications
- Difficult to compare - patient type, duration of study, different inherent rate of error
- Result - limited data to compare traditional incident reporting with anonymous reporting in medicine

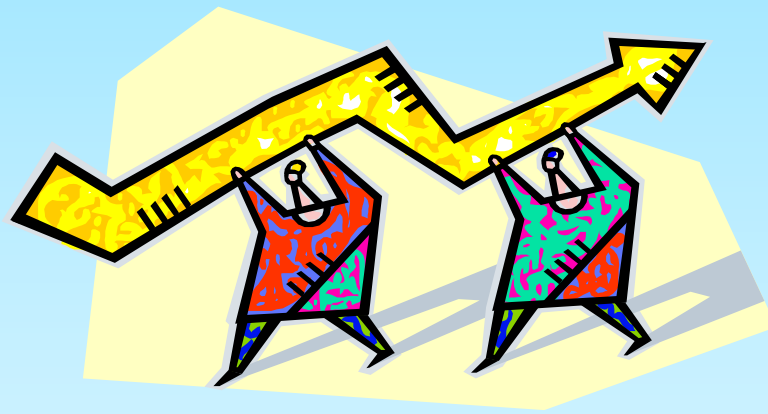


Study Hypothesis



- More medical errors would be reported through an anonymous system
- Information would be collected on a wider range of problems
- Reporting of near-miss events would increase

METHODS



- **CHRMC Seattle, Washington**
 - Community and tertiary-care
 - IICU and Medical unit
 - IRB approval
- mid-Feb to mid-May 2003
- Electronic anonymous medical error reporting system
- Physicians and nursing staff
- Standard form used by those who refused to participate

- Training provided to nurses and physicians on the unit
 - Access, examples of medical errors, importance of reporting errors, types of feedback provided
 - Anonymous nature stressed
- Data collected
 - Date, time, unit
 - Dialogue boxes - describe event and outcome
 - Option to provide name for feedback

- Reports reviewed within 48 hours

- Determined if error or not
- Categorized
 - Serious - permanent injury or death
 - Moderately Serious - temporary physical/emotional injury
 - Trivial - no injury/change in treatment plan
- Taxonomy



TABLE 1
Classification Scheme for Types of Medical Errors Occurring during Care of Hospitalized Children

Type of error	Description
Communication	Error resulting from misunderstood verbal communication between health care providers or illegible or confusing orders
Patient identification	Patient with incorrect or missing identification, wrong patient receiving treatment, mislabeled laboratory slips, mislabeled or incorrect medical record
Equipment failure	Nonfunctioning or improperly functioning equipment such as monitors and intravenous pumps
Medication	Error in ordering, dispensing, or administering a drug
Treatment	Error in administering treatments other than medication such as procedures and intravenous fluids
Protocol deviation	Failure to follow established hospital procedures for providing care to patients
Medical judgment	Failure of a physician or nurse to properly evaluate or respond to a patient's condition, failure to respond to abnormal tests, provision of care that was clearly inappropriate
Other	Types of errors not otherwise listed

- Final categorization based on agreement of 2/3 physician reviewers
- Serious medical errors reported to leadership immediately
- Batched reports provided monthly





- Comparison

- Standard incident reports mid-Feb to mid-May years 1999 to 2002
- Four time frames selected as
 - Avoid selecting outlier time
 - Educational campaign to report medical errors
- All reports reviewed by 3 reviewers using same schema
 - Excluded reported labeling errors (33.8% of 1999-2002 errors; none with anonymous)

Statistics

- Errors reported per 100 patient-days
- Rate ratios with 95% CI compared error reporting rates between the systems
- Rates were compared between the systems overall, by unit, type, severity, near-miss status, and per time-frame
- Interobserver reliability assessed using Kappa statistics

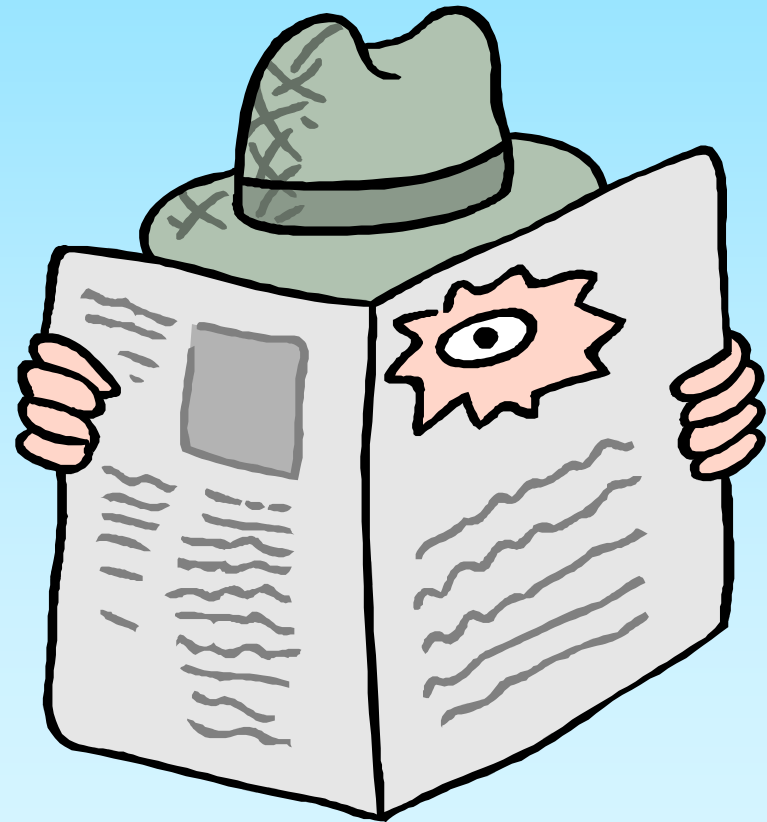


RESULTS



Anonymous Reporting

- 146 reports completed
- 131 medical errors (89.7%)
 - 95 medical unit
 - 36 IICU
- 5420 patients days
- Error rate 2.41/100 patient days
- Interobserver agreement
 - Kappa 0.526 (moderate agreement)



Standard Incident Reporting

- 633 reports completed
- 538 medical errors (85.0%)
- Error rate including mislabeling
 - 2.4/100 patient days
- Error rate excluding mislabeling
 - 1.56/100 patient days
- Interobserver agreement
 - Kappa 0.615 (substantial agreement)



Error Rates and Rate Ratios

TABLE 2
Rates of Reported Medical Errors in the Medical Unit and Infant Intensive Care Unit (IICU) via Anonymous Reporting System and with incident Report System

Reporting system	Medical unit*	IICU	Total	RR (95% CI) [§]
Anonymous reporting	2.26 (1.83, 2.75)	2.97 (2.09, 4.09)	2.41 (2.02, 2.86)	
Incident reports [†]				
All years [‡]	1.35 (1.12, 1.53)	2.23 (1.85, 2.66)	1.56 (1.40, 1.73)	1.54 (1.26, 1.90)
1999	1.16 (0.86, 1.52)	2.21 (1.50, 3.15)	1.41(1.12, 1.75)	1.72 (1.29, 2.29)
2000	1.55 (1.20, 1.97)	2.90 (2.09, 3.91)	1.92 (1.57, 2.31)	1.26 (.97, 1.67)
2001	1.26 (0.94, 1.65)	2.63 (1.81, 3.70)	1.52 (1.21, 1.87)	1.59 (1.20, 2.12)
2002	1.41 (1.08, 1.82)	1.34 (1.10, 1.74)	1.40 (1.10, 1.74)	1.73 (1.30, 2.32)

*Values presented are number of errors/100 patient days, with 95% CI in parentheses.

[†]Rates of errors reported via incident-report system after excluding reports of mislabeled laboratory specimens.

[‡]Includes incident reports from 1999 to 2002.

[§]Rate ratios are of reporting rates with the anonymous system compared with those based on incident reports from the years 1999-2002 in total or individually.

TABLE 3**Comparison of Types of Medical Errors Reported with an Anonymous System and via Incident Reports**

Type of medical error	Anonymous system n (%)	Incident reports 1999-2002 n (%) [*]
Communication	12 (9.2)	43 (12.4)
Patient identification	2 (1.5)	18 (5.2)
Equipment failure [†]	3 (2.3)	26 (7.5)
Medication [†]	85 (64.9)	185 (53.2)
Treatment	11 (8.4)	36 (10.3)
Protocol violation	15 (11.5)	37 (10.6)
Medical judgment	3 (2.3)	3 (0.9)

^{*}Excludes reports of mislabeled laboratory specimens.

[†]p < .05

Error Severity

TABLE 4
Comparison of Severity of Medical Errors Reported with an Anonymous System and via Incident Reports

Severity of reported errors	Anonymous system n (%)	Incident reports 1999-2001 n (%)[*]
Trivial	10 (7.6)	23 (6.6)
Moderately serious	101 (77.1)	272 (78.6)
Serious	20 (15.3)	51 (14.7)

^{*}Excludes reports of mislabeled laboratory specimens.

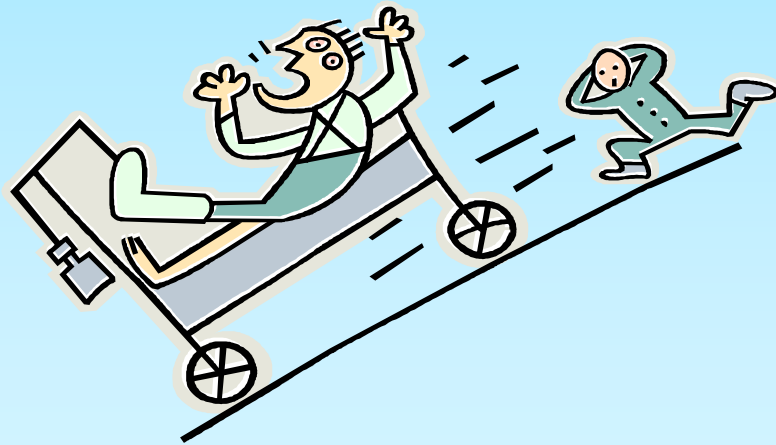
Near Misses

- Anonymous reports vs.. Incident reports
 - 25.2% vs.12.6% (p=0.001)
 - RR = 3.10 (1.91-4.98)
- Near-miss med errors
 - RR = 3.10 (1.81-5.24)



Errors That Reach Patient

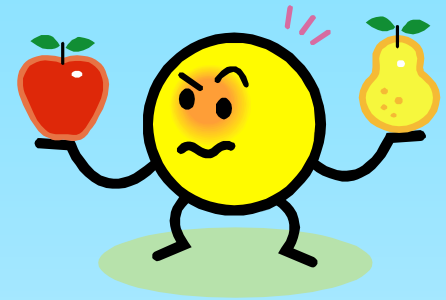
- More reported with anonymous system
 - RR = 1.32 (1.05-1.67)



DISCUSSION



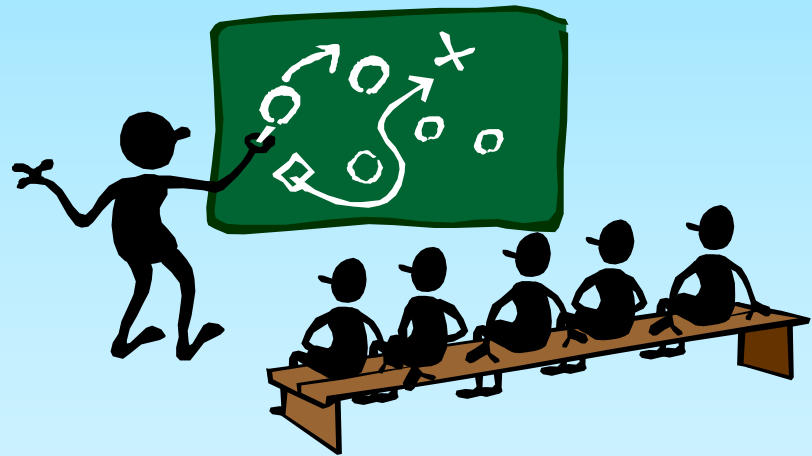
Original Hypothesis



- Anonymous reporting did
 - Increase events reported
 - Increase near-misses reported
 - Increase medication errors reported
 - Fewer equipment failures reported
 - No difference in other error types

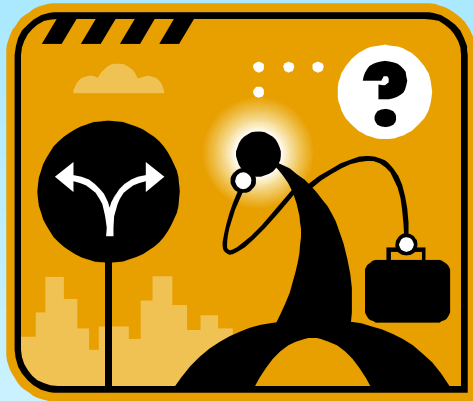
Effect of pre-study/ongoing “coaching”

- Assumed rate of medical error constant over time
- Excluded labeling errors
- Educational campaign began in 1999
- No secular trend viewed in time-sequenced data
- Reinforcement still may have impacted results



- Severe Events
 - Small number did not allow for detection of difference between two reporting methods
- Difference in reporting between medical unit and ICU
 - ICU already reports more frequently
 - ICU staff “too busy”
 - Medical unit better buy-in

CONCLUSIONS



- Anonymous reporting resulted in an increase in reporting
- Captured “near-misses”
- may be complimentary to other methodologies to increase detection of medical error



Development, Testing, and Findings of a Pediatric-Focused Trigger Tool to Identify Medication-Related Harm in US Children's Hospitals



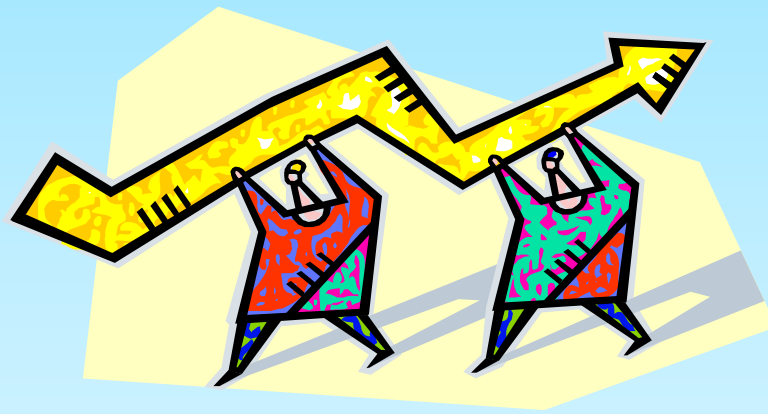
Takata G et al. Pediatrics 2008; 121(4):e927-e935

Objectives



1. Develop and test a pediatric trigger tool for ADE detection in hospitalized patients
2. Describe the incidence and characteristics of these events identified by the tool

METHODS



Methods: Phase I

- Phase I: Modifying the IHI adult focused ADE trigger tool for Pediatric Inpatients
- 12 children's hospitals evaluated the IHI tool, applying to 931 patient charts
- 13 adult focused triggers were removed
 - Low PPV, ambiguity, triggers resulted in extreme inefficiencies during chart review
- 4 pediatric-specific triggers added
- IRB approval or waiver for Phase I and II from all sites

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

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

Methods: Phase II

- Cross sectional study using retrospective chart review
- 80 randomly selected patients from each of 12 American Children's hospitals
 - 20 patients from four consecutive 2 week blocks
- Eligibility criteria:
 - Minimum 2 day stay in hospital
 - Left hospital/died between March 18, 2002 and May 28, 2002
 - Not admitted via newborn nursery, obstetrics, or day hospital

Methods: Phase II

- Each chart was reviewed by a primary and secondary reviewer using a standardized process and data collection sheets to identify triggers and associated ADE
- If ADE identified, details documented regarding the ADE
- ADE noted during chart review but not be trigger tool also recorded
- Hospital physician reviewed primary chart reviewers documentation to confirm/reject AE occurred.
 - If discrepancy, secondary reviewers documents accessed
- Completed data sent without identifiers electronically to data repository

Statistical Analysis

- Used Stata 9.0 for analysis
- Descriptive stats included calculation of 95th percentile
- Proportions - binomial distribution
- Rates - Poisson distribution



Outcomes



Outcomes

- 960 charts or 6806 patient days from 12 children's hospitals reviewed
- Largest detailed review of ADE in children published at the time
-

Outcomes Reported

- Standardized incidence rates:
 - ADEs per 100 patients
 - ADEs per 1000 patient-days
 - ADEs per 1000 medication doses
- Triggers per patient
- Trigger PPV
- Severity of ADEs
- Preventability of ADEs
- Stages (ordering, transcribing, dispensing, administration or monitoring)
- Class of medication
- Principal diagnosis on discharge
- Hospital unit

Patient Characteristics

TABLE 3 Patient Characteristics

Characteristic	Average	Median	Semi-Interquartile Range
Age, y	5.9	3.9	1.8–7.1
Length of stay, d	7.1	4.0	3.0–5.0
Medications per patient	14.3	10.0	8.0–14.0
Doses per patient	90.5	39.0	29.0–55.0

ADE Statistics

TABLE 4 ADE Statistics

Measure	Result			
	Total	Trigger Tool ^a	Incident Report ^a	Chart Review Only ^b
No. of ADEs	107	89	4	18
ADEs per 100 patients (95% CI)	11.10 (9.13–13.50)	9.27 (7.45–11.40)	0.42 (0.11–1.07)	1.88 (1.11–3.00)
ADEs per 1000 patient-days (95% CI)	15.70 (12.90–19.00)	13.10 (10.50–16.10)	0.59 (0.16–1.50)	2.64 (1.57–4.18)
ADEs per 1000 medications (95% CI)	7.79 (6.39–9.42)	6.48 (5.21–7.98)	0.29 (0.08–0.74)	1.31 (0.78–2.07)
ADEs per 1000 doses (95% CI)	1.23 (1.01–1.49)	1.02 (0.82–1.26)	0.05 (0.01–0.12)	0.21 (0.12–0.33)
Patients with ADE				
n, %		70 (7.29)		
95% CI		55 (5.73)–87 (9.12)		

^a Four ADEs were identified both by the trigger method and voluntary incident report.

^b All ADEs not associated with a trigger were identified by chart review. Events included hypokalemia (4); tachycardia (3); abdominal pain/nausea/vomiting, altered mental status, anemia, clonus, fever, pruritis, seizures, and stomatitis (1 each); and "other" (3).

TABLE 5 PPVs of the Inpatient Pediatrics ADE Trigger Tool

Trigger ID	Trigger	PPV, % (95% CI)
T ₁	Diphenhydramine use	8.44 (5.68–12.00)
T ₂	Vitamin K use	1.85 (0.05–9.89)
T ₃	Flumazenil use	0.00 (0.00–0.00)
T ₄	Antiemetic use	1.55 (0.80–2.69)
T ₅	Naloxone use	12.10 (3.40–28.20)
T ₇	Sodium polystyrene use	20.00 (0.51–71.60)
T ₁₀	PTT of • 100 s	16.70 (0.42–64.10)
T ₁₆	Rising serum creatinine	3.85 (0.47–13.20)
T ₂₁	Oversedation/lethargy/fall/hypotension	14.90 (6.20–28.30)
T ₂₂	Rash	12.70 (5.96–22.70)
T ₂₃	Abrupt medication stop	19.70 (10.90–31.30)
T ₂₅	Serum glucose of • 150 mg/dL	0.60 (0.12–1.74)
T ₂₆	Hyperkalemia	3.57 (0.74–10.10)
T ₂₇	Called codes	14.30 (0.36–57.90)
T ₂₈	Laxative or stool softener use	2.82 (1.36–5.13)
Total		3.73 (3.00–4.57)

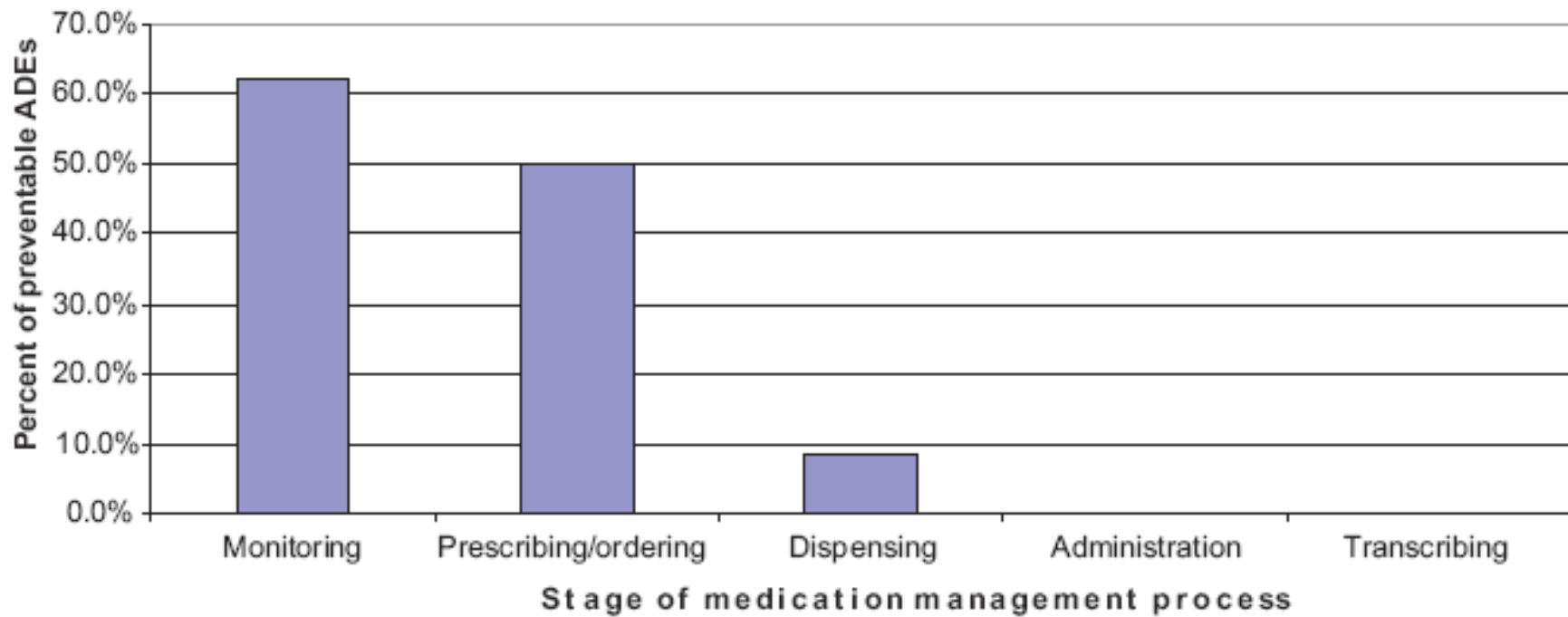
Severity Category

- 97.2% of ADE - “temporary harm” and required intervention
- 2.8% of ADE - “temporary harm” and required initial or prolonged hospitalization

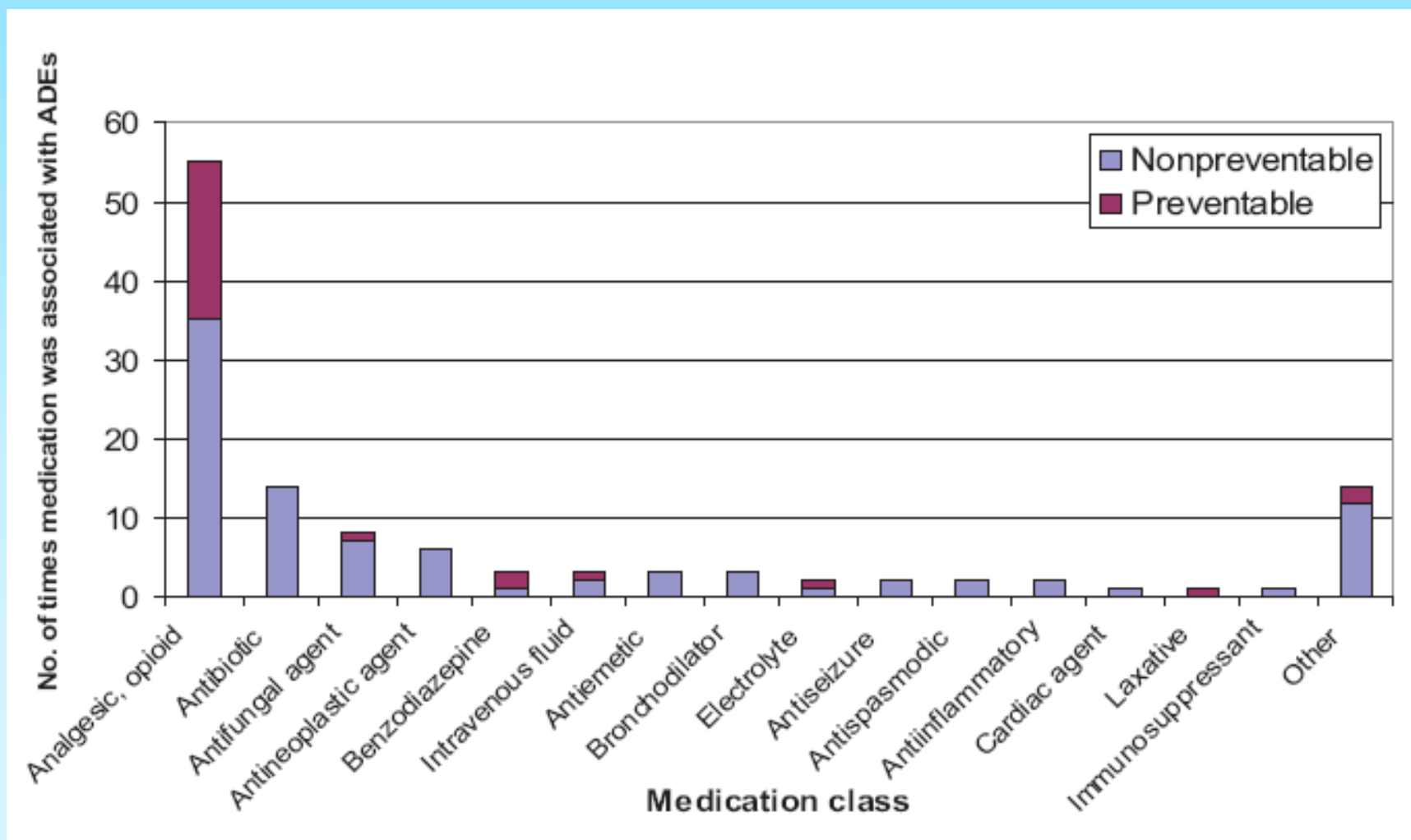
Preventability of ADEs

- 22% preventable and 17.8% identified earlier
- ONLY 3.7% (4 cases) generated an incident report
 - All of these were identified by the trigger tool
- 16.8% (18) did not have an associated trigger
 - Identified by chart review

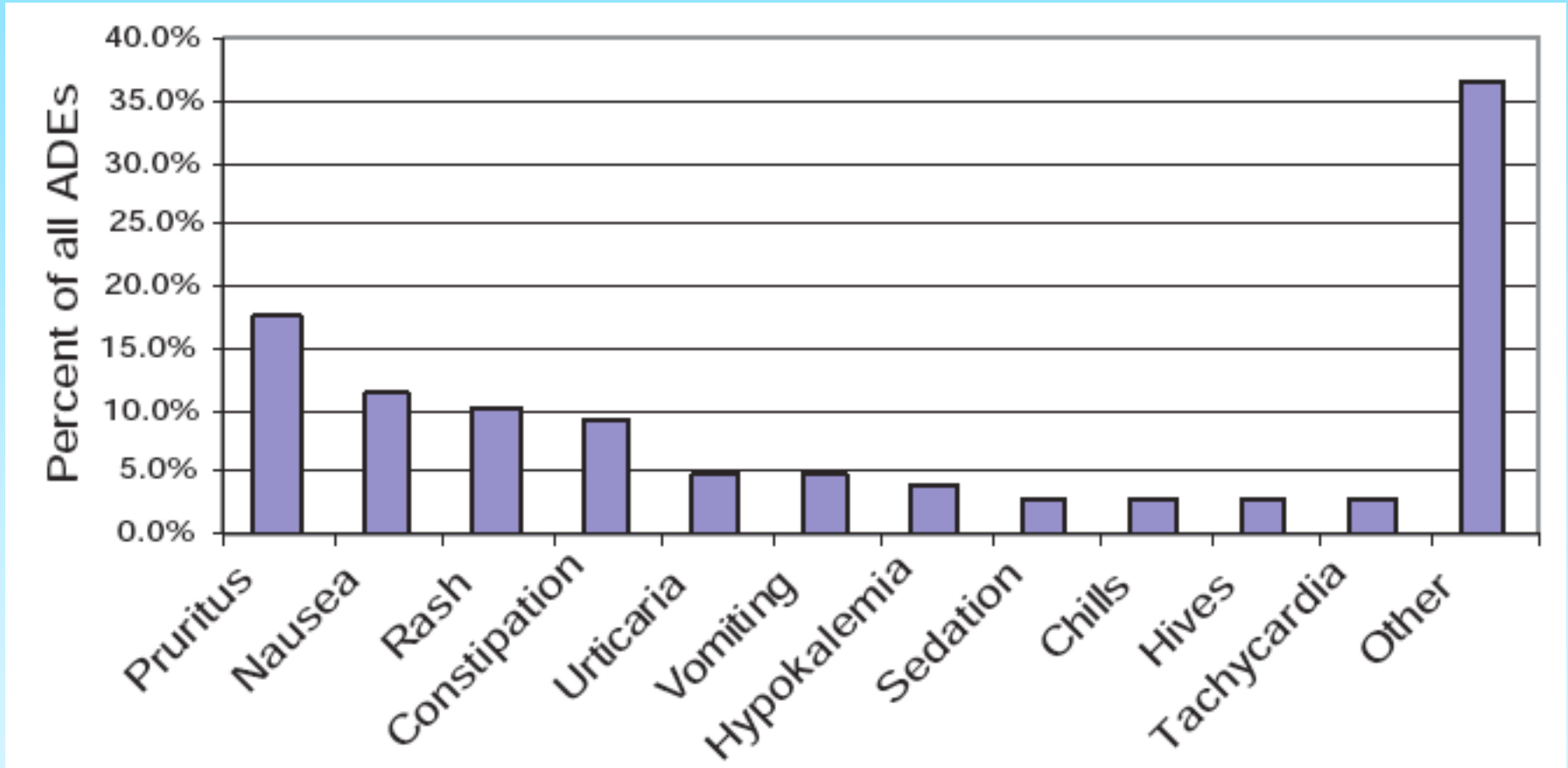
Stage of Medication Management Process in Which a Preventable ADE Occurred (N = 24)



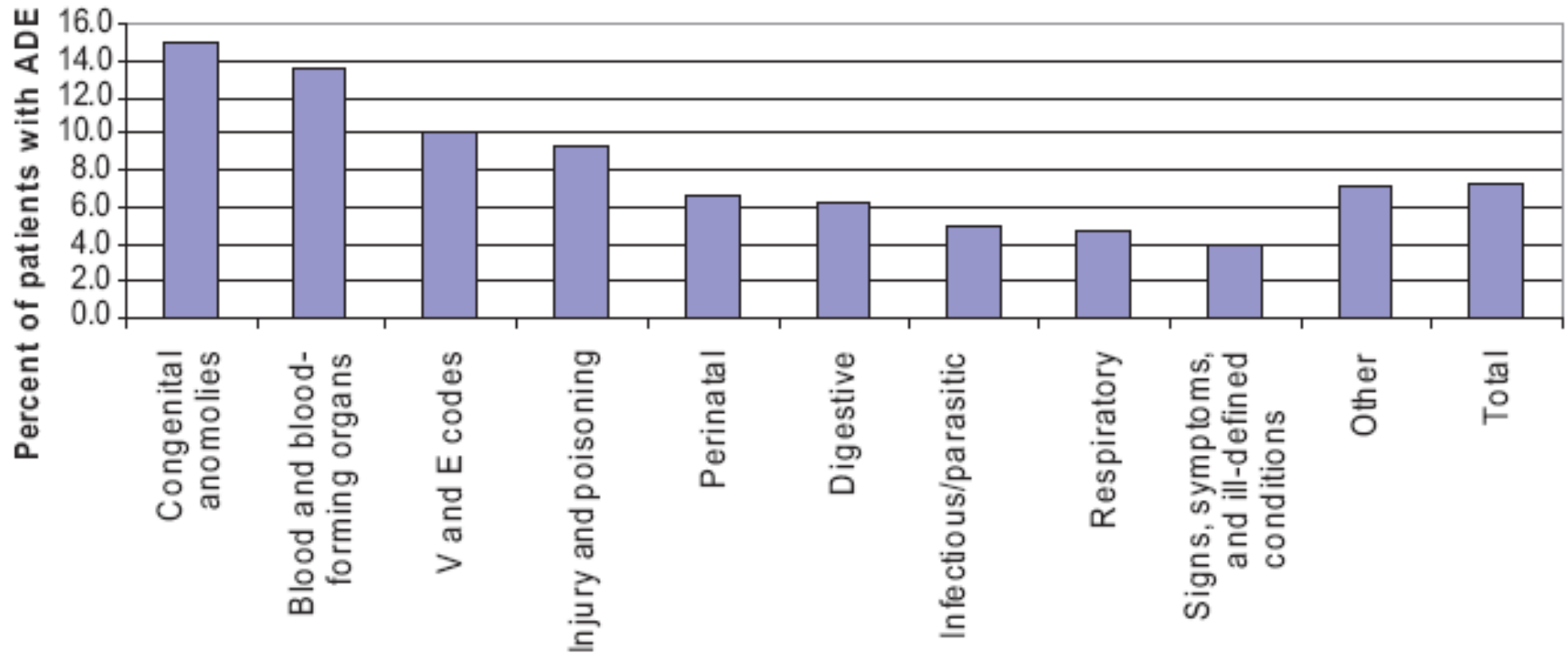
Medication Classes Associated with All ADEs (N = 107)



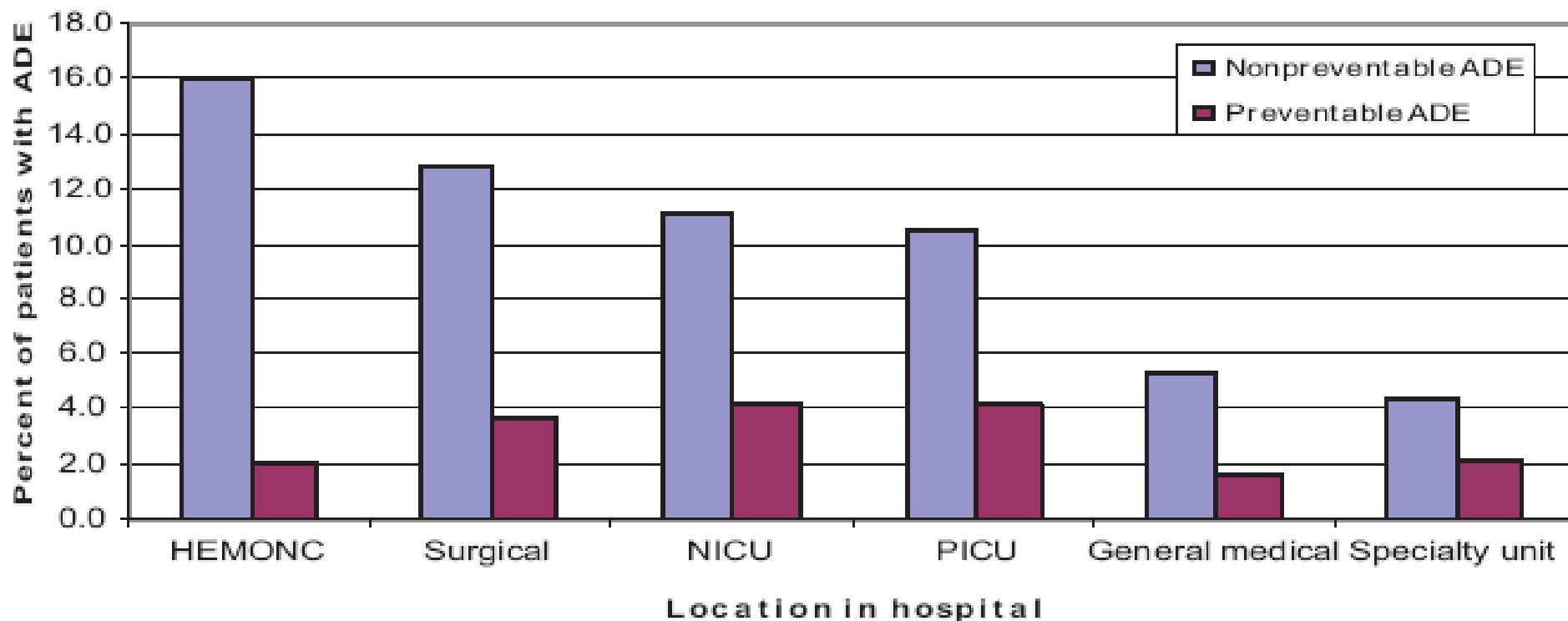
Percent Type of ADE (n=107)



Percentage of Patients with an ADE According to Discharge Diagnosis



Percentage of Patients with an ADE According to Hospital Location



Discussion



- Largest detailed review of ADEs in pediatrics
- Trigger tool was robust compared with incidence reports, and chart review
- This study identified 11.1 ADEs per 100 admissions
 - This is 1.8-4.8 more than previously estimated
- Only 4 of the 107 ADEs identified by the trigger tool generated incidence reports
 - trigger tool did not miss AE reported using incidence reports
 - Trigger tool identified 22 times more ADE than incidence reports

Discussion



- Limitations
 - Lack of gold standard for ADE to compare with, so used total ADE of all ADE identified
 - Subject to bias
 - Single reviewer unless conflict to interpret triggers/AE/preventability
 - Did not standardize duration to do each review
 - Couldn't calculate efficiency of method
 - Did not calculate interrater reliability
- Chart review picked-up 18 ADE not detected by the trigger tool

Conclusions



- Trigger tool methodology is a robust manner to ADEs and monitor over time - superior to other methods
- Tools can be adapted to use in different patient populations and settings
- Can potentially be automated, improving efficiency of the tool
- Can be used to identify areas of vulnerability and targeted evidence-based intervention
 - 51% of ADE were associated with analgesic opioids

