Pediatric Trauma Resuscitation Checklist

TOOL KIT

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Trauma is the leading cause of death and acquired disability in children and adolescents. More than 9 million children are injured annually, resulting in more than 200,000 hospitalizations and 17,000 deaths.[1,2] The initial care of these injured children can be challenging, requiring a systematic approach to ensure that high-quality care is quickly provided. The Advanced Trauma Life Support (ATLS) protocol has been developed to facilitate and structure this care.

Despite evidence supporting its effectiveness, deviations from ATLS protocol can occur even among highly experienced teams[8] leaving patients vulnerable to missed injury and poorer outcomes. Errors in management have been reported to contribute to as many as one-third of trauma-related deaths. Up to half of these deaths can be related to the initial resuscitation phase and be classified as preventable if standard management had been used.[3]

Implementing a checklist is a low-cost option that has been shown to reduce errors in several medical domains.[5, 6] Our research, funded by an EMSC Targeted Issues grant (Grant No. H34MC19351), has shown that the use of a checklist during pediatric trauma resuscitation is a reliable method for increasing adherence with the ATLS protocol.[7] This tool kit is designed to help hospitals create a trauma resuscitation checklist, addressing the unique needs of each institution while benefiting from previous work conducted by Children's National.

Summary of Background and Significance

- Errors in the initial resuscitation can impact the short- and long-term outcomes of injured children.

- Adherence to ATLS protocol is associated with improved patient outcomes, while errors in ATLS performance can be linked to poor outcomes, even when experienced teams are conducting the resuscitation.

For questions regarding this checklist, the tool kit, or research at Children's National, please contact Jennifer Fritzeen, MSN, RN, PCNS-BC, at jfritzee@childrensnational.org or Randall Burd, MD, PhD, at rburd@childrensnational.org.

*The Trauma Nursing Core (TNCC), the Emergency Nursing Pediatric Course (ENPC), and Pediatric Advance Life Support (PALS) are all additional trainings for trauma team members. In addition, simulator trainings and other supplemental trauma courses have been shown to improve task performance during pediatric trauma resuscitation.

The Benefits of Checklists

Checklists are cognitive aids that can assist users in achieving more accurate task completion. By focusing attention on critical tasks, the checklist provides a conceptual framework for the user to perform a set of tasks without increasing an individual's cognitive workload.[5]

Research conducted by Children's National has shown that a trauma checklist is associated with improved ATLS performance in both simulated and clinical trauma resuscitations. The use of a checklist has demonstrated the following benefits:

- improved frequency and timing of ATLS primary and secondary task completion, including critical evaluation tasks such as assessment of circulatory and neurological status;

- increased number of ATLS tasks completed in each resuscitation;

- decreased time to obtaining vital sign measurements; and

- decreased time to intubation by an average of six minutes once decision to intubate is made.

Despite positive results of the checklist, healthcare professionals often resist their use. Reasons for resistance include:

- beliefs that personal performance is already adequate and cannot be improved by a checklist;

- beliefs that the checklist discounts the provider's decision-making skills and discredits the education required to perform a given task; and

- beliefs that the checklist interferes with or slows personal or team performance.

Addressing these common beliefs early in the checklist development and implementation stages will help reduce team resistance. Examples of ways that these beliefs can be addressed include:

- emphasizing that all teams (even highly-experienced ones) make errors in the application of the ATLS protocol, with the frequency of errors often unrelated to individual knowledge or skill level;

- presenting data about the observed benefits of checklists in experienced teams, showing that all teams may benefit from checklist use; and

- highlighting that implementation of a checklist can speed the performance of tasks, and usually does not impact overall resuscitation length.

Children's National Pediatric Trauma Resuscitation Checklist

The Pediatric Trauma Resuscitation Checklist is divided into four sections: Pre-arrival Plan, Primary Survey, Secondary Survey, and Departure Plan. Note that not every step of the ATLS protocol is included in the checklist. ATLS tasks that were rarely or never forgotten by providers at Children's National were omitted (e.g., breath sounds).

Tasks within white boxes are to be performed during each resuscitation. Grey boxes contain additional tasks that should be considered for higher acuity patients, including those triaged to higher level activations.

Please click on each section for more information regarding specific tasks. Please close each information box before opening subsequent boxes.

Figure 1: Checklist used during post-implementation pediatric trauma resuscitations at Children's National Medical Center

Trauma Resuscitation Checklist

Items in the shaded boxes pertain to high-acuity patients — may be marked as N/A

Pre-arrival Plan
- ☐ Introductions & confirm team roles
- ☐ Brief team on incoming patient
- ☐ Estimate weight: _____ kg
- ☐ Oxygen connected to NRB
- ☐ Suction hooked up
- ☐ Trauma shears available
- ☐ Bair hugger on bed
- ☐ RSI meds removed from Pyxis

For Attending activations: ☐ N/A
- ☐ Prepare intubation equipment
- ☐ Order Code Orange blood
- ☐ CPR board in room or on bed

PUT PATIENT LABEL HERE

Primary Survey

A
- ☐ Confirm airway is protected
- ☐ Confirm C-spine is immobilized properly (manually or with collar)

If intubating: ☐ N/A
- ☐ GCS assessed before giving RSI medications
- ☐ Report ET tube size, depth, and color change
- ☐ Confirm $ETCO_2$ reading on monitor
- ☐ Order chest x-ray for placement confirmation

B
- ☐ Confirm O_2 placement

C
- ☐ Check distal pulses (then central, if needed)
- ☐ Confirm IV/IO access has been established
- ☐ Give fluid bolus (NS/LR) or blood ☐ N/A

D
- ☐ State GCS (eyes, verbal, motor)
- ☐ State pupil size and response

E
- ☐ Completely remove patient's clothing
- ☐ Cover patient with warm blanket
- ☐ Take temperature

VITALS
State and evaluate whether logical and WNL for age:
- ☐ Heart rate (with good waveform)
- ☐ Respiratory rate
- ☐ Oxygen saturation
- ☐ Blood pressure

Secondary Survey

Evaluate and state findings:
- ☐ Head
- ☐ Ears
- ☐ Ocular/periorbital integrity
- ☐ Facial bones
- ☐ Nose
- ☐ Mouth
- ☐ Neck
- ☐ Chest
- ☐ Abdomen
- ☐ Pelvis
- ☐ Lower extremities
- ☐ Upper extremities
- ☐ Log roll and back exam
- ☐ C-spine exam

Departure Plan
- ☐ Summarize 1° and 2° survey findings
- ☐ Brief team on plan of care and patient destination

Prepare patient for travel: ☐ N/A
- ☐ Equipment
- ☐ Medications
- ☐ Identify who will travel with patient
- ☐ Notify destination (OR, PICU, etc.)

DO NOT ADD TO MEDICAL RECORD

Click here to download the "Trauma Resuscitation Checklist" to your desktop. Two versions are available: checklist as a pdf file and checklist as a modifiable Publisher (pub) file.

How to Modify the Pediatric Trauma Resuscitation Checklist for Individual Use

A modifiable version of Children's National Pediatric Trauma Resuscitation Checklist can be downloaded to your desktop by clicking on the "Download" button on page 5. This checklist closely follows the ATLS protocol recommendations for the initial management of injured children. Some items reflect hospital-specific protocols at Children's National, necessitating checklist alteration before the implementation at other institutions. Checklist items that may need to be modified are highlighted.

Please refer to the "Resource," "References," and "Glossary" sections for further definitions of specific checklist tasks and additional checklist resources.

Checklist Formatting

The checklist has been designed for use in a paper-and-pen format. Acceptable alternatives to the paper-and-pen format include methods that allow for physical checking of boxes by a single administrator such as:

1. a handheld, erasable whiteboard or

2. an electronic version on a tablet or computer-on-wheels.

The chosen format should be practical and match the capabilities of the institution.

Things to Consider

1. Determine which checklist items require documentation. Consider adding tasks or assessments that tend to be forgotten during trauma resuscitation.

2. Review items for modification with other trauma team members in your facility. It is important that a multidisciplinary approach is used.

3. Determine if the checklist will be part of the medical record so that form standards are met for the checklist at your institution.

4. Determine which clinical role will be the administrator of the checklist. Providers fulfilling this role need to be included in all decision-making as the checklist needs augment work flow.

5. If using the paper-pen format, consider printing the checklist on colored paper to make it easily identifiable.

> **Our Experience:**
>
> Multidisciplinary focus groups assisted with checklist item inclusion/exclusion. Performance improvement data was utilized to show forgotten assessments or tasks.
>
> For example: trauma patients requiring intubation were receiving a paralytic agent prior to GCS assessment, leading Children's National to modify its trauma checklist to include GCS assessment prior to RSI medications.
>
> The checklist at Children's National is not part of the medical record. It is kept in the trauma documentation packet to ensure that each trauma activation has a checklist readily available. The checklist is printed on bright gold paper for easy identification.

How to Use the Pediatric Trauma Resuscitation Checklist

The following materials are needed to implement a paper-and-pen format checklist:

- a one-page paper checklist available for every resuscitation;
- a dedicated writing surface (e.g., clipboard, working stand);
- a location to deposit completed checklists (unless it is part of the medical record); and
- a dedicated team (or specified individual) in charge of printing and providing the resuscitation checklists.

Checklist Administrator

Identify one clinical role within the trauma team for administering the checklist. This individual should:

- be present at all trauma team activations;

- be part of the leadership team in the room and maintain awareness of the overall activity in the room; and

- have few hands-on care responsibilities during the trauma resuscitation.

It is a good idea to identify a secondary "back-up" checklist administrator. Situations may arise in which the primary checklist administrator is late to the resuscitation and the secondary role can assume responsibility.

Administration Technique

Checklist administration relies on two principles:

1. verbalization of checklist items by both the checklist administrator and hands-on trauma team members and

2. physically checking boxes ONLY when the task has been completed.

> **Our Experience:**
>
> The surgical coordinator (senior surgeon) in the room has been designated the primary checklist administrator. This role does not have a primary bedside responsibility and can remain at a distance to evaluate the dynamics of the room and the activities occurring.
>
> Because the surgeon is not always located in the emergency department, the pediatric emergency medicine attending or fellow at Children's National serves as the back-up checklist administrator. The pediatric emergency medicine attending or fellow can initiate the checklist and then turn the checklist over to the surgical coordinator upon arrival.

> For more information about the Pediatric Trauma Resuscitation Checklist, click on the video "*How to Use the Trauma Resuscitation Checklist.*" This video primarily focuses on the roles and responsibilities of the checklist administrator.

The checklist administrator may use one of two administration methods for both the primary and secondary survey sections of the checklist. Research by Children's National staff has shown that each method is effective in preventing deviations from ATLS protocol. A brief description of each administration method is provided below.

The Do List Method[5]	The Challenge-Response Method[5]
• The checklist is used as a "step-by-step cook-book" to lead the team throughout the trauma activation. • The administrator calls out each step and the step is then done by the appropriate member of the team. • LIMITATION: With this approach, a skipped item can easily pass unnoticed once the sequence of tasks is interrupted.	• The checklist is used as a backup procedure to ensure that all items have been completed. All parts of the trauma activation are done according to memory. • The checklist administrators use the checklist to verify that all items listed on the checklist have been accomplished. • The administrator calls out every item and a bedside trauma team member responds that the item has been completed. • LIMITATION: This method may be perceived as slow and repetitive.

Barriers to Using the Pediatric Trauma Resuscitation Checklist

The checklist administrator must check the boxes in real time as tasks are completed. The physical checkmark removes the mental process of remembering which tasks have been completed and which remain to be done.[11] Two problems are often associated with the use of medical checklists. A brief description of each is provided below.
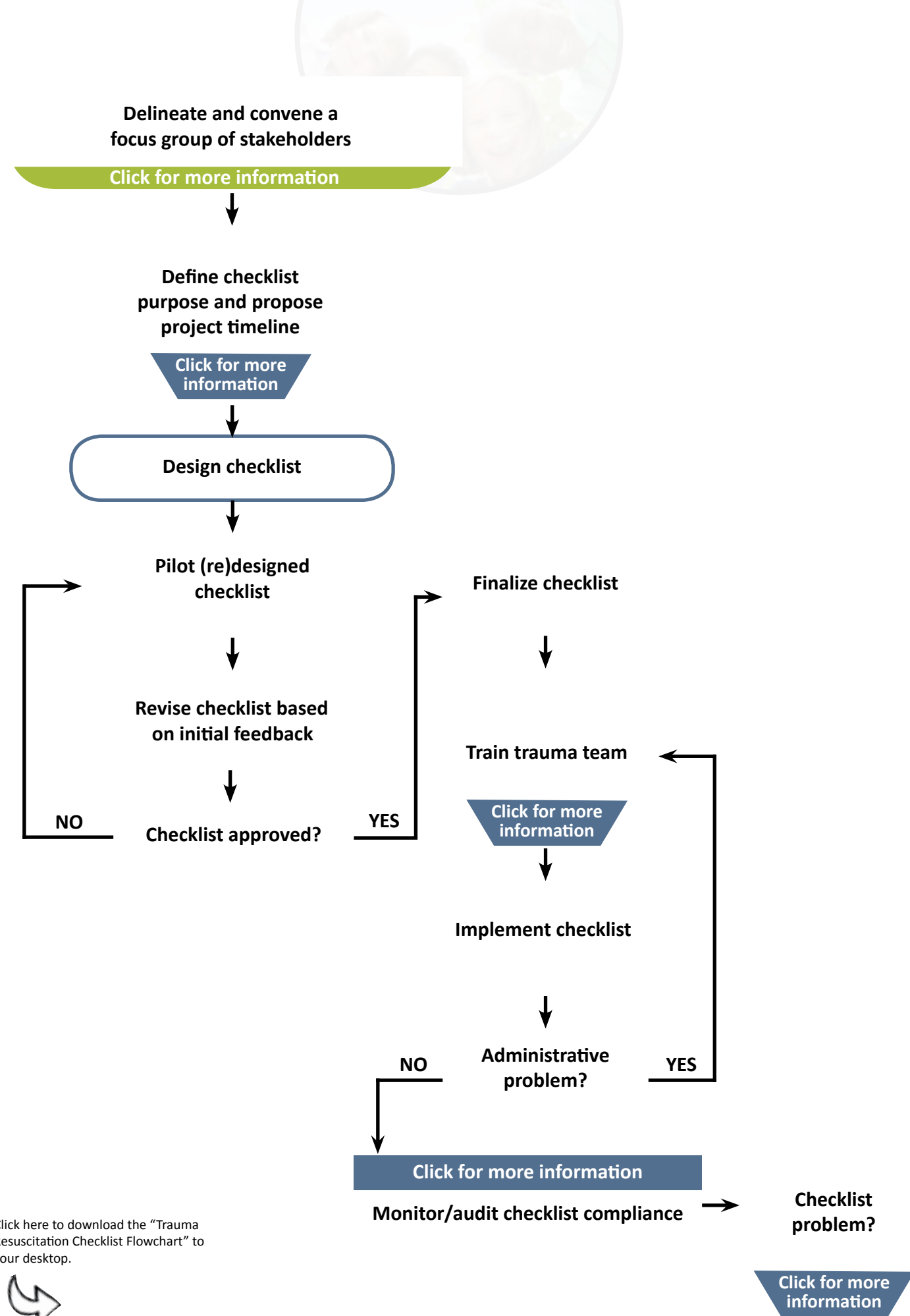
Potential Barriers	Solutions
Just Checking Boxes: A common problem seen with medical checklists is the problem of checking all boxes, regardless of task completion, to show "compliance" with checklist use. Checklist administrators should not check boxes before tasks are completed, without verification from the bedside team, or all at once at the end of the resuscitation.	Teach checklist administrators to check boxes only after a task has been completed. If a task is not completed, the box should be left blank.
Prioritizing Strict Checklist Adherence Over Patient Care: As a static paper-and-pen tool, the checklist should never supersede the goal of quality patient care. The checklist has several limitations that can become detrimental to patient care if followed too strictly.	Teach team members that the checklist is not a replacement for the ATLS protocol, but an aid for ensuring completion of all ATLS tasks in the correct order. Examples of the checklists limitations should be explicitly mentioned during training and throughout implementation. Individuals who become too strict with their administration method and lose focus on the resuscitation should be given additional training about appropriate checklist use.

How to Implement the Checklist

Adequate education on checklist use is important for all members of the trauma resuscitation team as many medical providers are unfamiliar with the best practices for checklist use. Keep in mind that successful checklist implementation involves trial-and-error, constant feedback from end-users, and continued monitoring after the initial implementation period.

Page 10 includes a flowchart for a generalized implementation process that has been successful at Children's National. Click on each "For more information" box for additional instructions about individual steps. Please close each box before opening subsequent boxes.

Left column (flowchart)

Delineate and convene a focus group of stakeholders

Click for more information

↓

Define checklist purpose and propose project timeline

Click for more information

↓

Design checklist

↓

Pilot (re)designed checklist

↓

Revise checklist based on initial feedback

↓

Checklist approved?

NO → (loops back to Pilot (re)designed checklist)

YES → **Finalize checklist**

↓

Train trauma team

Click for more information

↓

Implement checklist

↓

Administrative problem?

YES → (loops back to Train trauma team)

NO ↓

Click for more information

Monitor/audit checklist compliance → **Checklist problem?**

Click for more information

Click here to download the "Trauma Resuscitation Checklist Flowchart" to your desktop.

Right column

CHECKLIST FAQs

1. If a designated checklist administrator isn't present, who should do the checklist?

In addition to having a designated checklist administrator, make sure a "back-up administrator" is appointed in the case that the principal administrator is not yet present or for some reason unable to use the checklist (e.g., providing direct patient care at the bedside). At Children's National the emergency medicine attending or fellow acts as the back-up checklist administrator.

2. If working in a pediatric trauma center and an adult patient comes in, can the checklist still be used?

Although the checklist has been designed for the pediatric patient, the checklist closely follows the standard ATLS protocol for identifying and treating life-threatening injuries. Make sure to modify the checklist tasks according to your facility's protocols or available trauma supplies.

3. What are the trauma team roles that Children's National has at each of its resuscitations?

The trauma team at Children's National consists of:

- nurse leaders (recording nurse);
- bedside nurses;
- physician leaders (surgery attendings or fellows, emergency medicine attendings or fellows);
- bedside providers (surgery residents or trauma nurse practitioners);
- anesthesiologists (attending or fellow); and
- respiratory therapists.

4. If the checklist administrator arrives late to the trauma, should he/she still start the checklist?

The checklist has proven to improve ATLS performance in both primary and secondary task completion even if the administrator is late, so it can (and should) be initiated as soon as possible during the resuscitation.

5. Should the pre-arrival section be completed if the patient arrives before the trauma team is assembled?

It has been shown that the pre-arrival section tasks contribute greatly to the performance of the team and the timing of certain checklist tasks. If there is no pre-arrival notification, it is recommended that the team skip this section and move on to the primary survey section.

6. **How do you ensure that the checklist administrator was correctly using the checklist?**

Just checking boxes on the checklist is not sufficient for determining "correct checklist use." The video in Section 6 outlines the two methods for correct checklist use. It is very important to verbalize items as completed and checking the boxes off in real time. Staff at Children's National use video review as one approach for evaluating checklist use. Through video review, it was determined the concordance between task completion and checked boxes. The trauma administration and leadership team give direct feedback to team members if they see a high frequency of "false checking" (checking a box when a task is not actually completed).

7. **ATLS-certified providers have a lot of experience in trauma. Do they need to use a checklist?**

A checklist is a cognitive aid that assists in accurate task completion by providing a framework that allows the user to focus attention on critical tasks without increasing cognitive workload. It has been shown that even the most experienced trauma teams continue to make errors in completing all ATLS tasks.[12] The use of a checklist has been shown to increase the number of ATLS tasks completed per resuscitation, as well as improve the timing and frequency of ATLS primary and secondary task completion, even when administered by experienced physicians.

8. **Can certain checklist items be skipped for some patients?**

All tasks on the checklist follow the ATLS protocol requirements for the proper evaluation of trauma patients. It has been shown that using a checklist allows trauma teams to successfully complete more ATLS tasks than if a checklist was not used.[8]

Some items within the gray boxes on the enclosed checklist are the only potential checkboxes that should be left unmarked. These items correlate to specific patient cases (e.g., highest level trauma activation and patients who will be leaving the emergency department directly for another destination, such as an operating room, intensive care unit etc.). Each gray section contains an "N/A" checkbox, which should be checked if the patient does not meet these criteria.

9. **Will the checklist distract members of the trauma team and take the focus off the patient?**

The checklist acts as a cognitive aid during trauma resuscitations. By designating a provider who is hands-off and always present, the checklist administrator serves as a team leader who is able to help synthesize and communicate information from many sources. The checklist administrator is therefore able to allow bedside team members to focus more directly on the patient, while at the same time monitoring patient status.

Resources

The trauma research group at Children's National is dedicated to improving the care of injured children through education and research. The multidisciplinary research team is developing new analytical and technological approaches that will benefit the most severely injured children. Citations to helpful publications are linked below.

1. Using video review for assessment and improvement of team performance in a dynamic medical domain

2. Adherence to ATLS primary and secondary surveys during pediatric trauma

3. Factors associated with patient exposure and environmental control during pediatric trauma

Resources on Checklist Design

1. Projectcheck.org: a website designed to provide the public with easy access to other medical checklists as well as a "Checklist for Checklists" to facilitate the design process.

2. AHRG Checklist Review: an overview of design and implementation requirements in designing a checklist.

3. SJTREM: Implementation of Checklists in Health Care; Learning from High-reliability Organizations: a qualitative study exploring the experiences from checklist development and implementation in a group of non-medical, high reliability organizations.

4. IJQHC: Development of Medical Checklists for Improved Quality of Patient Care: a database search of checklist development methodology.

Resources on Checklist Implementation

1. Barriers to staff adoption of a surgical safety checklist: BMJ: QualSaf 2012; 21:191-19:

2. WHO Surgical Safety Checklist: an implementation manual designed by the World Health Organization.

3. OHA Surgical Safety Implementation Checklist Toolkit: a toolkit designed to improve teamwork and communication in the operating room.

References

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[10] Verdaasdonk EG, Stassen LP, Widhiasmara PP, Dankelman J. Requirements for the design and implementation of checklists for surgical processes. *Surg Endosc*. Apr 2009;23(4):715-726.

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Checklist Glossary and Acronyms

Forced-air warming blanket: a convection blanket placed under the patient; used in management of patient temperature.

Code Orange blood: uncrossmatched O negative blood for use in emergency blood transfusions.

Checklist compliance: only checking checkboxes when the task has been fully completed.

Introductions: once the team is assembled, each person should introduce themselves and state their role on the team.

Log roll: the lateral repositioning of the patient that allows for examination of cervical spine tenderness and back, as well as aiding in the removal of the backboard.

NRB: non-rebreather mask allows for higher oxygen concentration delivery when the patient is able to breathe unassisted.

Ocular/periorbital integrity: referring to the secondary survey assessment and evaluation of the entire ocular region (eyelid, eyeball, etc.).

Patient briefing: information from the field regarding the mechanism of injury and condition of the patient; should be conveyed to the team.

Resuscitation flowsheet: the main paper documentation method used throughout the resuscitation by the recording nurse.

RSI meds: rapid sequence intubation medications