

Announcing....



The Canadian Paediatric Trigger Tool



Reducing Harm in Paediatric Care: Learning about Adverse Events using a Validated Canadian Paediatric Trigger Tool

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For the CAPHC Paediatric Trigger Tool Research Group

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The Problem (1)

- The prevalence of adverse events (AE) in hospitalized children in Canada is unknown....
- Resulting in minimization of the paediatric patient safety problem at the policy and decision maker level



The Problem (2)

Reported harm in pediatric in-patient care:

- All adverse events: ~1.0/ 100 patients

(Woods Pediatrics 2005; Miller Pediatrics 2003 and 2004)

- Adverse drug events:

- True: 2.3-11/ 100 admissions

- Potential: ADE 10/ 100 admissions

- 22-60% preventable

(Kaushal JAMA 2001; Holdsworth APAM 2003; Takata IHI Annual Forum 2001)

- NICU:

- 74 per 100 admissions

- 56% preventable (Sharek Pediatrics October 2006)



The Problem (3)

Applying adult prevalence rates from the **CAES** (2004) to children:

- **>10,000 Canadian pediatric admissions/year** would be associated with AE
- Approximately 3,300 preventable AE would occur every year in Canadian hospitalized children



The Problem (3 cont)

Applying adult prevalence rates from the **CAES** (2004) to children:

- Children **with an AE** in hospital **would be** 2-18 times more likely to die
- Even if only 1% of the AEs resulted in a legal settlement, the financial impact on CMPA alone would be approximately \$3.3 million



The Challenge

Every day, we are missing opportunities
to prevent harm to children
hospitalized in Canada!

Documenting, managing and preventing Adverse Events: A Hierarchy of Methods

- Incident reports
- Incident reports and systems investigations
- Traditional chart review
- Trigger tools
- Automated triggers
- Recovery systems
- Automated triggers and recovery systems



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Incidence Estimates mainly Adult Chart Review Studies

Country	N	Year	Incidence of AE	Preventable?
Canada	3,745	2000	7.50%	37%
USA (U&C)	14,700	1992	2.90%	Not reported
Australia	14,179	1992	16.60%	51%
UK	1,014	1999	10.80%	48%
New Zealand	1,326	1998	12.90%	37%
USA (NY)	30,195	1984	3.70%	Not reported

Where to begin?

- CAPHC AGM 2004:
 - CAPHC's Patient Safety Collaborative was charged with developing a Canadian Paediatric Trigger Tool (CPTT) for use in Canadian Paediatric Centres
- An enthusiastic and talented multidisciplinary group of researchers was assembled



The CAPHC Canadian Paediatric Trigger Tool Design Group

- Dr. Anne Matlow
- Dr. G. Ross Baker
- Dr. Barbara Brady-Fryer
- Dr. Gerarda Cronin
- Dr. Mark Fleming
- Virginia Flintoft
- Mary-Ann Hiltz
- Michele Lahey
- Dr. Cheri Nijssen-Jordan
- Elaine Orrbine
- Margaret Zimmerman



Goal

- To gain a greater perspective of the number of adverse events that are taking place across the country in paediatric settings with an emphasis on both patient safety and quality improvement, by conducting a comparative study within the paediatric population with the data of the recently published Canadian Adverse Events Study (CAES)

Phase 1 - Objectives

- Evaluate the feasibility and applicability of existing trigger tools to the paediatric population
- Develop a paediatric trigger tool
- Develop a training module for the tool

Phase 1 - Methods (1)

- Review and evaluate available trigger tools
 - Vermont Oxford Neonatal Network Tool
 - Adverse Drug Events Tool
 - CHAI Adverse Drug Events Measurement Kit
 - Canadian Adverse Events Study trigger Tool
 - Calgary Adverse Drug Event Measurement Tool
 - IHI Global Trigger Tool (6 modules)

Phase 1 - Methods (2)

- Scope
 - General medical or surgical paediatric admissions from 0-18 years of age
 - Academic or Community hospitals with 24/7 Emergency Departments

Phase 1 - Methods (3)

- Triggers were listed based on previous use and content expertise and mapped onto the IHI modules
 - Care Module
 - Medication Module
 - Surgical Module
 - Intensive Care Module
 - Perinatal and Emergency modules excluded
 - **Laboratory Module (added)**


Phase 1 - Methods (4)

- Triggers validated by selected clinicians across Canada
- Unhelpful or ambiguous triggers were culled, a tool with 47 triggers resulted
- Triggers cross-referenced with the CAES trigger tool to enable comparative study
- A training manual was developed based on the pilot CPTT

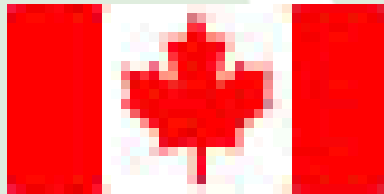
Phase 1 - Methods (5)

Feasibility test

- Conducted at 3 sites
 - stand alone pediatric, hospital within a hospital, and community
- 40 charts / site; 2 reviewers / chart
- 10 from four age categories
 - 0-28 days; 28-365 days; >1 year - 5 years; >5 yrs
- 5 charts from medicine and 5 from surgery
- Inter-rater agreement: Kappa statistic 0.83
- 32% of charts triggered



Our thanks to Health Canada for
funding Phase 1 of this initiative!



Health
Canada

Santé
Canada



Phase 2: Validation of the Canadian Paediatric Trigger Tool

Goal

To develop a comprehensive paediatric trigger tool that can be used to detect Adverse Events in children hospitalized in Canada, and thus to characterize the burden of the problem in Canada.



Phase 2 - Objectives (1)

- To validate and determine the reliability of the paediatric trigger tool in the Canadian paediatric acute care setting
- To provide information about the rate and type of triggers for potential AEs in a stratified random sample of charts from six Canadian paediatric hospitals

Phase 2 - Objectives (2)

- To provide information about the rate and type of AEs in a stratified random sample of charts from six Canadian paediatric hospitals
- To refine and finalize the CPTT to permit its application in the Canadian paediatric acute care setting, and thereby to enable paediatric healthcare organizations to efficiently determine the prevalence of AEs within their organizations

Phase 2 - Methods (1)

- Retrospective chart review using the CPTT
- Developed electronic version for data collection on laptop computer
- All data de-identified
- REB approval obtained for each participating centre

Phase 2 - Methods (2)

- Health information analysts at each centre selected 120 charts from FY 2005-06, based on a stratified random sampling algorithm.
- Powered to ensure that reliability and validity of the tool could be established with a high degree of confidence.



Phase 2 Methods (3)

Sampling Frame for each centre[†]

Age group	Medical*	Surgical*
0-28 days	12 or 13	12 or 13
29-365 days	12 or 13	12 or 13
>1 to 5 years	12 or 13	12 or 13
>5 to 18 years	12 or 13	12 or 13

[†]Obstetrics and Psychiatry excluded from sample

* Total sample / age group = 25

Phase 2 - Methods (4)

- Trained two nurses from each participating centre, and the three physician members of the research team, to perform retrospective chart reviews
- Both nurses and physicians participated in inter-rater reliability testing
- Chart review
 - 1 nurse reviewed each chart for triggers
 - 1 physician reviewed the same charts for AE

Definition: Adverse Events

- AE Criteria
 - Injury *and...*
 - Disability *and ...*
 - Prolonged LOS
 - Disability at discharge
 - Subsequent hospitalization after index stay
 - Death
 - Causation
 - Caused by medical management rather than underlying disease process

Phase 2 - Methods (5)

- Database included no patient identifiers
- Data repository
 - Department of Health Policy, Management and Evaluation, University of Toronto
- Statistical analysis
 - Manitoba Institute of Child Health (descriptive statistics, Chi square, odds ratio, sensitivity and specificity)



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Preliminary Results

Triggers

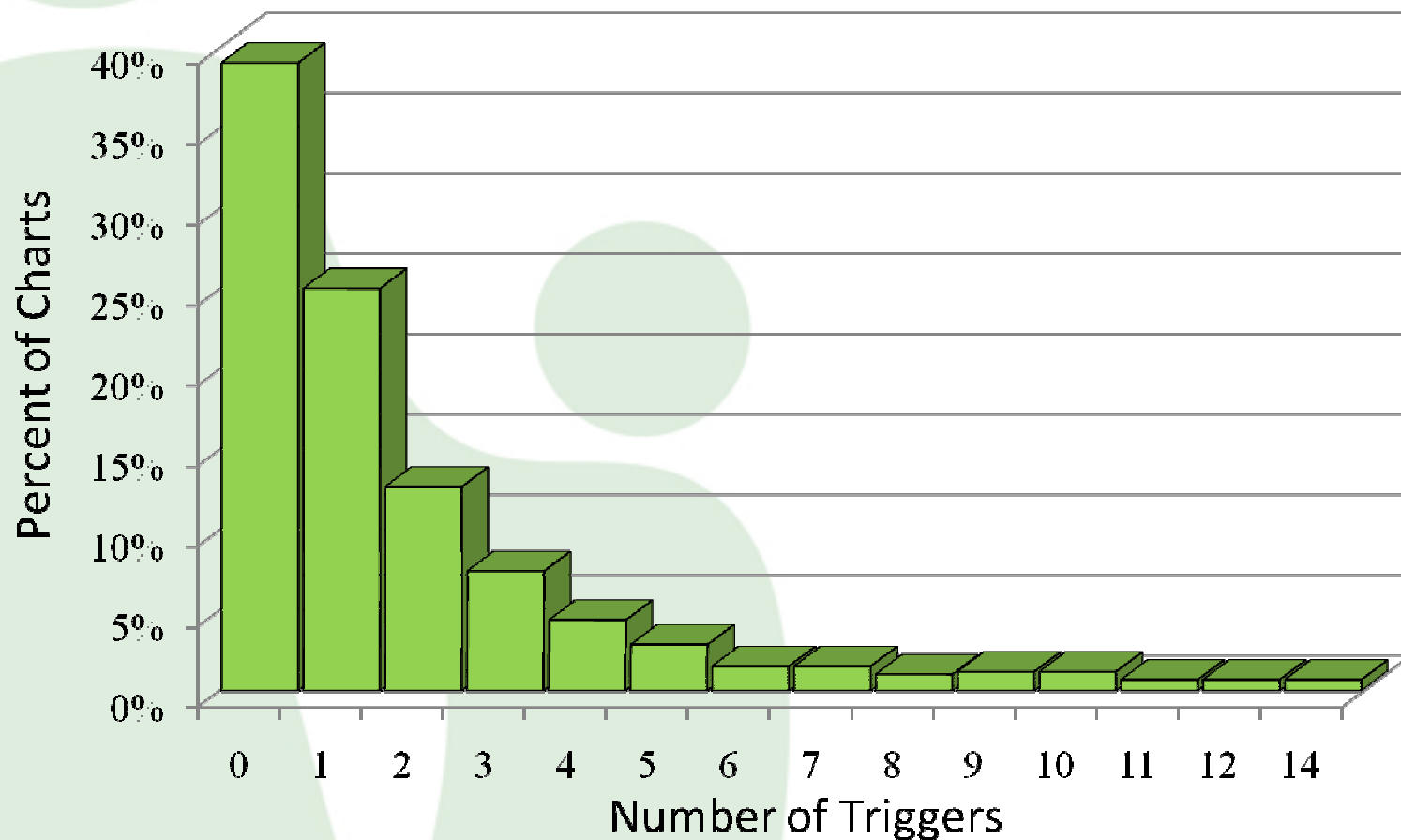
- Canadian Paediatric Trigger Tool
 - 47 Triggers
 - 5 Modules (+‘*Other*’)
 - Care, Medication, Laboratory, Surgical, and Intensive Care



Number of Charts with Triggers

Trigger	Charts	Percent
+ve	361	61.08%
-ve	230	38.92%

Frequency of Triggers per Chart



Most Frequently Selected Triggers (n=6) with PPV

Trigger Module	Trigger #	Trigger Description	# of Charts with Trigger	PPV%
Care	01	Transfusion/ use of blood products	89	42.7
Med	04	Anti-emetic Use (for symptoms)	85	20.0
Care	16	Unplanned admission (including readmission) within the 3 months prior to the index admission	80	23.8
Care	11	Cranial imaging in infants \leq 3 mos.	67	38.8
Lab	08	Potassium: 3.0 mmol/L > K+ > 6.0 mmol/L	59	35.6
Lab	10	Hypoxia: O ₂ Sat < 75%	52	48.1



Adverse Events

Based on the professional
judgment of three physician
reviewers

Rate of AEs & Preventability (Physician judgment)

AE	Charts	Percent	Preventable AE
+ve	89	15.1%	53 (60.0%)
-ve	502	84.9%	

Highest number of AEs / chart = 8

Sensitivity and Specificity of the Canadian Paediatric Trigger Tool

		Adverse Event		
Trigger	Yes	No	Total	
Yes	78	283	361	
No	11	219	230	
Total	89	502	591	

PPV = 0.22; CI = (0.17-0.26)

NPV= 0.95; CI = (0.92-0.98)

Se = 0.88; CI = (0.79-0.94)

Sp = 0.44; CI = (0.39-0.48)

Comparison of Nurse and Physician assessment of AE

		Physician		Total
		Yes	No	
Nurse	Yes	40	53	93
	No	49	449	498
Total		89	502	591

Kappa = 0.34, CI (0.23-0.43)

AE and Gender

	Adverse Event		
Gender	Yes	No	Total
Male	54 (16%)	276	330
Female	35 (13%)	226	261
Total	89	502	591



AE and Age

Age Group	Adverse Event		Total
	Yes	No	
0 - 28 days	33 (22%)	117	150
29 – 365 days	21 (14%)	127	148
>1 - 5 years	54 (16%)	98	152
> 5 years	18 (10%)	160	178
Total	89	502	591

Categories of AEs*

Categories of AE	Total # of AE
Diagnostic	14
Surgical	44
Fractures	1
Anesthesia	1
Medical Procedure	13
Drug/Fluid	10
Other clinical management	12
Adverse Event not covered elsewhere	15
System Issue only	1

* More than 1 category could be selected for each AE

Summary

- The current CPTT has a sensitivity of 0.88
- The tool has a PPV of 0.22 and a NPV of 0.95
- 15% of charts reviewed had an AE
- 60% of AEs were judged to be preventable
- Neonates had the highest incidence of AE
- The most common associated factor was surgery
- **The problem is real!**

Future Directions

- Review and refine the CPTT
- Conduct a multicentre study using the CPTT to identify AEs in hospitalized children
- Release the tool with appropriate training for large and small scale improvement initiatives
- Use the results of application of the CPTT to inform strategies to improve paediatric patient safety and health care outcomes



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