The Paediatric Trigger Tool

User guide

Contents:

Incident reporting typically identifies 5-10% of harm events.

Trigger Tools typically detect harm rates in excess of 30%.

Together, these two diagnostic measures can help you focus your improvement work to reduce your rate of harm.

Acknowledgements

With the support of clinicians in nine hospitals across the UK, we have developed the UK paediatric trigger tool in order to detect adverse events in paediatric care provided in district general hospitals, acute teaching hospitals and specialist paediatric centres.

This work has built on the original work of the Institute for Healthcare Improvement, in developing the Global Trigger Tool™ for use in adults, the Acute Trigger Tool an adaption for use in UK Hospitals, and original research led by Professor Anne Matlow to develop a Canadian Paediatric Trigger Tool.

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England

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Scotland

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- Royal Hospital for Sick Children, Edinburgh

Introduction

Welcome to the **Paediatric Trigger Tool (PTT) User's Guide**. Produced by the Safer Care Team at the NHS Institute for Innovation and Improvement, it is a practical guide to support anyone who is using, or thinking about using, the PTT.

The guide is arranged in five sections:

Complete newcomers to the Paediatric Trigger Tool may want to learn more about what the PTT is (and isn't), and what benefits it can bring.

► See Sections 1 and 2

Teams about to go live with the tool for the first time will benefit from the '7-step user guide'.

► See Section 3

Those already using the PTT may just want to use the 'Trigger definitions' to check or refresh their understanding of the triggers and what to look out for in case note reviews.

► See Section 4

'It pulls back the curtain to show us where the major problems really are'

Trigger Tool user

1. What is the Paediatric Trigger Tool?

The Paediatric Trigger Tool (PTT) is a rapid, structured case note review tool to help you measure the rate of harm in your organisation. It provides paediatric teams with an unbiased measure of the incidence of iatrogenic harm experienced by their patients (ie harm caused by medical care).

> 'The PTT brings highly-sensitive and specific adverse event measurement within reach of every paediatric team'

Most importantly, the PTT allows you to prioritise your safety improvement activity and track these improvements over time.

Co-produced by the NHS Institute's Safer Care Team and NHS clinicians, the PTT draws on the large and growing body of research and evidence exploring the benefits of trigger tool methodology[1].

And now, the PTT is also supported by the NHS Institute's **Trigger Tool Portal** – an easy-to-use, web-based facility that allows you to capture, automatically analyse and present the valuable data generated through using the trigger tool. There is more about the Trigger Tool Portal in **Section 3. '7-step user guide'.**

What it isn't...

The Paediatric Trigger Tool is **not** a benchmarking tool for making comparisons between paediatric teams or trusts. This is because:

- Counting adverse events relies on a series of clinical judgements by individual clinical reviewers. While use of the trigger tool methodology has been shown to enhance reliability between reviewers at organisational level, this does not extend to comparisons between reviewers in different organisations - except in the most highly-controlled situations (eg controlled trials).

- The adverse event rate in any given healthcare team will be influenced by a number of important factors outside the control of that team, such as patients' health and social status and local provision of other health and social care services.

As a quantitative tool, the PTT does not help you understand the detailed causes of specific adverse events. For this, we recommend using the PTT alongside other incident analysis techniques and other sources of information about patient safety - eg staff reports and patient complaints or comments.

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[1] Resar RK, Rozich JD, Classen D. Methodology and rationale for the measurement of harm with trigger tools. *Quality and Safety in Health Care*. 2003; 12; Suppl 2:39-45.

How does it work?

The PTT uses random sampling and rapid, structured case note review to bring very sensitive and specific adverse event measurement within reach of every paediatric team. Each review should take a maximum of 20 minutes per patient, and often less.

The object of the review is to identify harm – not to determine whether the event was preventable.

In our experience, the discussion about the **preventability** of an adverse event is often a barrier to determining the **cause** of an adverse event.

The full detail of how the PTT works is set out in **Section 3: 7-step user guide**. In essence, though, the process involves four key stages:

I. A structured manual review of each case note (patient record), looking for any of the triggers listed in the tool – eg INR level greater than 5.

II. Where a positive trigger is identified, carrying out a closer examination of the case notes to determine whether an adverse event has occurred – eg bleeding or haematoma.

III. Where an adverse event has occurred **and** harm has resulted, assigning a category of harm based on the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) Index for Categorising Errors.

IV. Capturing the data using the NHS Institute's Trigger Tool Portal and reviewing the analysis of harm generated by the case note reviews.

What defines an 'adverse event'?

The Paediatric Trigger Tool defines an adverse event as any physical harm to the patient (limiting the scope to physical rather than emotional harm).

However, a question many users have found useful in identifying an adverse event is: **'*Would you be happy if the event happened to you or to your child?'*** If the answer is no, then it probably is an adverse event.

The next question would be whether the event was part of the natural progression of the disease, or a complication of the treatment related to the disease process.

Admittedly the decision at times will be difficult and subjective, but experience has found the process to be reliable.

2. **Why use it?**

Traditional efforts to detect adverse events (AEs) have focused on voluntary reporting and tracking of errors. However, public health researchers have established that only 10 to 20% of errors are ever reported and, of those, 90 to 95% cause no harm to patients[2].

In order to select and test the changes that will reduce harm and improve safety and reliability, hospitals and healthcare teams need a more effective way to identify events that do cause harm to patients.

The use of triggers to identify adverse events from a manual case note review has been used extensively in the UK and elsewhere to measure the overall level of harm in a healthcare organisation.

Recognising the potential of the methodology, the NHS Institute for Innovation and Improvement is developing a suite of trigger tools for the UK to measure harm in paediatrics, primary care, mental health, community hospitals and in the community.

What is a trigger?

The Paediatric Trigger Tool is made up of a series of triggers grouped together to reflect different aspects or components of care. The groupings used in the PTT reflect five broad aspects of care in a child's hospital stay:

1. general care
2. surgical care
3. intensive care
4. medication
5. laboratory tests.

The trigger is a signpost, or clue, to help the reviewer find any adverse events that have resulted from any medical care provided.

For example...

An INR > 5 is not an adverse event in its own right, as the patient has not been harmed by it (even though it is unwanted). The majority of patients whose INR is over 5 do not suffer an adverse event as actions are taken to normalise the result. However, a patient with an INR over 5 who suffered a bleeding event has suffered an adverse event linked to that trigger.

The role of the INR trigger is to identify patients who through drug treatment are over anti-coagulated – these patients have a higher chance of suffering an adverse event. The level of 5 is chosen as the use of a lower level such as 4 would lead to the trigger being less sensitive in identifying an adverse event (ie the trigger would be identified frequently and lead to a detailed note review, but with few adverse events detected). This would make the tool much less efficient.

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[2] Sari A, Sheldon TA, Cracknell A, Turnbull A. Sensitivity of routine system for reporting safety incidents in an NHS hospital: retrospective patient case note review. *BMJ.* 2007 doi: 10.1136/bmj.39031.507153.AE http://www.bmj.com/cgi/content/abstract/334/7584/79

By themselves triggers are not adverse events. Their purpose is to allow the case note review to be completed fast enough to be feasible in everyday practice, while remaining reliable enough to pick up adverse events in the case notes and full patient record.

What benefits will come from using the tool?

These are just some of the benefits you can expect to gain through using the PTT:

- The PTT can **re-ignite** staff's passion and enthusiasm for improving the quality and safety of care they deliver to their patients.

- Having an internal, confidential and non-benchmarking tool allows paediatric teams to be **open and honest** about their overall rate of harm. The PTT is not about attributing blame, but wholly about safety improvement.

- Trigger methodology is a **tested and validated** tool for measuring harm and tracking improvements in patient safety. It is a valuable partner to other techniques for understanding threats to patient safety, including staff reporting and patient complaints.

- Safer care is **better for everyone**. Reducing harm results in safer care for the patient; improved professional satisfaction for clinicians; and less waste of healthcare resources.

Before you get started...

The following section takes you through the 7-step PTT process. But before you get started for the first time, you and your review team should ideally have had some initial training in case note review and trigger tool methodology.

This does not have to be onerous and we suggest participation in programmes or online tutorials listed on our web site at: www.institute.nhs.uk/triggertool

3. **7-step user guide**

Step 1: Select your reviewers

The review team should consist of two reviewers and a doctor who have been trained in case note review and trigger tool methodology. The two initial reviewers should also have extensive experience of paediatric care, and may include nurses and pharmacists. A paediatrician is needed to concur with the identification and severity of the adverse event, and to lead discussions regarding adverse events with other doctors in the organisation. The paediatrician will also play a lead role in supporting the reviewers during the training phase as this helps to improve inter-reviewer reliability.

- ✓ **TIP:** Reviewers may need to negotiate protected time to carry out the reviews. A sample business case is available at www.institute.nhs.uk/paeds. In paediatrics, it is not generally possible to undertake the type of mortality review that is generated before commencing acute adult trigger tool programmes. You will need to review a baseline of 20 records to start with and then 20 per month thereafter. This can be split into 10 records, twice a month if necessary. Remember, reviewers will need 20 minutes for each review; time to discuss the findings; time for data input; and time to prepare data presentations.

Step 2: Select your case notes

It is critical to select the initial case notes in a truly random fashion. You can use any method, as long as it is random and the patients selected have a minimum LOS (length of stay) of at least eight hours (currently under review). Case notes should be selected at least 30 days after discharge. This is because one of the triggers (readmitted within 30 days of discharge) cannot otherwise be determined.

So what makes a selection process random? A selection process is random as long as every case note has an equal opportunity of being chosen.

- ✓ **TIP:** One method might include generating random numbers between one and nine and selecting 10 patient records that end in the random number.

- ✓ **TIP:** Alternatively, you could print out all discharges (if deaths are included) and select every 10th case note for review.

- ✓ **TIP:** It is also useful to pull all prior case notes for the selected patients, allowing the reviewer to see any readmissions.

Once you know how you want to randomise your notes, you need to decide how you will get them. Will you approach your medical records department, or do you have a data clerk or secretary who can pull the notes for you?

- ✓ **TIP:** Select more than 20 cases as some notes will be unavailable – but do check that lack of availability does not result in the sample being skewed over time (eg notes for frequently-seen children may always be in the 'pending' tray in preparation for a clinic appointment, and never therefore sampled).

Step 3: Start reviewing

You will find an example of the **PTT worksheet** at the back of this guide. Hard copies (pdf files) can also be down loaded from our web site www.institute.nhs.uk/paeds or viewed on the **NHS Trigger Tool Portal**. Alternatively, you may find it easier to input the data directly into the **NHS Trigger Tool Portal.** To use the Trigger Tool Portal see page 12.

Whichever way you access it, you will need to complete a separate worksheet for each case note and you will need to review a minimum of 20 records per month thereafter.

✓ **TIP:** These reviews can be split into two sessions to be more resource friendly.

You should review only 'completed' case notes (those that have been processed and include the discharge summary and all diagnosis and procedure coding).

And, each case note should be reviewed for a maximum review time of 20 minutes. Less than 20 minutes is fine, but never more than 20 minutes.

✓ **TIP:** When you start out, both reviewers may wish to review the same set of notes independently for the first 20 patient records, and then discuss their findings with the paediatrician. This helps ensure the reviewers are thinking and working in a broadly similar way, thus establishing inter-reviewer reliability more quickly.

Step 4: Follow a consistent process

The case note review process should be consistent. The following pathway might be useful to follow:

- Discharge diagnoses (looking particularly for infections, complications or certain diagnoses).

- Discharge summary (looking for specifics of the assessment and treatment during the hospital stay).

- Medication orders and the medication administration documentation form.

- ✓ **TIP:** If your organisation uses electronic prescribing, download the prescription forms beforehand or arrange to have direct screen access.

- Laboratory results

- ✓ **TIP:** Again, if you use electronic reporting, download the reports beforehand or arrange to have direct screen access.

- Operative theatre documentation

- Nursing documentation.

- Physician case notes.

- If time permits, any other areas of the case notes.

Step 5: Find the positive triggers

As a minimum, all reviews should involve looking for triggers in the PTT's **General Care, Laboratory Test** and **Medication** components. The other components should only be used if applicable; for example, the **Intensive Care** component should be used when reviewing a chart for a patient who spent any days in an intensive care unit.

The new **NHS Trigger Tool Portal** (see 'Step 7') allows you to customise the review process and specify your own additional triggers. This is only advisable once you've gained more experience in trigger tool methodology and use within your organisation.

'A positive trigger is not an adverse event in itself; it is just a clue that one may have occurred'

A positive trigger is the presence of that item (eg INR level greater than 5). However, a positive trigger is not an adverse event in itself; it is just a clue that one may have occurred.

When you find a positive trigger, tick 'Yes' against it on the worksheet and then review the relevant portion of the case note to determine whether an adverse event has occurred. In the example of INR greater than 5, the reviewer should look for bleeding, decreased haemoglobin, haematoma and other adverse events that can result from over-anticoagulation.

- ✓ **TIP:** The object is not to find every possible adverse event in every case note you review. The tool is designed to produce a reliable sample that is sufficient to inform safety improvements in the hospital.

If no adverse event is found, move on and continue looking for other triggers.

- ✓ **TIP:** Be sure to include every adverse event you find, even if not identified by a trigger. Occasionally, you will come across an adverse event while looking for triggers or other details. All adverse events should be included and there is a component on the **PTT worksheet** to accommodate this (see PO1 'Other' at the bottom of the worksheet).

Where you do find evidence of an adverse event, tick 'Yes' on the worksheet in corresponding column.

Next you need to assign a **category of harm** using the NCC MERP Index categories listed in the tool and shown in the table below.

Step 6: Assign a 'category of harm'

The PTT uses an adapted version of the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) 'Index for Categorising Errors'. However, the

Paediatric Trigger Tool counts *any* adverse events causing harm to the patient, whether or not they are the result of an error.

Accordingly, the PTT excludes the first four categories in the NCC MERP Index because they describe medication errors that **do not** cause harm. The PTT does include categories E, F, G, H, and I of the index because these categories describe errors that **do** cause harm.

If an adverse event has occurred, but no harm has resulted then tick the N/A (not applicable) box.

Category	Description
E	Temporary harm to the patient and required intervention
F	Temporary harm to the patient and required initial or prolonged hospitalisation
G	Permanent patient harm
H	Intervention required to sustain life
I	Patient death

The review team will need to establish their own process if serious harm is identified, particularly where this has not previously come to the attention of clinicians and managers. The tool is not designed to establish accountability for error or harm. There are other tools such as the **National Patient Safety Agency (NPSA) Incident Decision Tree** or **Root Cause Analysis Toolkit** that provide useful frameworks for exploring and learning from incidents.

- ► Find both resources on the NPSA website at:
  http://www.npsa.nhs.uk/nrls/improvingpatientsafety/patient-safety-tools-and-guidance/incidentdecisiontree/
- ► http://www.nrls.npsa.nhs.uk/resources/?entryid45=59847&

Step 7: Capture and view your data via the NHS Trigger Tool Portal

After all case notes have been reviewed, you can then calculate the overall rate of harm. You can do this manually, but it is easier to use the new NHS Institute's **Trigger Tool Portal** www.institute.nhs.uk/triggertoolportal.

Co-designed by the NHS Institute's Safer Care Team and practicing paediatricians, the portal (shown below) allows you to capture and analyse the harm data generated from your case note reviews. Using it regularly will allow you to see whether your service is getting safer and more reliable.

PAEDIATRIC TRIGGER TOOL

www.institute.nhs.uk/safercare/portal

Trigger Tool Paediatrics

	Patient Age		years, months
Date Of Discharge:		
Length Of Stay:		days

|		Full Description	Trigger	Adverse Event	Severity of Adverse Event	Comment on this trigger
General	PG1	EWS or baseline obs missing or incomplete OR score/observation requiring response	● No ● Yes	● No ● Yes	N/A E F G H I	
	PG2	Tissue damage or pressure ulcer	● No ● Yes	● No ● Yes	N/A E F G H I	
	PG3	Readmission to hospital within 30 days	● No ● Yes	● No ● Yes	N/A E F G H I	
	PG4	Unplanned admissions	● No ● Yes	● No ● Yes	N/A E F G H I	
	PG5	Cranial Imaging	● No ● Yes	● No ● Yes	N/A E F G H I	
	PG6	Respiratory/Cardiac arrest/crash call	● No ● Yes	● No ● Yes	N/A E F G H I	
	PG7	Diagnostic imaging for embolus/thrombus +/- confirmation	● No ● Yes	● No ● Yes	N/A E F G H I	
	PG8	Complication of procedure or treatment	● No ● Yes	● No ● Yes	N/A E F G H I	
	PG9	Transfer to higher level of care (inc admission to specialist unit, ICU/ HDU)	● No ● Yes	● No ● Yes	N/A E F G H I	

The Trigger Tool Portal is easy to use and puts you in complete control of your data. It also enables you to drill down and identify the prevalence of specific triggers or groups of triggers. This unique analysis capability will help you focus your service improvement efforts where they're needed most.

The portal will also automatically generate SPC (statistical process control) charts and other visual data charts to help you understand and communicate your results. These can be easily exported into your own reports and presentations – giving you a powerful new tool to engage others in your safety improvement work, and prove progress.

► Find out more about the **NHS Trigger Tool Portal** and how to register at: http://www.institute.nhs.uk/triggertoolportal
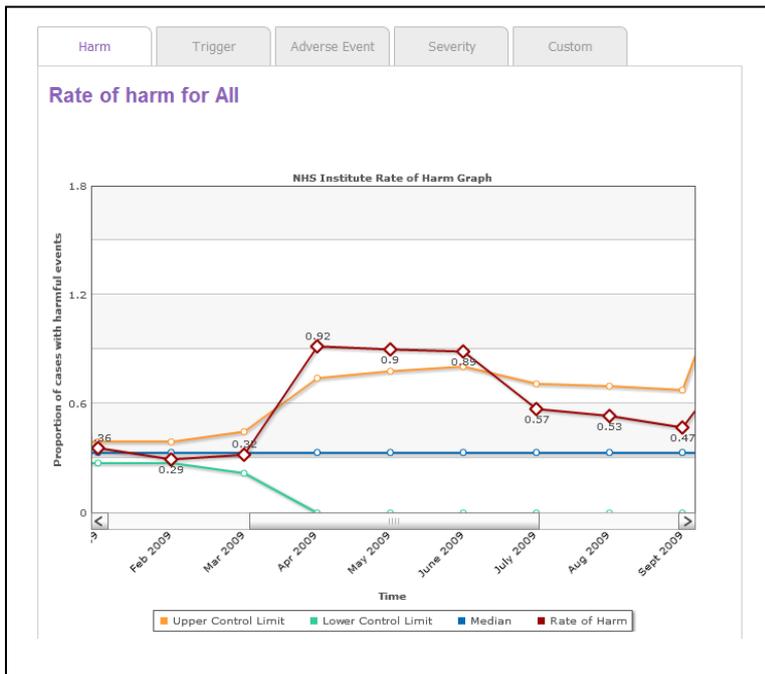
The Trigger Tool Portal will automatically generate charts like these – helping you understand, illustrate and communicate your data.
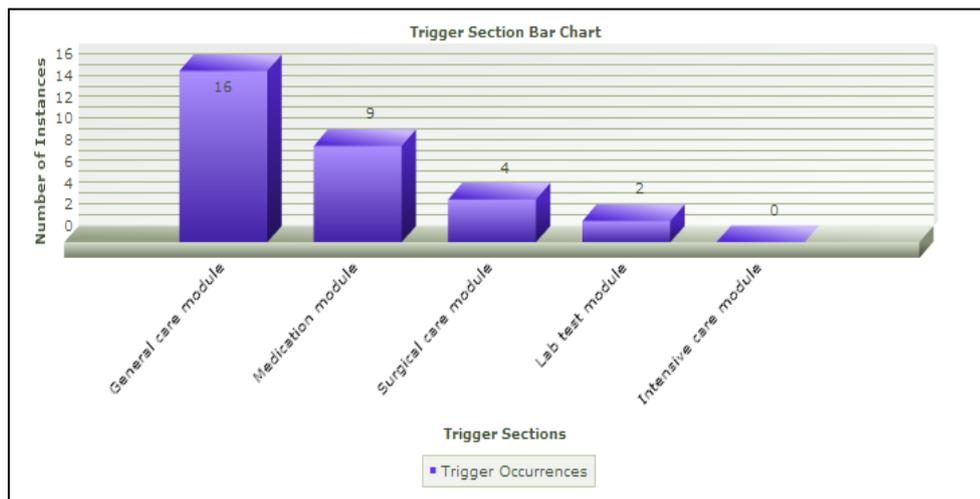
4. Trigger definitions

This section lists all the triggers used in the five components of the PTT, giving a brief explanation of why each may indicate an adverse incident and what to look out for during your reviews.

General care component

PG1 Early warning score
If an early warning scoring risk or standard baseline observation assessment system is in use, then the lack of a score or incomplete observations, or a score or observation requiring a response, may be a precursor to an adverse event. Note: if you do not use an early warning score, then consider adapting one from elsewhere.

PG2 Tissue damage or pressure ulcer
Tissue damage or pressure ulcer may be difficult to define. All children who are admitted to hospital and who have difficulty in turning will need to be assessed for pressure ulcers on admission and throughout their stay. Look for assessments and, in particular, look in nursing notes for comments on reddening of the skin and early development of tissue damage. Also look for tissue damage as a result of IV therapy.

PG3 Readmission within 30 days
An adverse event may not manifest itself until after the patient has been discharged from the hospital, especially if the length of stay is minimal. As the chart is reviewed, look to see if this admission was within 30 days of a previous hospitalisation. Or, did the current admission result in another future hospitalisation? Examples of adverse events may include surgical site infection, recurrent infections, relapses and ongoing seizures. This is easier to detect if all the patient's records are pulled along with the case note currently being reviewed.

PG4 Unplanned admission
Any unscheduled admission for a known or previously-diagnosed condition could be an indication of an adverse event. The fact that it was unscheduled may be as a result of sub-optimum treatment which would be considered as an adverse event. Consider the reason for the admission and whether it was related to an adverse event or not.

PG5 Abnormal cranial imaging
Any abnormal cranial imaging (including, but not limited to, cranial imaging with evidence of significant ischemia or grade 3-4 hemorrhage) may be the result of fluctuations in blood pressure, cardio-respiratory arrest, or electrolyte imbalances. The adverse event will be intra-ventricular hemorrhage. Congenital anomalies should not be considered as adverse events.

PG6 Respiratory or cardiac arrest / crash calls

All respiratory or cardiac arrests need to be carefully reviewed as they may represent the end event of a flawed care process. Not all crash calls are adverse events. However, cardiac or pulmonary arrest occurring intra-operatively, or in the post-anaesthesia care unit, should always be considered an adverse event. If these occur in the first 24 hours post-operatively, they are also very likely to be an adverse event. A sudden cardiac arrhythmia, with a resulting crash call, may well be associated with no adverse event. But failing to rescue a patient, due to lack of recognition of physiological change in signs and symptoms, would definitely be an adverse event.

PG7 Diagnostic imaging for embolus / thrombus +/- confirmation

Development of a DVT or pulmonary embolism (PE) during a hospital stay should be considered as an adverse event. Even if all appropriate preventive measures appear to have been taken, from a patient's perspective this is a harmful event. If the hospitalisation occurs due to a DVT or emboli, look for drug-related or other cause (at previous admission or outside of the hospital).

PG8 Complication of procedure or treatment

Evaluate the reason for the procedure. The procedure itself may be required due to an adverse event. Look for complications from any procedures. Procedure notes do not always note the complications, especially if the complication occurs hours or days after the procedure note has been documented.

PG9 Transfer to higher level of care (including specialist unit/ICU/HDU)

Transfers include those that occur within hospital, to another hospital, or to your hospital from another. Transfer to an intensive care unit or high dependency unit, or step up to 'specialising' on the same ward, is a trigger that indicates an adverse event may have occurred. Admissions to intensive care or HDU, or the decision to give specific intensive nursing input on the same ward, may have occurred when a patient's clinical condition deteriorated, perhaps secondary to an adverse event.

When reviewing this trigger, look for the reasons for the transfer and the change in condition. For example, in the case of admission to intensive care following respiratory arrest and intubation, if the respiratory arrest was a natural progression of an exacerbation of chronic disease, it would not be an adverse event. But if it was caused by a post-operative event (eg a pulmonary embolus, or over-sedation) it would be an adverse event.

PG10 Hypoxia O$_2$ sat <85%

Hypoxia that is not in keeping with the condition of the child (eg in congenital heart disease or chronic lung disease) could be an indication of an adverse event such as a cardiac or respiratory arrest.

PG11 Cancelled elective procedure / delayed discharge

Cancellation of an elective procedure might indicate that the patient has experienced an adverse event that compromised their procedure. Alternatively, the patient may experience and adverse event as a result of waiting longer than planned for the procedure.

Delayed discharge for non-clinical reasons can result in an adverse event. This includes discharges to home or to another clinical area (eg a delay of six hours from the time of being classified as clinically fit for discharge home, due to waiting for medications to be released from pharmacy). Reviewers should agree what is reasonable for their organisation.

Surgical care component

PS1 Return to theatre

A return to surgery is a trigger and means you should check whether an adverse event occurred during the previous surgery.

An example of an adverse event is a patient who had internal bleeding following the first surgery and required a second surgery to stop the bleeding. Where patients have a second surgery that is exploratory, but does not reveal anything (looking for bleeding, or a suspected retained surgical instrument) this would still be considered an adverse event.

Sometimes a return to theatre after a previous surgical procedure is planned and is therefore not an adverse event. For example, a procedure that must be completed in stages, or a procedure that is completely unrelated to the first procedure, and the result of another diagnosis - such as pacemaker insertion after a bowel resection. It is important to distinguish whether the additional procedure was planned.

PS2 Change in planned procedure

An unexpected change in surgical procedure can be the result of unexpected findings after the procedure has started; a change in clinical condition during the procedure; or an adverse event occurring during the procedure. When the procedure on the post-operative note is different from the procedure planned in the pre-operative note, or documented in the surgical consent, a reviewer should look for details as to why the change occurred.

An unexpected change in procedure, due to equipment failure or missing equipment, is an adverse event if the patient experienced additional pain, time in the hospital or other harm as a result of the different procedure.

PS3 Surgical site infection or hospital acquired urinary tract infection

Surgical site infections are the second most common type of adverse events in adult hospitalised patients, increasing the length of stay and morbidity. (Few studies are available on children.) Look for any nosocomial infections, surgical site infections, or urinary tract infections. Any infection occurring in hospital is an adverse event. The infection may occur after discharge, so look at visits to the emergency department, community nursing, or outpatient visits.

PS4 Removal / injury/ repair of organ
Review theatre notes and post-operative notes for evidence that the procedure included repair, injury or removal of any organ. Except in cases of trauma, where organ injury or a suspicion of organ injury is the reason for surgery, this may indicate an operative event damaging the organ.

Intensive care component

IP1   Readmission to Intensive Care or High Dependency Care
Any readmission to the ICU indicates a high probability of an adverse event occurring on the ward or outside the hospital. Look for a relationship with an adverse event. Examples might be pulmonary oedema, secondary to excess fluid administration, or an aspiration.

Medication component

PM1 Vitamin K (except for routine dose in neonates)
If vitamin K was administered as a response to a prolonged INR, review the chart for evidence of bleeding. The laboratory reports should indicate a lowered haematocrit or presence of faecal occult blood (blood in stools). Check the progress notes for evidence of excessive bruising, gastrointestinal (GI) bleed, hemorrhagic stroke, large haematomas, or other bleeding episodes.

PM2 Naloxone
Naloxone is a powerful opiate antagonist. Determine why the drug was used. If it has been used because of opiate overdose or overuse, an adverse event has occurred.

PM3 Flumazenil (Romazicon)
Flumazenil reverses benzodiazepine drugs. Determine why the drug was used. If hypotension or marked, prolonged sedation occurred following benzodiazepine administration, an adverse event has occurred.

PM4 Glucagon or glucose ≥ 10%
The administration of glucagon or glucose ≥ 10% (oral or intravenous), may indicate that the patient has received too much or too little insulin or oral hypoglycemic. They may also have experienced symptoms as a result of this. Both the symptoms and the administration of additional medication are adverse events.

PM5 Chlorphenamine or antihistamine
Although frequently used for allergic reactions to drugs, these drugs can also be prescribed as a sleep aid, a pre-op/pre-procedure medication, or for seasonal allergies. If the drug has been administered, review the chart to determine if it was ordered for symptoms of an allergic reaction to a drug administered, either during the hospitalisation or before admission.

PM6 Anti-emetics

All administration of anti-emetics should be recorded as a trigger and professional judgment needs to be exercised to determine if an adverse event has occurred. Nausea and vomiting can be the result of drug toxicity or overdose, particularly in patients with impaired renal function. Some drugs, such as theophylline, frequently cause nausea and vomiting when levels are out of the therapeutic range. Anti-emetics are also commonly administered to patients post-operatively, or those receiving chemotherapy or PCA. Where these have not been administered in advance of nausea and vomiting, you may wish to consider this as an adverse event. In some instances, clinicians judge that potential side effects from prophylactic use of anti-emetics may outweigh the potential benefits and may not consider any resulting nausea or vomiting in these circumstances to be an adverse event.

PM7 IV Bolus ≥ 10ml/kg colloid or crystalloid given

Administration of the colloid or crystalloid is an indication of possible collapse/shock and is an indication of a possible adverse event. It may be detected separately under PG6.

PM8 Abrupt medication stop

While some medication courses, such as antibiotics, are for a limited duration, the cessation of several medications at once, or cessation of a long-term medication (eg an antihypertensive) is a trigger requiring further investigation. It may indicate an adverse drug reaction, drug interaction, or sudden change in the patient's condition.

Lab test component (Use the local laboratory upper limit for children)

Haematology

PL15 Thrombocytopenia (platelets <100)

Abnormal coagulation or platelet counts (due to sepsis or ITP) that requires treatment with clotting products or platelet transfusions, may not be an adverse event as it is part of a pathological process. But if it is left untreated and the child suffers a bleed as a consequence, you should record an adverse event.

PL1 High INR >5 or aPTT >100

Look for evidence of bleeding to determine if an adverse event has occurred. An elevated INR in itself is not an adverse event.

PL2 Transfusion

Procedures can require intra-operative transfusion of blood products for replacement of estimated blood lost, but this has become less common with 'bloodless surgery'. Any transfusion of packed red blood cells (RBCs), or whole blood, should be investigated for causation, including excessive bleeding, unintentional trauma of a blood vessel, etc. Transfusion of many units within the first 24 hours of surgery, including intra-operatively and post-operatively, will commonly be related to a peri-operative adverse event. Exceptions would be where excessive blood loss occurred pre-operatively. Fresh frozen plasma and platelets can reflect system problems that include failure to plan changes in anticoagulants prior to surgery, and the need to reverse quickly in order to carry out the surgery.

PL3   Abrupt drop in Hb or Hct (>25%)

Any drop of 25% or greater in Hb grams or Hematocrit (Hct) requires an explanation. All bleeding-associated events might commonly be identified by this trigger. Smaller 'drops' can obviously also be associated with adverse events, but the question as to whether harm has occurred needs to be answered subjectively. Anticoagulant use is frequently found to be associated with this particular trigger.

Biochemistry

PL4   Rising urea or creatinine (>2x baseline)

Review laboratory records for rising levels of either BUN or serum creatinine. If a change of two times greater than baseline levels is found, review medication administration records for medications known to cause renal toxicity. Review medical progress notes and the history, seeking physical and other causes of renal failure, such as pre-existing renal disease or diabetes that could have put the patient at greater risk of renal failure. If multiple factors are identified, subjective judgment may be needed to determine whether renal failure was an adverse event.

PL5/PL6 Electrolyte abnormalities (Na+ <130 or >150, K+ <3.0 or >6.0)

Electrolyte imbalance can either precede or be associated with adverse events. Not all patients with electrolyte abnormalities will be symptomatic. Review the case notes for evidence of symptoms.

PL7   Hypoglycaemia (<3mmol/l)

Not all patients will be symptomatic; if the patient is not symptomatic there is probably no adverse event. Review for associated use of insulin, or oral hypoglycemics with evidence of symptoms and commonly followed by administration of glucose (oral or intravenous). Signs and descriptions of symptoms such as lethargy, shakiness, etc, will be described by nurses in the notes.

PL8   Hyperglycaemia (>12mmol/l)

Glucose greater than 12mmol/l requiring treatment in the non-diabetic could be the result of IV fluid/TPN error, nosocomial infection, steroid overdose, osmotic dieresis or sepsis - all of which are adverse events.

PL9 Drug level out of range

Where a drug level has been taken and the result is a subtherapeutic level or a toxic level, this may imply harm to the patient. For example, a subtherapeutic level of an anticonvulsant may result in the patient having seizures and may be due to poor management of, or compliance with, treatment. A toxic level of an antibiotic, such as gentamicin, may result in renal failure or deafness. A toxic level of paracetamol may result in acute liver damage and death.

These may be due to a drug interaction that alters the metabolism of a drug; the prescription of an incorrect dose; or lack of recognition of impending organ failure which would have required a lower dosage of drug to be prescribed. If a patient has recently started a drug

which takes a while to achieve steady state, then subtherapeutic levels may be an expected part of monitoring, and would not necessarily imply harm. This should be at the discretion of the reviewer.

Microbiology

PL10 MRSA bacteraemia
Review for any positive MRSA bacteraemia.

PL11 C. difficile
If a patient is on, or has been on, multiple antibiotics, this adverse event can be observed. A positive C. difficile result is an adverse event.

PL12 Vanc resistant enterococcus (VRE)
Review for any nosocomial infections, central line infection, surgical site infection, or urinary tract infections. Any infection occurring in hospital is an adverse event. Exceptions might be the urinary tract infection from outside the hospital, or infection being treated but not contracted in hospital.

PL13 Nosocomial pneumonia
Look for x-ray or lab reports that suggest pneumonia. Any pneumonia diagnosed in the hospital needs to be looked at carefully. Any infection starting in hospital needs to be considered nosocomial and an adverse event, unless clearly contracted from outside the hospital. Re-admissions could also represent pneumonia from a previous hospitalisation, particularly if antibiotic resistant.

PL14 Positive blood culture
A positive blood culture at any time during hospitalisation must be investigated as an indicator of an adverse event. A surgical site infection, sepsis, infected lines, or any other hospital acquired infection is an adverse event.

PO1 Other event
Any other event that has not been detected by the trigger tool but is an adverse event.

5. Further help and support

Training

We recommend that each organisation has at least one person who has received formal training in trigger tool methodology and case note review. Together with the resources provided, including this guide, this person can then train others within the organisation.

At the time of writing, the Safer Care programme offers a limited number of one day 'quick start' training events as well as more comprehensive patient safety improvement programmes. We are also investing in Webex tutorials and hope to offer these as an alternative or top-up option in the future.

www.institute.nhs.uk/triggertool

Measurement for improvement

Measurement for improvement uses Statistical Process Control (SPC) to determine whether or not a trend is actually demonstrating a sustained change (improvement or deterioration) or just natural variation.

More information on SPC and variation can be found via this link:
http://www.institute.nhs.uk/quality_and_service_improvement_tools/quality_and_service_improvement_tools/statistical_process_control.html

Methods for implementing service improvement

The methodology for implementing and sustainable improvement is based on the model for improvement. Also known as PDSA cycles, this model describes the cycle of Plan, Do, Study and Act. Further information can be found via this link:

http://www.institute.nhs.uk/quality_and_service_improvement_tools/quality_and_service_improvement_tools/plan_do_study_act.html

Additional Resources

Rozich JD, Haraden CR, Resar RK. **Adverse drug event trigger tool: A practical methodology for measuring medication related harm**. *Quality and Safety in Health Care*. 2003; 12:194-200.

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Sharek PJ, Horbar JG, Mason W, et al. **Adverse Events in the Neonatal Intensive Care Unit: Development, Testing, and Findings of a NICU-focused Trigger Tool to Identify Harm in North American NICUs**. Pediatrics 2006;118:1332-1340.
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Matlow A. et al. **The Development of the Canadian Paediatric Trigger Tool for Identifying Potential Adverse Events** Healthcarequarterly 2005; 8: 90-93

Matlow A and Cronin G**, Reducing Harm in Paediatric Care: Learning about Adverse Events using a Validated Canadian Paediatric Trigger Tool** For the CAPHC Paediatric Trigger Tool Research Group Montreal, October 14, 2007
http://www.caphc.org/documents_annual/2007/conference_ppts/14_10_2007/patient_safety/matlow_cronin.pdf