



Severe Head Trauma in Children

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Introduction

Mild traumatic brain injury (mTBI) or concussion injury is a complex brain injury that results in nearly 3 million people seeking emergency attention or an office based visit annually in the United States.

Management of mTBI in the adult arena has been evaluated and guidelines are generally standard across the trauma community. Identifying children at risk for clinically important brain injury after a minor head trauma varies among trauma centers and providers alike. There is variability surrounding the clinical decision to observe children with mTBI in the Emergency Department (ED) or to admit for a period of neurologic monitoring given the efforts to reduce the use of computed tomography in the pediatric patient. The variability in the health care providers' training, expertise and experience can lead to inconsistency in diagnosis and management of concussion injuries.

The literature is scarce for strong levels of evidence on how to best manage a mild traumatic head injured child. In the absence of clinically important symptoms of traumatic brain injury, there continues to be disparity in the literature on how to best manage the mTBI patient. Should we obtain a head CT on all children to rule out intracranial pathology? We know this answer to be no. But if no head CT, what is an appropriate time of observation? This question came up time and again at our trauma center and a decision by the Pediatric Trauma Service was to evaluate use evidence based literature and work with our pediatric colleagues across disciplines to develop a management algorithm that we could all support.

Objectives

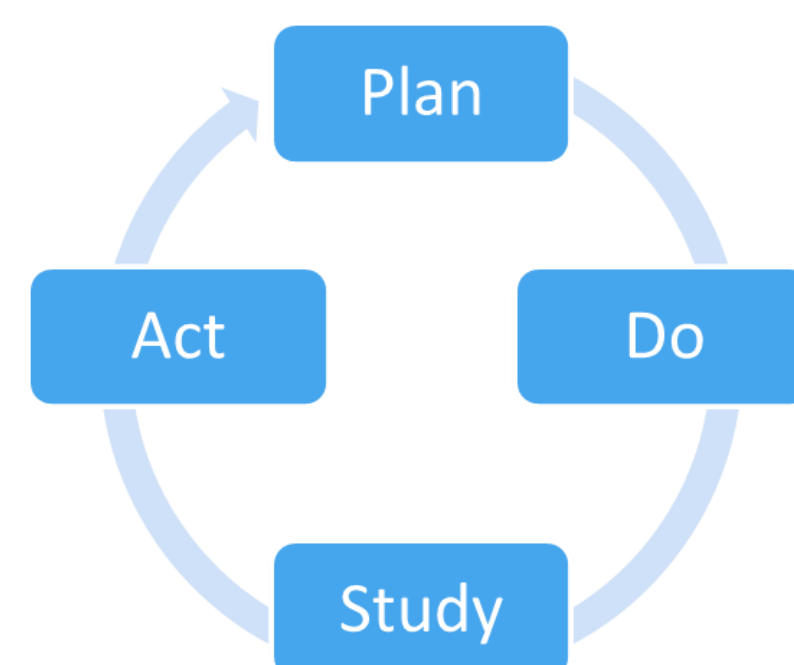
The goals for the Pediatric Head Management Pathway are to:

1. Identify at-risk children clinically important TBI
2. Evaluate the evidence for the mild traumatic head injured child
3. Develop a risk stratification (low, medium, high)
4. Develop imaging protocols (PECARN)
5. Develop initial management algorithm for head injured child
6. Develop an internal standard of care between disciplines
7. Measure the guideline for effectiveness

Methodology

In order to accomplish the goals for the mTBI Collaborative, the SIUH Pediatric Trauma team implemented a PDSA cycles that would:

1. Identify stakeholders
2. Arrange stakeholder meetings
3. Evaluate resources
4. Evaluate data
5. Develop an algorithm
6. Implement and rollout algorithm
7. Evaluate the algorithm /pathway
8. Plan for further program improvements
9. Develop IRB research protocol to validate findings



PDSA Cycle

Step 1: Plan

Identify Stakeholders

A mTBI Collaborative was created, which included:

- Pediatric Neurology
- Neurosurgery
- Neuropsychology
- Pediatric Trauma
- Emergency Medicine
- Pediatric Rehabilitation
- Child Abuse Pediatrician
- Pediatric Trauma Program Staff

Evaluate Resources

There was an extensive literature review and the literature was shared with the 'MTBI Collaborative'. Brainstorming sessions with our stakeholders were established to determine the clinically important signs, symptoms, and presentation of mTBI.

Arrange Stakeholder Meetings

On November 29, 2017, the first mTBI Pediatric Collaborative meeting was held to discuss the literature that had been collected and shared with the group.

Step 3: Study

Evaluate the Program

Since the implementation of the management pathway there has been an **80% reduction in PICU admissions.**

December 2016

mTBI PICU admissions - 5
Pediatric Trauma Activation's/Consults - 31
Pediatric Trauma Admissions - 33

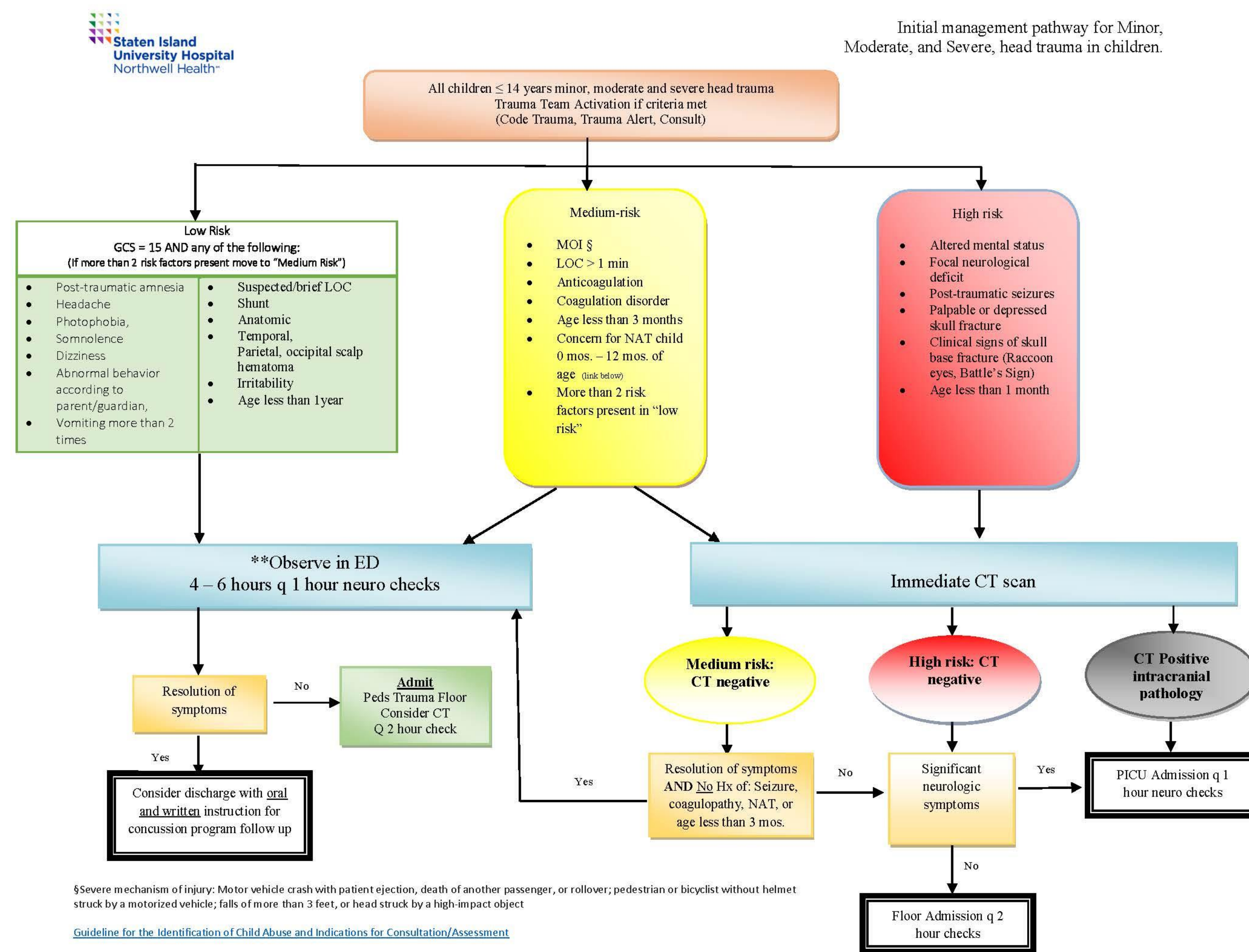
December 2017*

mTBI PICU admissions - 1 (an 80% reduction!)
Pediatric Trauma Activation's/Consults - 28
Pediatric Trauma Admissions – 36

*Preliminary data suggestive of improved utilization of resources.

Step 2: Do

Develop the mTBI Initial Management Pathway



Step 4: Act

Evaluate Data

Evaluation to determine effectiveness of the properly implemented guideline will be forthcoming in an IRB approved study to evaluating pediatric patients treated in the ED for a mTBI. A study design is in development to look at how concussions are managed and treated across disciplines in our ED. Through this mechanism, we will be able to assess all children who have been seen for concussive injury and evaluate the effectiveness of the pathway. We will track the data to observe if any child needed a second ED evaluation. In order to evaluate the process, utilizing the trauma registry, we are able to track the number of Pediatric Trauma Activation's and/or Trauma Consults as well as the admissions to the PICU. The number of activation's should remain relatively constant, but we would anticipate a reduced number of PICU admissions/days.

Summary

A major component of a successful pediatric trauma center is the ability of the interdisciplinary care team to effectively communicate together to reach a common goal. Development of the *Initial Management Guidelines for mild traumatic head injured patients*, has been extremely positive for the relationship between our Emergency Medicine providers and our Pediatric Trauma providers. Through this project, we have been able to decrease the LOS of our Pediatric Head Injured Patients in the ED as well reduce the average number of PICU days and admission denials. The next vital phase of the project includes a research project evaluating the effectiveness of the pathway for appropriateness of care, appropriate Concussion Program referrals, decreased PICU days, and positive patient feedback.

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