

Adverse events in the Pediatric Emergency Department: a prospective cohort study

Supplementary material 1: Patient characteristics and systems factors to be examined for association with the occurrence of adverse events

Patient Characteristics	Further Description/Categories
Age	Age, in years
Sex	male/female
Language	Both parents fluent in English and/or French
Immigration	Both parents immigrated to Canada in last five years
Pediatric Canadian Triage Acuity Scale (PedsCTAS)	Five categories: 1=resuscitation; 2=emergent; 3=urgent; 4 semi-urgent; 5=nonurgent Variable be grouped into 3 categories for analysis: (1) resuscitation and emergent; (2) urgent; and (3) semi-urgent and nonurgent
Time of day of patient presentation to the ED	'regular hours' (8 am to 5 pm) / 'after hours' (5 pm to 8 am)
Weekday/weekend presentation of patient to the ED	'weekday' (Monday to Friday) / 'weekend' (Saturday and Sunday)
Discharge disposition	Admitted / discharged / left without being seen /left against medical advice/died. Variable will be grouped in 3 categories for analysis: (1) admitted, (2) discharged, (3) left without being seen and left against medical advice. If any patients die, then a fourth category will be added.
Indwelling line, or indwelling urinary catheter, or dialysis catheter or respiratory support needed	Variable grouped as 'yes' vs 'no'
Mental health presentation	For example, depression, anxiety, substance abuse
Chronic condition	Defined as a condition needing on-going, regular follow-up or regular medication use (e.g asthma, cancer, kidney disease, congenital heart disease, diabetes)
System factors	Further Description/Categories
Length of time to see physician	Time between triage and first physician assessment
Number of ED physicians involved in that patient's care	Number of ED staff physicians that assume responsibility for care (reflects number of end-of-physician-shift hand overs for each patient); Variable divided into three categories: 1, 2, or more than 2
Location within the ED	Participating ED is divided into two areas: 'ambulatory' and 'acute' zones
Need for a consultation	Consultation by ED consultant physician of another sub-speciality (e.g.; pediatric general surgery, orthopedics, cardiology, etc.)
Level of physician initially managing patient (ED staff versus medical trainee)	Participating centre is a teaching facility and patients may be seen first by ED staff or by medical trainees (i.e.; medical students, residents, fellows); variable grouped into

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	primary assessor 'consultant' vs 'trainee'
Overall ED census (i.e. the overall number of patients present in the ED)*	This reflects all the patients currently present in the ED - those in the waiting room, those in ED examination rooms, and those in ED examination rooms awaiting inpatient beds
The number of patients waiting to be seen*	The number of patients in the ED who have not yet been seen by a physician.
Number of patients awaiting in-patient beds*	The number of patients for whom inpatient beds have been requested (for admission) but who remain in the ED

*These are system variables that reflect volume and operational processes. Given the volume of patients that can present over a short period to the triage desk it was not feasible to collect these variables at the exact moment each patient is triaged. We operationalized the data collection of these variables by capturing these variables at the midpoint of each hour during each shift. We then used this data for patients who arrived within 30 minutes before or after this time point. For example, if a patient presents to the ED at 13:10, we used for this patient the data collected at 13:30 for these specific variables.

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Supplementary material 2: Types of adverse events and system response required

Types of adverse events

Diagnostic issue: documented signs, symptoms, laboratory tests or imaging not acted on or an indicated diagnostic test not ordered

Management issue: suboptimal management plans despite accurate diagnosis or based on an inaccurate diagnosis.

Unsafe disposition decision: patient placed at unnecessary risk of experiencing death or major disability by being discharged from the ED or hospital.

Suboptimal follow-up: problems with follow-up arrangements lead to the development of new symptoms, unnecessary prolongation of symptoms, an unscheduled return visit to the ED or a subsequent unscheduled hospital admission (this could be due to inadequate availability of follow-up or due to inappropriate follow-up arrangements).

Medication adverse effect: patient experiences a symptom related to a medication regardless of whether the medication was appropriately prescribed or taken.

Procedural complication: patient experiences adverse consequences of a procedure.

Nosocomial infection: infection acquired in ED or in hospital.

System response for adverse events

- No treatment (symptoms only)
- Visit to lab facility or other health care facility
- Visit to MD
- Visit to ED
- Medical intervention
- Surgical intervention
- Admission to hospital
- Transfer to critical care
- Death

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Supplementary material 3: Telephone survey

ED Visits

Since your child's Emergency Department visit on _____(date), have Yes
your child returned to an Emergency Department?

No

OR Since our last phone call on _____(date), have you/your child returned
to an Emergency Department?) NA

NA

Why NA?

How many visits to an emergency department have they had?

1 2 3

Visit 1: Which Emergency Department did you visit?

Visit 1: Please describe the reason for your visit:

Visit 1: Do you remember the date of this visit?

Yes No

Visit 1: What was the date of the visit?

Visit 2: Which Emergency Department did you visit?

Visit 2: Please describe the reason for your visit:

Visit 2: Do you remember the date of this visit?

Yes No

Visit 2: What was the date of the visit?

Visit 3: Which Emergency Department did you visit?

Visit 3: Please describe the reason for your visit:

Visit 3: Do you remember the date of this visit?

Yes No

Visit 3: What was the date of the visit?

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Admitted to Hospital

Since your child's Emergency Department visit on _____ (date), has Yes No NA
your child been admitted to hospital?

OR

Since our last phone call on _____ (date), has your child been admitted to
hospital?

Why NA?

How many times were they admitted to hospital?

1

2

3

Admission 1: Which hospital were they admitted to?

Admission 1: Please describe the reason for the admission:

Admission 1: Do you remember the date of this admission?

Yes No

Admission 1: What was the date of admission?

Admission 2: Which hospital were they admitted to?

Admission 2: Please describe the reason for the admission:

Admission 2: Do you remember the date of this admission?

Yes No

Admission 2: What was the date of admission?

Admission 3: Which hospital were they admitted to?

Admission 3: Please describe the reason for the admission:

Admission 3: Do you remember the date of this admission?

Yes No

Admission 3: What was the date of admission?

Health Professional

Since your child's Emergency Department visit on _____ (date), Yes No NA

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has your child seen a health professional other than in the Emergency Department or in-hospital?

OR

Since our last phone call on _____ (date) has your child seen a health care professional other than in the Emergency Department or in-hospital?

Why NA?

How many visits with a health professional have you had?

 1 2 3

Visit 1: What type of health professional did you see?

Family Doctor
 Specialist
 Nurse Practitioner
 Chiropractor
 Physiotherapist
 Other

Visit 1: If specialist, please specify:

Visit 1: If other, please specify:

Visit 1: Please describe the reason for your visit:

Visit 1: Do you remember the date of this visit?

 Yes No

Visit 1: What was the date of this visit?

Visit 2: What type of health professional did you see?

 Family Doctor
 Specialist
 Nurse Practitioner
 Chiropractor
 Physiotherapist
 Other

Visit 2: If specialist, please specify:

Visit 2: If other, please specify:

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Visit 2: Please describe the reason for your visit:

Visit 2: Do you remember the date of this visit?

 Yes No

Visit 2: What was the date of this visit?

Visit 3: What type of health professional did you see?

 Family Doctor Specialist Nurse Practitioner Chiropractor Physiotherapist Other

Visit 3: If specialist, please specify:

Visit 3: If other, please specify:

Visit 3: Please describe the reason for your visit:

Visit 3: Do you remember the date of this visit?

 Yes No

Visit 3: What was the date of this visit?

Problem Resolved

Did the problem your child had on your Emergency Department visit resolve?

 Yes No NA

Why NA?

Can you tell me what happened?

What did you do?

New Health Problems

Since your Emergency Department visit, has your child had any new health problems develop?

 Yes No NA

OR

Since our last phone call on (date), has your child had any new health problems develop??

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Why NA?

Please describe the problem(s) (i.e. when did it start? what are the symptoms?)

What do you think is/are the cause(s) of this problem(s)?

What did you do?

For the new health problem: On a scale of 0-5 (0 = not serious at all, 5 = very serious), how seriously is this problem affecting your child's quality of life?

0

1

2

3

4

5

Worsening Pre-existing Health Problems

Since your/your child's Emergency Department visit, has your child had any worsening of pre-existing health problems? Yes No NA

OR

Since our last phone call on (date), has your child had any worsening of pre-existing health problems?

Why NA?

Please describe the problem(s) (i.e. when did it start? what are the symptoms?)

What do you think is/are the cause(s) of this problem(s)?

What did you do?

For the worst pre-existing health problem: On a scale of 0-5 (0 = not serious at all, 5 = very serious), how seriously is this problem affecting your child's quality of life?

0

1

2

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 3 4 5**Mental Health Questions – ONLY IF PATIENT PRESENTED WITH A MENTAL HEALTH ISSUE (includes family conflict, behavioural changes, alcohol, intoxication, ingestion, anxiety, depression, etc.)**

**** FOR RA ONLY**** Was the child's visit due to a mental health issue? Yes No

Since your child's visit on _____(date) did they attempt any self-harm?

 Yes No

OR

Since our last phone call on (date) did your child attempt any self-harm?

What happened? (i.e. when, the event, injuries)

Since your child's visit on _____(date) did they attempt to harm anyone else?

 Yes No

OR

Since our last phone call on (date), did your child attempt to harm anyone else?

What happened? (i.e. when, the event, injuries)

Since our last phone call on _____(date) did anyone harm or attempt to harm your child?

 Yes No

What happened? (i.e. when, the event, injuries)

Did the child or family need to contact the police since their visit to the ED?

 Yes No

OR

Did the child or family need to contact the police since our last phone call?

What happened? (i.e. when, the event, etc.)

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Did the child or family contact a mental health crisis line since their visit to the ED?

Yes No

OR

Did the child or family contact a mental health crisis line since the last phone call?

Please elaborate:

****Possible Adverse Events Identified by Family – Please read the following script:** “For the next section, I am going to describe a possible medical scenario and ask whether or not you believe your child experienced this during their ED visit”**

A medication problem occurs when a medication is not given exactly as it was meant to be given. For example, a medication may be given in the incorrect amount or the patient had an allergic reaction to the medication.

Do you think a medication problem occurred or was stopped before occurring?

Yes No NA

Why NA?

Please describe the medication problem:

A complication of care occurs when there is unwanted result of treatment. For example, unexpected bleeding occurred; the patient was transferred to the intensive care unit because of a complication.

Do you think a complication of care occurred or was stopped before occurring?

Yes No NA

Why NA?

Please describe the complication of care:

An equipment problem occurs when equipment fails or is not used correctly. For example, equipment not available when needed; an intravenous line leaked or became blocked.

Do you think an equipment problem occurred or was stopped before occurring?

Yes No NA

Why NA?

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Please describe the equipment error:

A miscommunication between staff occurs when members of the staff give or receive information from other staff about diagnosis, treatment, or care that is inadequate (not enough information), conflicting (information that is different from what someone else gave) or incorrect. For example a test was repeated because the original result was lost or destroyed; a test was cancelled by mistake.

Do you think a miscommunication between staff occurred or was stopped before occurring?

Yes No NA

Why NA?

Please describe the miscommunication:

Miscommunications between staff and your family occur when you or your family gives or receives information from staff about diagnosis, treatment or care that is inadequate (not enough information), conflicting (information that is different from what someone else gave) or incorrect. Examples: Medication instructions were not explained to you or your family.

Do you think a miscommunication between your family and staff occurred or was stopped before occurring?

Yes No NA

Why NA?

Please describe the miscommunication:

Was there any other action that may have caused health care problems for your child? For example, the child fell off a stretcher?

Yes No NA

Why NA?

Please describe the other action:

COMMENTS:

End of Interview

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*

Supplementary material 4: Outcome and preventability scales

Outcome assessment: confidence that outcome is related to health care received

- 1. No evidence for causation
- 2. Slight evidence for causation
- 3. Management causation <50-50 but close call
- 4. Management causation >50-50 but close call
- 5. Strong evidence for management causation
- 6. Certain evidence for management causation

Preventability scale: Confidence that outcome was preventable

- 1. Definitely not preventable
- 2. Probably not preventable
- 3. Probably preventable
- 4. Definitely preventable

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Supplementary material 5: Baseline characteristics for eligible, non-enrolled patients (N=369) and comparison to enrolled patients

Characteristic	Non-enrolled patients		Enrolled patients		p-value
	N	n (%)*	N	n(%)*	
Age, median (IQR)	369	6.21 (1.90-12.85)	1367	4.34 (1.50-10.57)	<0.001
Female Sex	369	175 (47.4)	1367	676 (49.5)	0.99
Disposition	367		1367		0.03
Discharged		324 (88.3)		1281 (93.7)	
Admitted		35 (9.5)		68 (5.0)	
Left without being seen/against medical advice		8 (2.2)		18 (1.3)	
PedsCTAS			1367		0.004
1 – Resus		4 (1.1)		4 (0.3)	
2 – Emergent		53 (14.4)		84 (6.1)	
3 – Urgent		167 (45.4)		691 (50.5)	
4 – Semi Urgent		115 (31.3)		495 (36.2)	
5 – Non Urgent		29 (7.9)		93 (6.8)	
Presenting complaint (4 most common)	368		1367		
Fever		44 (12.0)		207 (15.1)	0.99
Difficulty breathing/ SOB		28 (7.6)		108 (7.9)	0.99
Abdominal pain		24 (6.5)		72 (5.3)	0.99
Cough/congestion		24 (6.5)		135 (9.9)	0.99

*unless otherwise indicated

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Supplementary material 6: Description of flagged up and triggers identified among 584 patients.

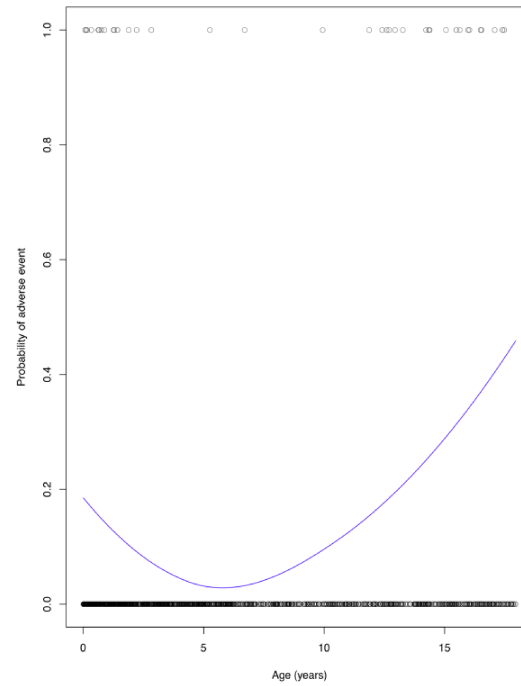
584 patients with flagged outcomes and/or triggers	
<i>Flagged outcomes, n=1244*</i>	<i>Triggers, n =14</i>
Unplanned admission, n=31	Transfer to higher level care, n=1
Return ED visit, n=169	Intubation/accidental extubation, n=1
Unplanned visit to health care provider, n=153	Unplanned surgery, n=1
Unresolved symptoms, n=619	Hospital acquired infection, n=3
New symptoms, n=138	Transfusion of blood products, n=2
Worsening of pre-existing condition, n= 7	Abrupt drop in hemoglobin, n=3
Self-harm/ harm to others/police/crisis line, n =20	Low/high potassium, n=2
Family identified concern, n=107	Dissatisfaction with care, n=1

*Patients and families could report triggers on any of three phone calls. For example, one patient could report “unresolved symptoms” on each of three calls.

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Supplementary material 7: Probability of adverse event by age



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Supplementary material 8: Results of multivariate logistic regression* for variables associated with occurrence of adverse events

Characteristics		
	Odds ratio	p-value
Age		0.03
<i>Linear term</i>	0.96 (0.87-1.05)	
<i>Quadratic term</i>	1.02 (1.01-1.04)	
Mental health visit		0.32
No	Ref	
Yes	2.28 (0.40-8.96)	
Arrival by Ambulance		0.08
No	Ref	
Yes	2.87 (0.86-7.71)	
Time to discharge or admission	1.09 (0.96-1.19)	0.17
Weekend		0.05
No (Mon-Fri)	Ref	
Yes (Sat-Sun)	0.40 (0.13-0.99)	

* All logistic regression analyses adjusted for shift (day, evening, night) to account for oversampling of night shifts

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