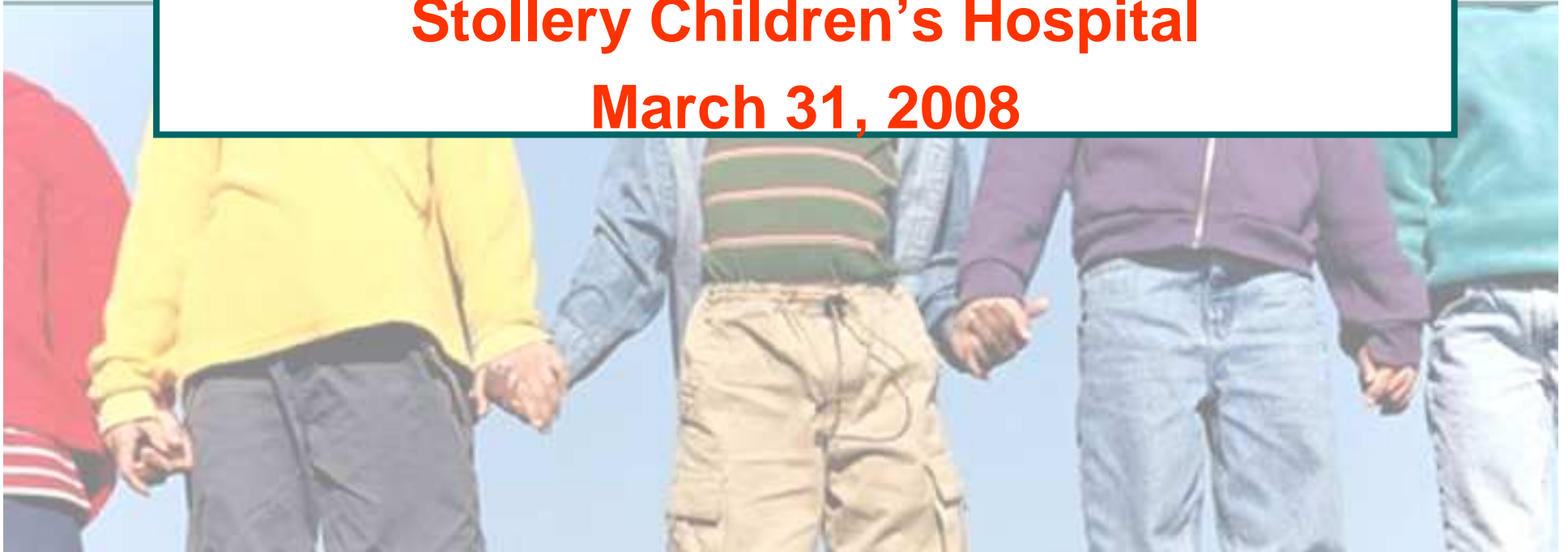


The Canadian Paediatric Trigger Tool



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Stollery Children's Hospital
March 31, 2008





OBJECTIVES

- To discuss current methods available for detection of adverse events, focusing on trigger tool methodology
- To review the history behind the development of the Canadian Pediatric Trigger Tool (CPTT)
- To review the results to date, and future directions



DECEMBER 10, 2007

People



VALERIE

DENNIS QUAID

BABY TWINS IN DANGER



THE QUAID FAMILY ON NOV. 14

After a shocking hospital error, the star and his wife, Kimberly, keep a tense vigil as their 3-week-old newborns struggle to recover



WHEN THE DOSE IS DEADLY

Commonly used in hospitals nationwide, the anticoagulating drug heparin can be fatal to infants who are mistakenly given too much.

PEOPLE Magazine,
December 10, 2007

www.people.com

Patient Safety

Freedom from accidental injury as a result of medical care or medical errors

Medical Error

- Any error in the delivery of medical care, whether it causes harm or not
- The failure of a planned action to be completed as intended
- The use of a wrong plan to achieve an healthcare aim



Medical Errors

Can occur with problems in
practice, products, procedures or
systems



Adverse Event

- Any *unintended injury* caused by medical management, whether caused by error or not
- Does not include harm caused by underlying disease processes
- “Preventable” adverse events are those that are avoidable based on current knowledge

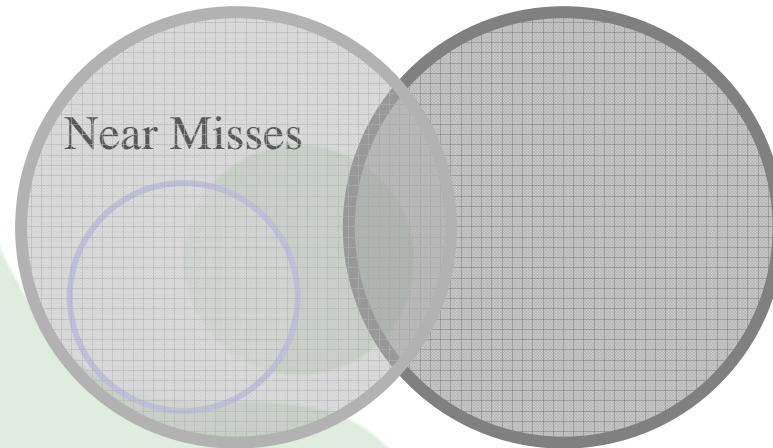
Near Miss

- A medical error that has a significant potential to cause harm but does not
- A serious error that nearly causes harm
- An opportunity for free education on how to improve processes of care



Medical Errors vs Adverse Events

Medical Errors



Adverse events

Preventable adverse events



Definition: Adverse Events

AE Criteria (As per Wilson et al Med J Aust 1995, and others)

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

Incidence Estimates from Chart Review Studies

Country	N	Year	Incidence of AE	Preventable?
Canada	3,745	2000	7.5%	37%
USA (U&C)	14,700	1992	2.9%	Not reported
USA (NY)	30,195	1984	3.7%	Not reported
Australia	14,179	1992	16.6%	51%
UK	1,014	1999	10.8%	48%
N Z	1,326	1998	12.9%	37%



What do we know about harm in pediatric in-patient care?

- NOT MUCH
- All adverse events: ~1.0/ 100 patients
(Woods Pediatrics 2005; Miller Pediatrics 2003 and 2004)
- Adverse drug events:
 - 2.3-11/ 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)

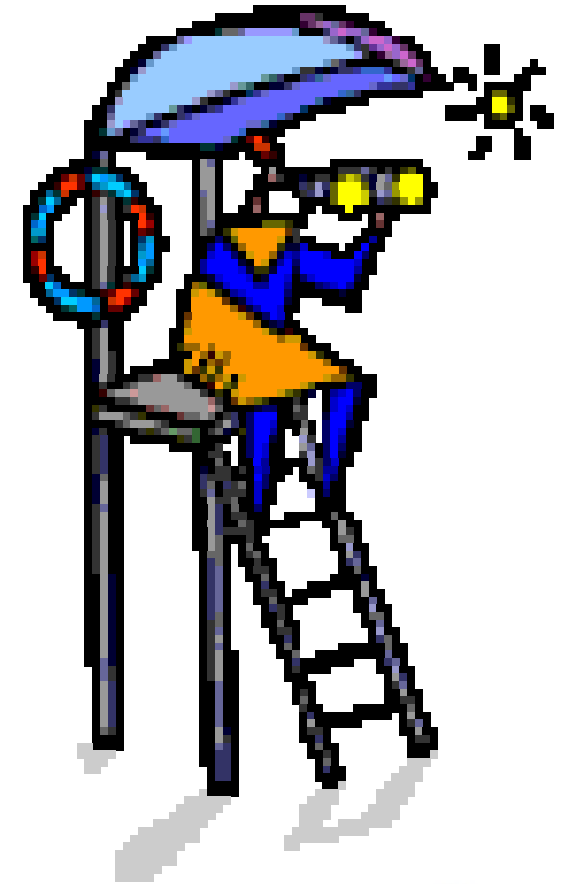


To measure is to
know(Archimedes)

.....

You can't improve
what you can't
measure.....

But how???



Detecting Adverse Events

Method **AE/1000 admissions**

Incident Reports (2-8%)	5
Retrospective Chart Review	30
Stimulated Voluntary Reports	30
Automated Flags (triggers)	55*
Daily chart review	85
Automated Flags and Daily review	130*

- Jha J Am Med Inf Assoc 1998;5:305
- O'Neil Ann Int Med 1993;119:370





A TRIGGER IS A CLUE

A TRIGGER TOOL IS A SCREENING TOOL





MEOW

Trigger Tools to detect AEs

Study	Incidence of AE	#Trigger Positive
Harvard MPS	3.7%	7817 (26.0%)
Australia	16.6%	6210 (43.7%)
UT/CO	2.9 %	2868 (19.5%)
UK	10.8%	405 (40.5%)
New Zealand	12.9%	4197 (62.0%)
Canada	7.5 %	1527 (40.7%)

Adverse Events in the NICU

Sharek et al. Pediatrics. 2006;118:1332-1340

74 per 100 admissions of which 56% preventable

n=554

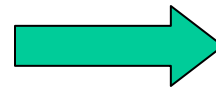
TABLE 5 Frequency of Unique AEs

Rank	AE	Unique AEs	%
1	Nosocomial infection (sepsis, wound, etc)	154	27.8
2	Catheter infiltration/burn	86	15.5
3	Abnormal cranial imaging	58	10.5
4	Unplanned extubation requiring reintubation	46	8.3
5	Hypotension	42	7.6



CAPHC's TRIGGER TOOL DESIGN GROUP

- Anne Matlow, Chair
- G. Ross Baker
- Barbara Brady-Fryer
- Gerarda Cronin
- Mark Fleming
- Virginia Flintoft
- Mary-Ann Hiltz
- Michele Lahey
- Cheri Nijssen-Jordan



OBJECTIVES

1. Incidence of AEs in Canadian children
2. Incidence of AEs in Canadian children vs Canadian adults
3. Launch QI efforts

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)

Trigger Tool Development

Step 1

- Triggers selected from other tools and adapted to paediatric population per
 - Vermont Oxford Neonatal Network Tool
 - Adverse Drug Events Tool
 - CHAI Adverse Drug Events Measurement Kit
 - Calgary Adverse Drug Event Measurement Tool
 - IHI Global Trigger Tool (6 modules)
 - Canadian Adverse Events Study Trigger Tool



Trigger Tool Development

Step 2

- Mapped triggers onto IHI modules and **cross-referenced with the CAES trigger tool**

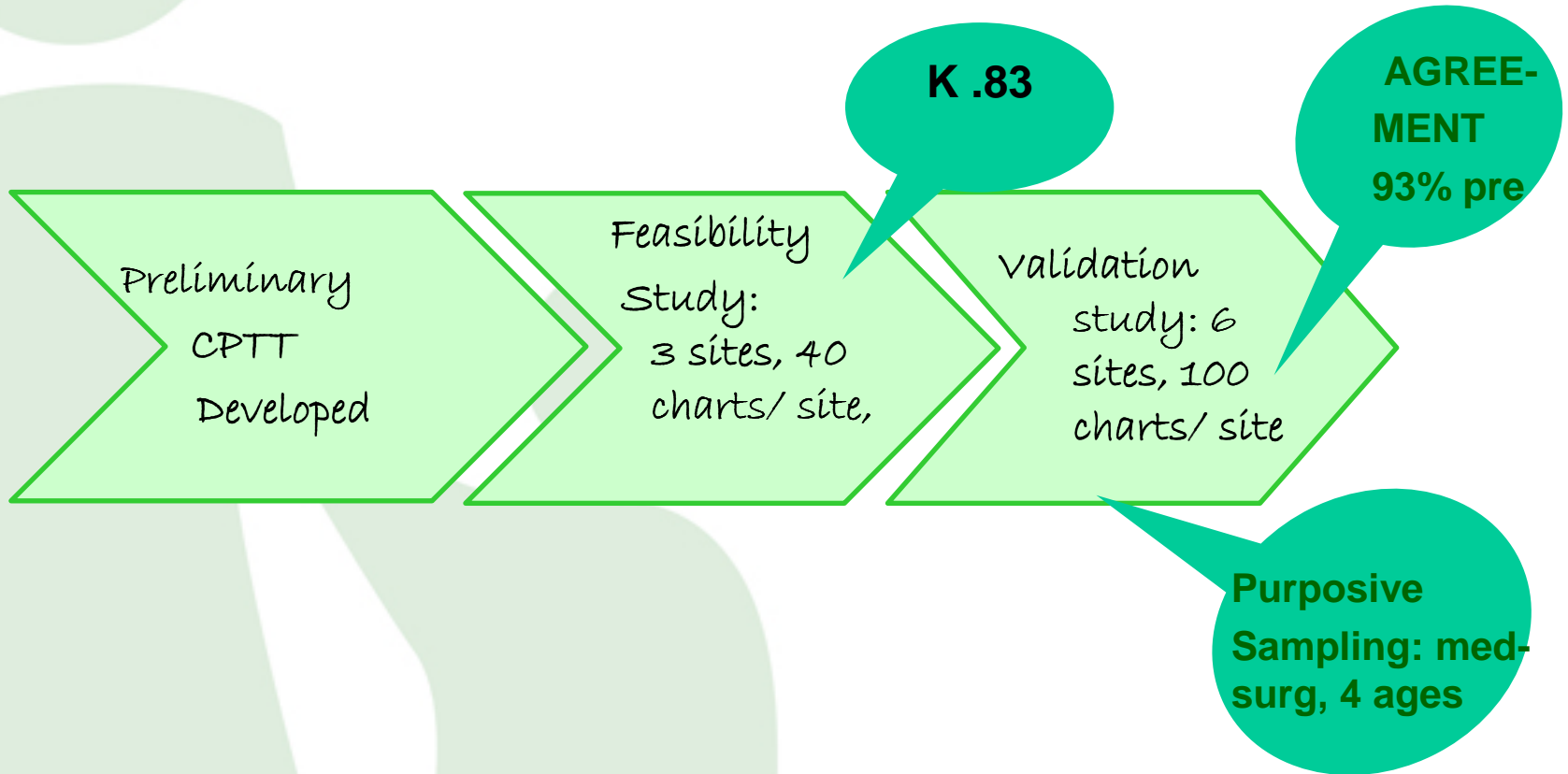
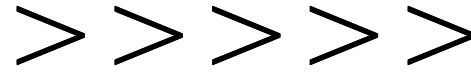
Care, Medication, Surgical, Intensive Care Modules used, Laboratory module added
Perinatal and Emergency modules excluded

- Ambiguous triggers were deleted = a preliminary tool with 47 triggers
- Training manual developed

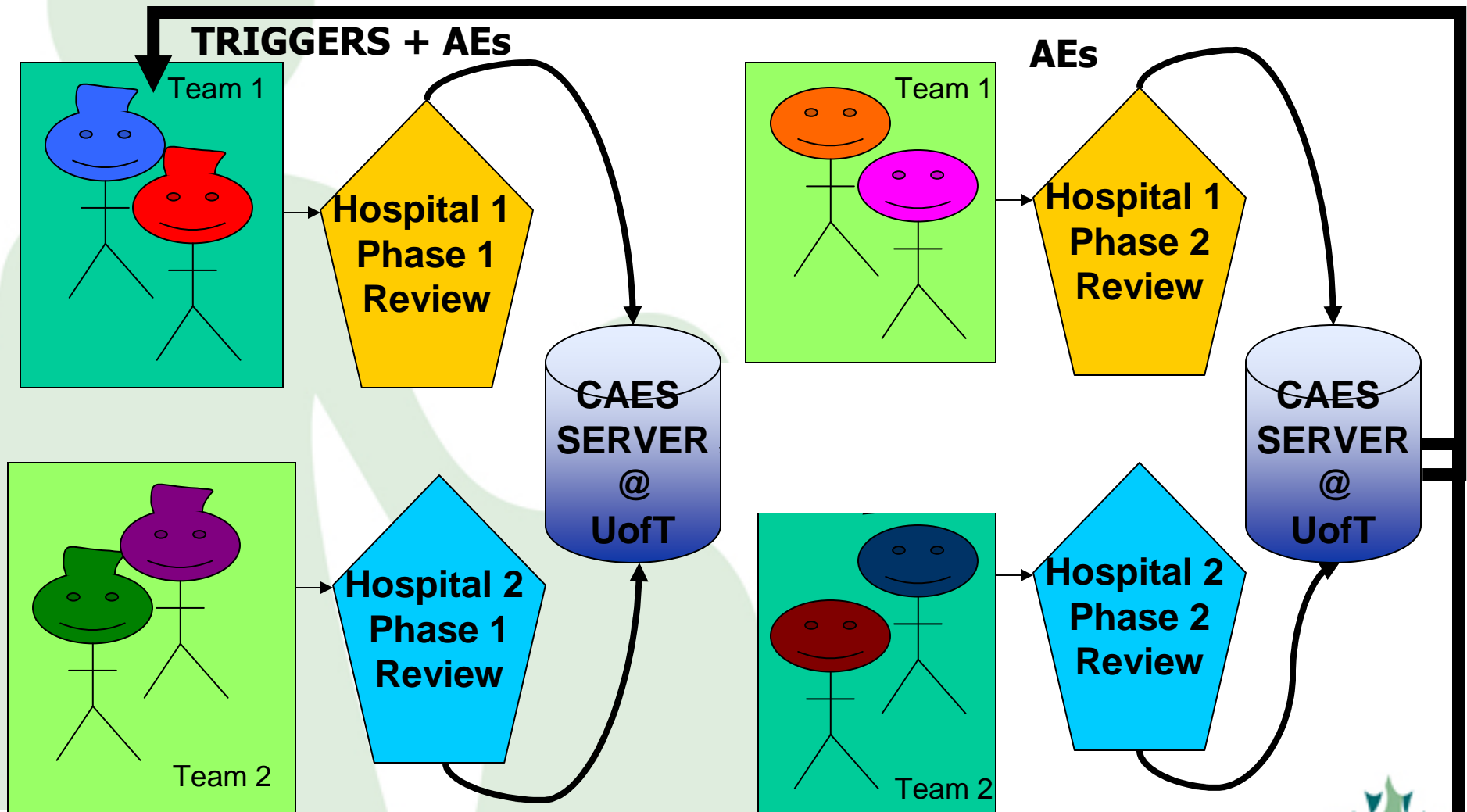
PRELIMINARY CANADIAN PEDIATRIC TRIGGERS

<i>CARE MODULE</i>	
C1	Transfusion/ use of blood products
C2	Any code or arrest
C3	Dialysis (New Onset)
C5	Diagnostic Imaging for Embolus/thrombus with/without confirmation
<i>MEDICATION MODULE</i>	
M6	Vitamin K (excluding newborns)
M7	Benadryl (Diphenhydramine) - for symptoms of allergic reaction
M8	Romazicon (Flumazenil)
M9	Narcan (Naloxone)
M10	Anti-emetic Use (for treatment of symptoms)
M11	Over sedation / hypotension
M12	Abrupt medication stop
M14	Antidiarrheals - Diphenoxylate (Lomotil), Loperamide (Imodium), Kaopectate, Pepto-Bismol

Our Journey



CPTT Validation Study- Methods



Main Menu

L05 Sodium: 120 mmol/L > Na > 150 mmol/L

No Yes

Date of Abnormal Na:

Lowest / Highest Na:

Treatment / Outcome / Other Clinical Details:

L06 Potassium: 3.0 mmol/L > K+ > 6.0 mmol/L

No Yes

L07 Rising BUN / Creatinine > 2 x Baseline

No Yes

Date of BUN:

Date of Creatinine:

Admission BUN:

Admission Creatinine:

Highest BUN:

Highest Creatinine:

Treatment / Outcome / Other Clinical Details:

L08 Hypoxia O2 Sat < 75%

No Yes

<<

>>



AEESP2 1.02 - Injury Disability Causation (01/04) - Elevated Potassium / 002

Main Menu

Injury:

Did the Patient Sustain an Unintended Injury or Complication?: No Yes Almost Injured

Describe Clinical Context/Event:

POD#1 Potassium = 5.8; POD #2 K= 6.0; POD#3 K=6.4. IV potassium not stopped until late POD#3. Cardiac Arrest - successfully resuscitated

Disability:

Did the Injury or Complication Result In: (select all that apply) (stop review ONLY if None of the Above selected)

- Disability at the time of discharge
- Prolonged hospital stay
- Subsequent hospitalization
- Death
- Intervention or treatment without sequelae listed above
- Outpatient visits
- None of the above (No AE)

Describe Disability, Prolonged Stay, Temporary Injury/Complication - Impact on Patient:

Patient had elevated serum K - lead to cardiac arrest - successfully resuscitated. Transferred to ICU. Monitored x2 days. no sequelae - transferred back to ward and discharged home 3 day with no residual deficits

<< >>



Results

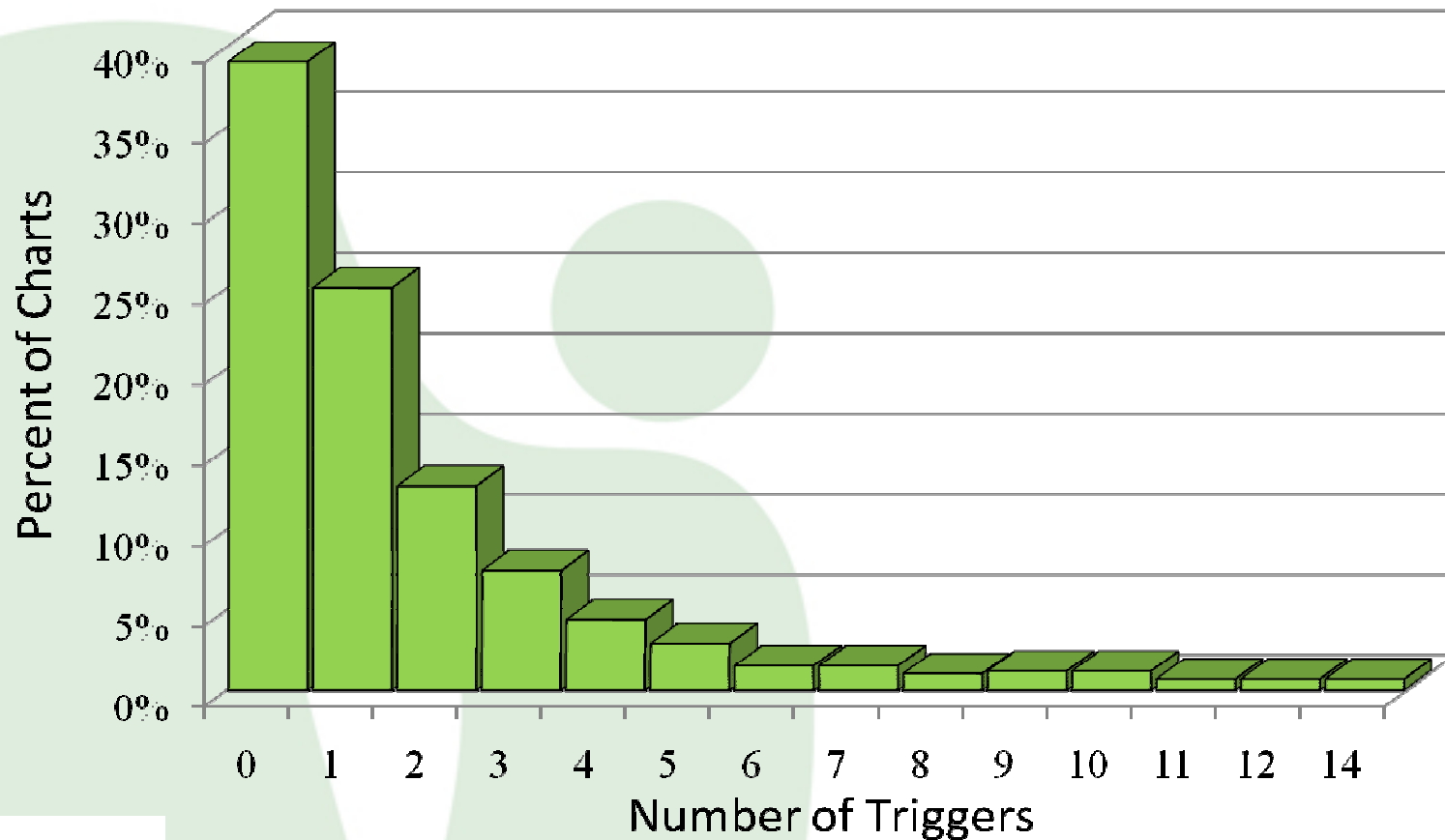
Number of Patients with Triggers

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

591 patient charts



Frequency of Triggers per Chart



Most Frequently Identified Triggers

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



% of patients with AEs

AE	Patients	Percent
+ve	89	15.1%
-ve	502	84.9%

Rate of AEs

**190 AEs in 591 patients =
32.2%**

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 pat	502	591



Sensitivity and Specificity of the Canadian Paediatric Trigger Tool

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

Se = 0.88; CI = (0.79-0.94)

Sp = 0.44; CI = (0.39-0.48)



Sensitivity and Specificity of the Canadian Paediatric Trigger Tool

		Adverse Event		Total
		Yes	No	
Trigger	Yes	78	28	591
	No	11	219	
Total		89	502	591

9 did not use "other" category
2 probably not AEs

Comparison of Nurse and Physician Assessment of AEs

		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)



Summary

- In a select group of patients CPTT had a sensitivity of 0.88 to detect AEs
- 15% of patients reviewed had an AE
- Overall rate of AEs was 32.2%
- 60% of AEs were judged preventable
- Neonates had the highest incidence of AE
- Nurses and Doctors differed in their assessments of AEs



Summary

- In a select group of patients CPTT had a sensitivity of 0.88 to detect AEs

- 15% of

- Rate of

- 60% of

- Neonat

- Better e
triggers

- Nurses

Unique aspects of the tool

- First pediatric tool using Wilson's criteria for adverse events
- Rigorous 2 step methodology;
93% agreement among nurses
- Global trigger tool
- Opportunity to use same tool to compare incidence of AEs in adults and pediatrics

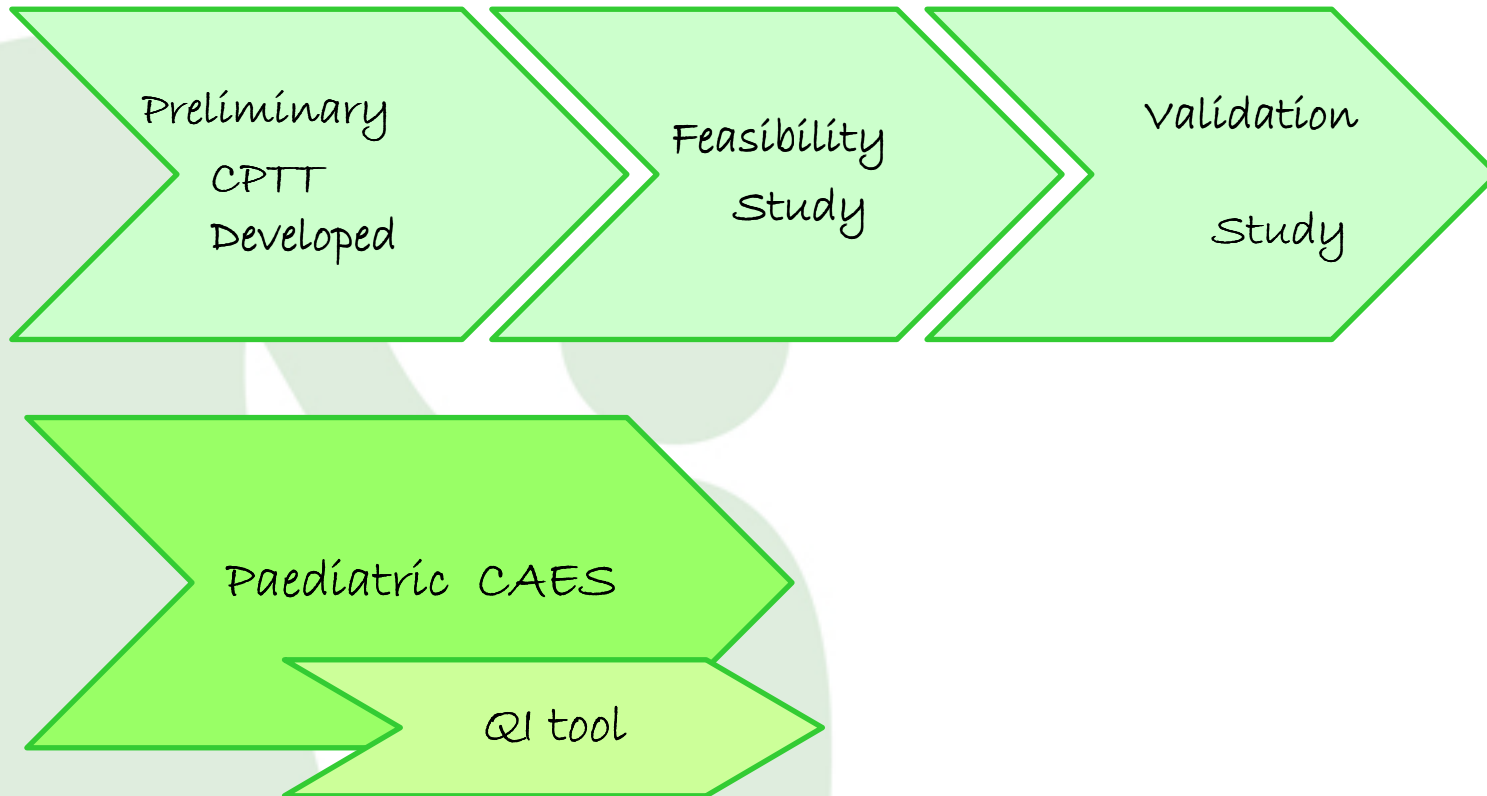
On review

- Feedback: tool has too many triggers
- Fatigue with using the tool
- 4 triggers not used at all – delete?
- Able to remove/ merge triggers with minimal effect on sensitivity

→ **35 triggers**

↓
Reassessing reliability of 35 trigger tool

Where we are going



Canadian Paediatric Adverse Event Study

Goals:

1. To determine the incidence of AEs in children hospitalized in Canada.
2. To compare the rate of paediatric AEs between hospital category i.e. teaching, large and small.
3. To compare the rate of AEs across specialties
4. To determine the frequency of various AEs
5. To determine the rate of preventable AEs in children hospitalized in Canada.
6. To compare rates to AEs in adults

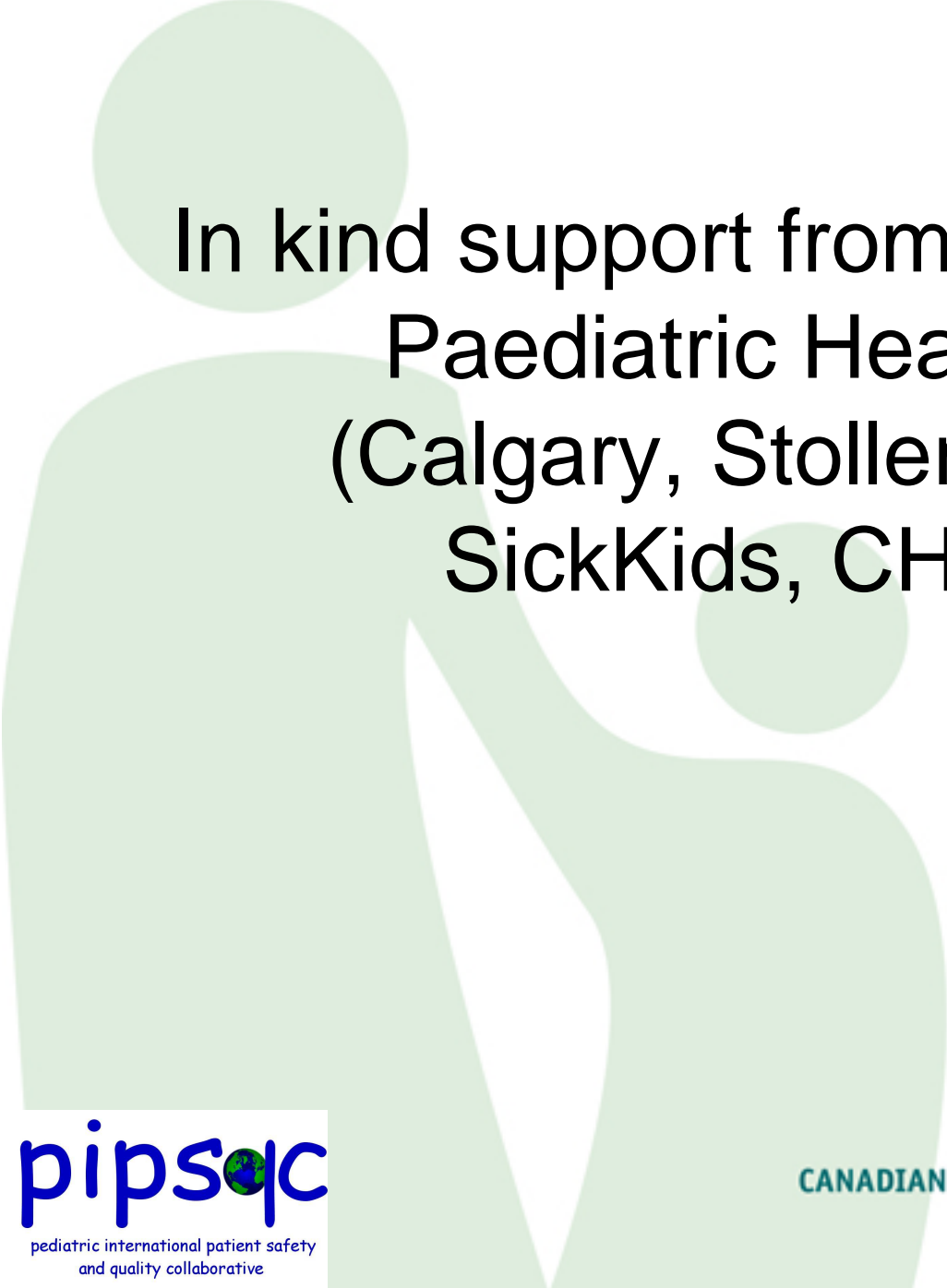
Canadian Paediatric Adverse Event Study

Current focus: Building a **web-based Data Collection**
tool

- Cross platform compatibility
- Instantaneous database updating
- Immediacy of access
- Data moves on line directly to server
- Data safety/security
- Multiple concurrent users

Our sincere thanks to all our Funders

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 - Winnipeg Regional Health Authority
 - Calgary Health Region
 - Stollery Children's Hospital, Edmonton
 - Izaak Walton Killam Health Centre, Halifax
 - Spelman Cronin Consulting
 - CAPHC



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SickKids, CHEO, IWK)



Thank you !