

Concussion –mTBI injury Care Map

Go directly to [Care Map Flowchart](#)



Goal

- To standardize and optimize the care of a patient with a mTBI in order to optimize outcome and safely return the patient to play and to school.

When accessing a document, please use the browser return arrow (upper left-hand corner) to return to the Care Map

Care Map Symbols

Links to more information or returns to a previous page.

Start of a Care Map Segment

Decision Point

Stop and Evaluate

Care Map Step
Blue underlined text is a hyperlink

Progression of care – Patient Improving



Source Reference



Education Module



Hospital Policy



Hospital Reference



Provider Information



Download File

Concussion Care Map

Go directly to [Care Map Flowchart](#)

[Concussion in Children and Adolescents](#)

[Concussion Metrics](#)

Suggested Inclusion Criteria

Age ≥ 2

Direct or Indirect injury resulting in neurophysiologic impairment



This care map document does not supersede the clinical judgment of a provider regarding the care **that** is ultimately ordered for a given patient. [Click to see full disclaimer.](#)



Executive Summary: [ETCH grand rounds](#)



[CDC Heads Up. A Safer Brain, Stronger Future](#)



[Patient Education](#)



Concussion Care Map

Go directly to [Care Map Flowchart](#)

[Concussion in children and Adolescents](#)

Concussion Care Map [Metrics](#)

Potential reasons to avoid the concussion care map

GCS<13

NAT

Pt < 2



This care map document does not supersede the clinical judgment of a provider regarding the care that is ultimately ordered for a given patient. [Click to see full disclaimer.](#)



Executive Summary: [ETCH grand rounds](#)



[CDC Heads Up. A Safer Brain, Stronger Future](#)



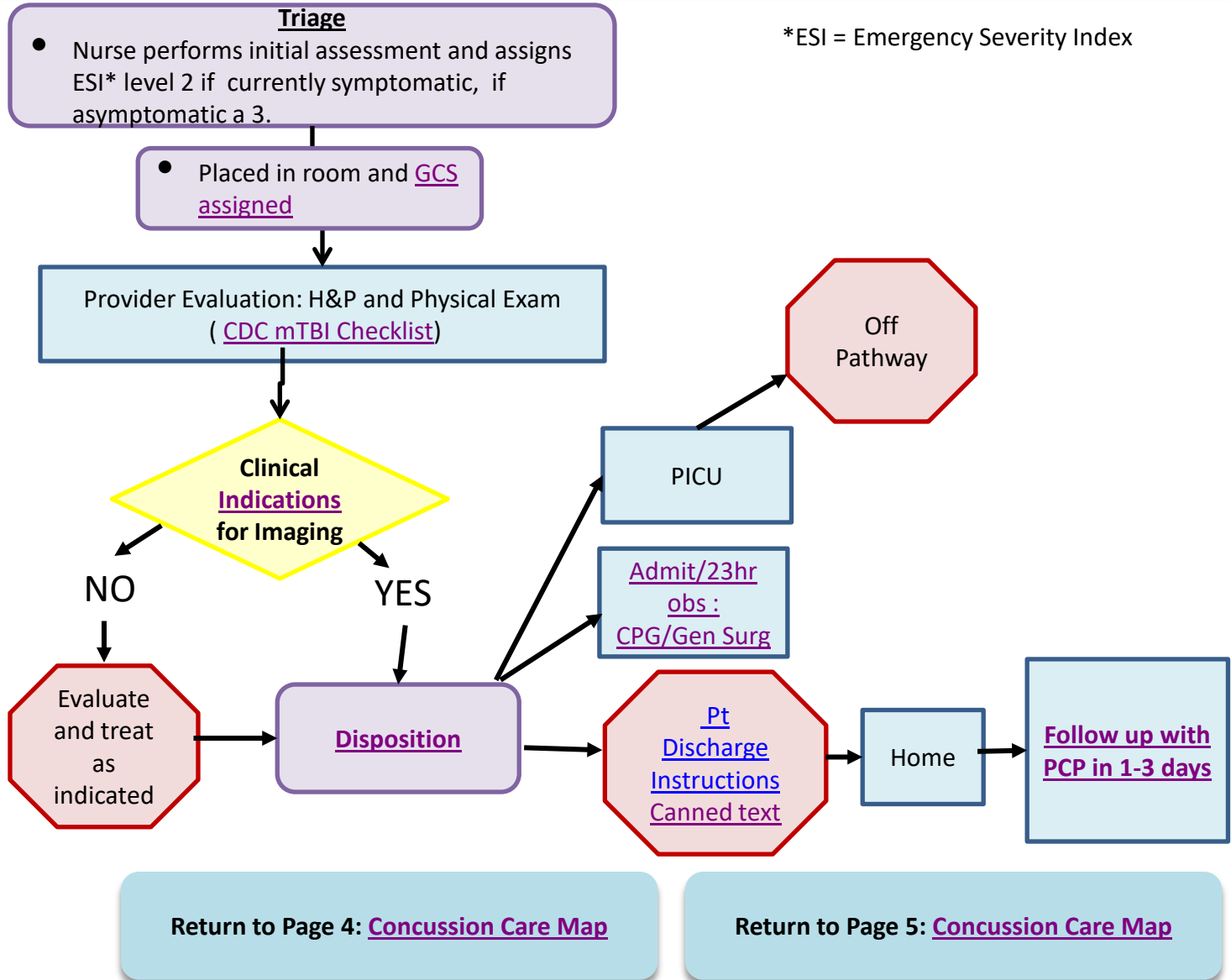
[Patient Education](#)



Emergency Department Care: Chief Complaint = Traumatic Brain Injury



Diagnostic testing & therapies not routinely recommended: Computed tomography (CT) scans are not necessary in the immediate evaluation of minor head injuries; clinical observation/Pediatric Emergency Care Applied Research Network (PECARN) criteria should be used to determine whether imaging is indicated.



Return to Page 4: [Concussion Care Map](#)

Return to Page 5: [Concussion Care Map](#)

Inpatient Care

Continued from previous [page](#)

Inpatient Care Order Set

Activity Restrictions :
Activities as tolerated with restrictions
Min Stim- no video games, no electronics, no high stimulation toys
Limited TV, none after 2300

Notify Provider if severe headache, excessive sleepiness or change in mental status, or new neurologic concerns

Medical Care
Neuro checks q 4 hr
Pain and Nausea control
Consider Melatonin

Discharge Criteria
Normal MS
Adequate pain and nausea control on PO meds
Care team to complete ACE prior to discharge (>5 yrs)
Follow up arranged with PCP, neurology, NS, or sports medicine as indicated

Discharge Instructions include
School excuse until cleared at follow up
Return to play guidelines
Warning signs to assess for

Diagnostic testing & therapies not routinely recommended: Computed tomography (CT) scans are not necessary in the immediate evaluation of minor head injuries; clinical observation/Pediatric Emergency Care Applied Research Network (PECARN) criteria should be used to determine whether imaging is indicated.

Tx of Symptoms – Current Recommendations

- **Headache**
 - Tylenol
 - Ibuprofen
 - Rest
- **Nausea**
 - Zofran is preferred
 - Phenergan if needed but be aware of potential adverse effect of excessive drowsiness.
 - Phenergan gel may be helpful without the drowsiness)
- **Sleep disturbance**
 - Sleep hygiene
 - Schedule sleep and awake times
 - Relaxing routine
 - Melatonin
 - *Benzodiazepines should be avoided
- **Dizziness**
 - Typically resolves with rest

Return to Page 6: [Concussion Care Map](#)

Recommendations from UpToDate

Pediatric Glasgow Coma Scale

	1	2	3	4	5	6
Eyes	Does not open eyes	Opens eyes in response to painful stimuli	Opens eyes in response to speech	Opens eyes spontaneously	N/A	N/A
Verbal	No verbal response	Inconsolable, agitated	Inconsistently inconsolable, moaning	Cries but consolable, inappropriate interactions	Smiles, orients to sounds, follows objects, interacts	N/A
Motor	No motor response	Extension to pain (<u>decerebrate response</u>)	Abnormal flexion to pain for an infant (<u>decorticate response</u>)	Infant withdraws from pain	Infant withdraws from touch	Infant moves spontaneously or purposefully

Return to Page 6: [Concussion Care Map](#)

- Symptom Check List

B. Symptom Check List* Since the injury, has the person experienced any of these symptoms any more than usual today or in the past day?
 Indicate presence of each symptom (0=No, 1=Yes). *Lovell & Collins, 1998 JHTR

PHYSICAL (10)			COGNITIVE (4)			SLEEP (4)		
Headache	0	1	Feeling mentally foggy	0	1	Drowsiness	0	1
Nausea	0	1	Feeling slowed down	0	1	Sleeping less than usual	0	1 N/A
Vomiting	0	1	Difficulty concentrating	0	1	Sleeping more than usual	0	1 N/A
Balance problems	0	1	Difficulty remembering	0	1	Trouble falling asleep	0	1 N/A
Dizziness	0	1	COGNITIVE Total (0-4) _____			SLEEP Total (0-4) _____		
Visual problems	0	1	EMOTIONAL (4)			<p>Exertion: Do these symptoms <u>worsen</u> with: Physical Activity __Yes __No __N/A Cognitive Activity __Yes __No __N/A</p> <p>Overall Rating: How <u>different</u> is the person acting compared to his/her usual self? (circle) Normal 0 1 2 3 4 5 6 Very Different</p>		
Fatigue	0	1	Irritability	0	1			
Sensitivity to light	0	1	Sadness	0	1			
Sensitivity to noise	0	1	More emotional	0	1			
Numbness/Tingling	0	1	Nervousness	0	1			
PHYSICAL Total (0-10) _____			EMOTIONAL Total (0-4) _____					
(Add Physical, Cognitive, Emotion, Sleep totals)				Total Symptom Score (0-22)		_____		

Return to Page 7: [Concussion Care Map](#)

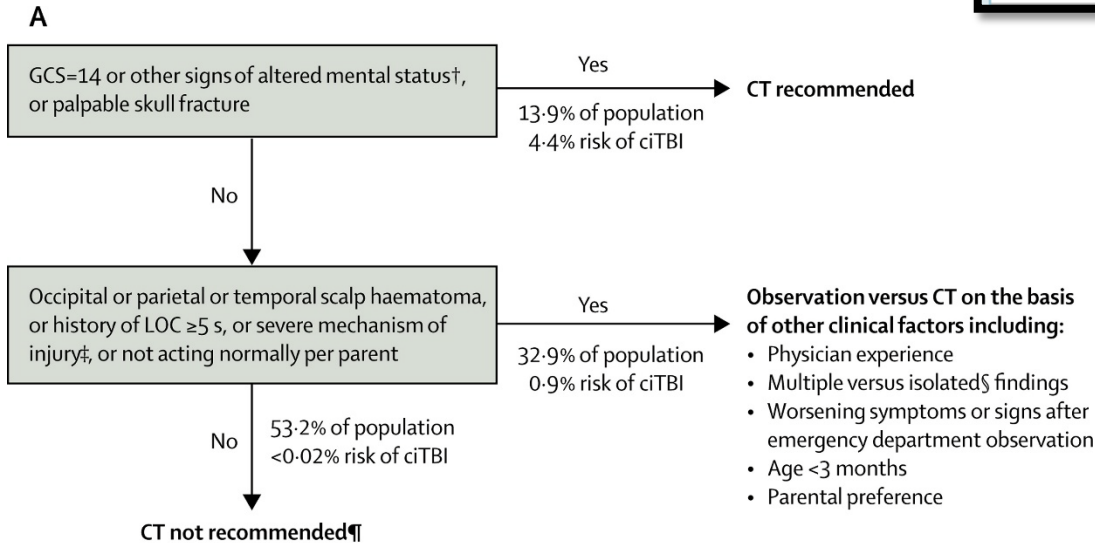


Indications for Neuroimaging

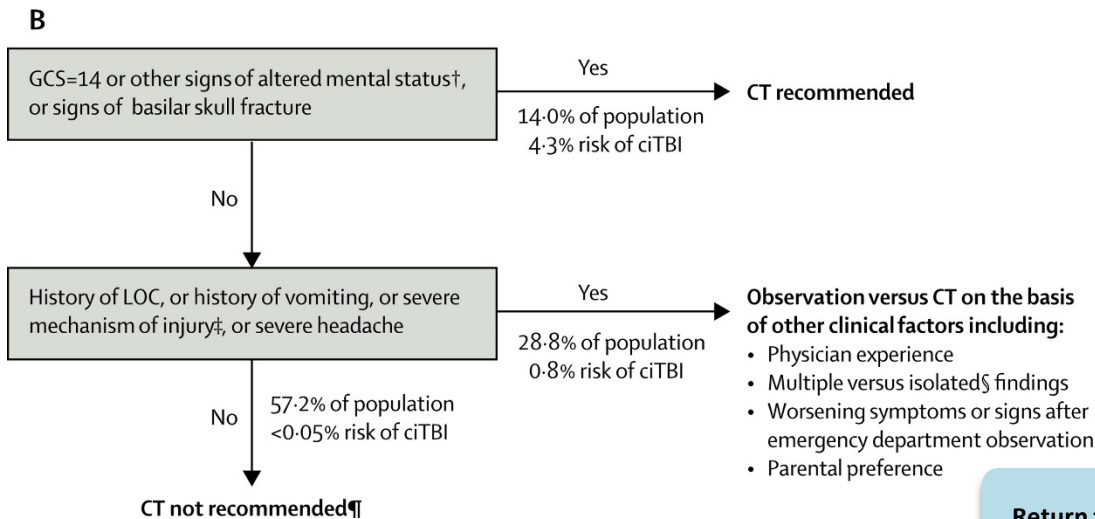
- **Computed tomography (CT) scans are not necessary in the immediate evaluation of minor head injuries; clinical observation/Pediatric Emergency Care Applied Research Network (PECARN) criteria should be used to determine whether imaging is indicated.**
- Minor head injuries occur commonly in children and adolescents. Approximately 50% of children who visit hospital emergency departments with a head injury are given a CT scan, many of which may be unnecessary. Unnecessary exposure to x-rays poses considerable danger to children including increasing the lifetime risk of cancer because a child's brain tissue is more sensitive to ionizing radiation. Unnecessary CT scans impose undue costs to the health care system. Clinical observation prior to CT decision-making for children with minor head injuries is an effective approach.

Return to Page 6: [Concussion Care Map](#)

< 2 years of age



≥ 2 years of age



Return to Page 6: [Concussion Care Map](#)

PECARN Meditech screens

[-] PECARN Rules for CHI<2			
✓ [-] PECARN Rules for CHI<2			
GCS<15	Yes	<input type="radio"/> No	Comment:
Signs of altered mental status	Yes	<input type="radio"/> No	Comment:
Palpable skull fracture	Yes	<input type="radio"/> No	Comment:
High Risk Total			
✓ [-] PECARN Rules for CHI<2			
Occipital, parietal or temporal scalp hematoma	Yes	<input type="radio"/> No	Comment:
History of LOC > 5 sec	Yes	<input type="radio"/> No	Comment:
Severe mechanism of injury	Yes	<input type="radio"/> No	Comment:
Not acting normally per parents	Yes	<input type="radio"/> No	Comment:
Intermediate Risk Total			

[-] PECARN Rules for CHI>2			
✓ [-] PECARN Rules for CHI>2 (a)			
GCS<15	Yes	<input type="radio"/> No	Comment:
Signs of basilar skull fracture	Yes	<input type="radio"/> No	Comment:
Agitation	<input type="radio"/> Yes	<input type="radio"/> No	Comment:
Somnolence	Yes	<input type="radio"/> No	Comment:
Slow Response	Yes	<input type="radio"/> No	Comment:
Repetitive Questions	Yes	<input type="radio"/> No	Comment:
High Risk Total	***Patient at High Risk, CT Scan Needed***		
✓ [-] PECARN Rules for CHI>2 (b)			
Vomiting	<input type="radio"/> Yes	<input type="radio"/> No	Comment:
History of LOC > 5 sec	Yes	<input type="radio"/> No	Comment:
Severe Headache	Yes	<input type="radio"/> No	Comment:
Fall > 5 feet	Yes	<input type="radio"/> No	Comment:
MVA with ejection, roll-over or fatality	Yes	<input type="radio"/> No	Comment:
Bike/pedestrian vs vehicle without a helmet	Yes	<input type="radio"/> No	Comment:
Struck by high impact object	Yes	<input type="radio"/> No	Comment:
Intermediate Risk Total	***Patient at Intermediate Risk, Observation vs. CT***		

Choosing Wisely Information for Families for CT indications

- The accidents listed below are more likely to cause serious head injuries:
 - A motor vehicle accident
 - Falling from three or more feet off the ground
 - Falling down five or more stairs
 - Falling off a bicycle without a helmet
- The symptoms listed below may be signs of serious injury:
 - Becoming unconscious
 - Tingling on one side of the body
 - Being dizzy or losing balance
 - Loss of vision or hearing
 - A headache that gets worse
 - Being very sleepy or irritable

Return to Page 6: [Concussion Care Map](#)

Disposition Criteria

- Discharge Criteria
 - Normal Mental Status
 - Adequate headache and nausea/vomiting control
 - C-Spine has been adequately assessed and cleared
 - **For ED, suggest observation for 4-6 hours after event for those who are not imaged to assess for changes in clinical status if symptomatic on presentation**
- Gen Surgery Admission
 - Any transfers from Level I trauma center for the first 23 hours (except for non-accidental trauma)
- CPG Admission
 - Any Traumatic Brain Injury requiring admission to the floor that presents to ETCH ED
 - Any concerns for non-accidental trauma
 - Intracranial hemorrhages cleared by Neurosurgery
- PICU Admission as clinically indicated

Return to Page 6: [Concussion Care Map](#)

Additional Discharge Criteria after Admission

- Provider to complete [ACE Symptom score](#) prior to discharge on patients over 5.
- Follow up arranged with PCP, neurology, NS, or sports medicine as indicated.
- Considerations:
 - Most patients can and should follow up with their PCP within 72 hours even after an inpatient stay. A school excuse and activity restrictions as far as return to play guidelines should be given at discharge.
 - For those wishing to return quickly to a high-level sporting activity, a sports medicine referral should be considered.
 - Follow up should be scheduled with neurology and neurosurgery if involved in their inpatient care or severity or persistent symptoms are of a concern

Return to Page 7: [Concussion Care Map](#)

Additional Follow Up resources

- KOC – concussion after **sports injuries(in season)**
 - Dr. Amber Luhn and Dr. Joshua Johnson
 - Typically seen within 72 hrs of injury
 - Automatic referral program with Knox County Athletic Trainers to KOC clinic
 - Do also work with some outlying county athletic trainers, but not all
 - Follow ACE scoring at each visit to track progress
 - Direct Care line: 865-410-7903
- Children’s Neurology – any closed head injury requiring hospitalization because of significant altered mental status with persistent or concerning symptoms
 - Existing Neurology patients follow with their specific provider
 - All new patients are scheduled with Dr. Sheah
 - Referrals through main office

Return to Page 7: [Concussion Care Map](#)

Discharge Instructions: canned text

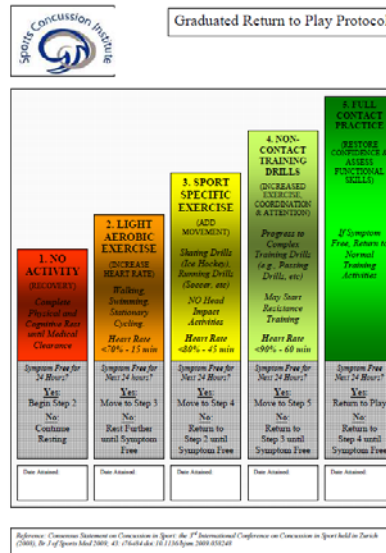
- Keep a close eye on your child for the first 12 to 24 hours after injury.
 - Make sure your child drinks plenty of fluids,
 - gets a good night's rest,
 - and limits how much caffeine they drink.
- You will be given basic instructions on head injury care.
- When to seek further help:
 - Repeated vomiting,
 - severe headache or worsening headache,
 - seizure activity,
 - trouble walking or talking,
 - changes in their eyesight,
 - feeling weak or numb in any part of the body,
 - if they are unable to control urination or bowel movements,
 - or they are very sleepy.
- If symptoms last longer than a month or if as your child restarts activities their symptoms return, please contact your provider.
- Make sure you are aware of the following:
 - Rest is very important to make sure they recover well.
 - Have your child only participate in activities that are quiet: For example- Brief periods of watching TV or reading, quiet games, etc.
 - It is very important to prevent a second head injury so make sure that they always wear their helmets, seat belts and any additional safety equipment.
 - Do not return to activity or school until you have been released by a medical provider in 1 to 3 days.

Return to Page 6: [Concussion Care Map](#)

Return to Page 7: [Concussion Care Map](#)

Activity Recommendations

- [CDC Recommendations](#)
- [Return to School](#) Form (available in Meditech)
 - For mTBI with persistent symptoms. (Used most often in consultation with Neurology or Neurosurgery)
- [Return to play](#)
- Any athlete desiring a RTP prior to 1 month should have a sports medicine evaluation if PCP not comfortable with concussion management



Return to Page 6: [Concussion Care Map](#)

Return to Page 7: [Concussion Care Map](#)

- **School/Daycare**

- Typically ok to return after 1-2 days of rest
 - Do not recommend longer than 5 days
- This is determined based on the child’s ability to stay focused and concentrate
- If unable to tolerate a full day of school, please contact your PCP for modifications or referral
- Patients with significant injury requiring admission should be sent home with a specific modification plan based on severity of injury.

- **Physical Activity**

- Physical rest for at least 24-48 hrs, do not return until after symptoms resolve
- Slowly return to light physical activity
 - Noncontact
 - Light aerobic activity ok
 - “nose breathing”
 - Immediately stop if symptoms return
- Sports – depends on injury
 - Typically 4 weeks
 - Needs clearance by medical provider

Return to Page 6: [Concussion Care Map](#)

Order Sets : Concussion Admission

Adm - Concussion

Concussion Order Set

Admit to

Inpatient

Observation

Isolation

Yes

Condition

Critical

* Comment: Activities as tolerated with restrictions as listed. Minimal stimulation-no video games, no electronics, no high stimulation toys. Limited TV and no TV after 2300

Isolation

Per Policy

Yes

Activity

Activity

Other New Thu Jun 24 08:26 Edit

Diet

Regular Diet 1-2

Starts with Breakfast 0700 P

Starts with Lunch 1100 (Next Meal) P

Starts with Dinner 1600 P

Regular Diet 2+

Starts with Breakfast 0700 P

Starts with Lunch 1100 (Next Meal) P

Starts with Dinner 1600 P

Nursing

Vital Signs

N/R Q4H New Thu Jun 24 08:26 Edit

B/P Frequency

Neuro Checks

N/R Q4H New Thu Jun 24 08:26 Edit

I & O

Strict New Thu Jun 24 08:26 Edit

Notify Provider

Yes New Thu Jun 24 08:26 Edit

* Comment: If severe HA, excessive sleepiness or change in MS, or any new neurologic concerns. Persistent vomiting or vision changes.

Medication

Analgesics

Acetaminophen [TylenoL]

Acetaminophen [Tylenol Liquid (160 mg/5 ml)]

295 mg PO Q4HPRN liquid 15 mg/kg Q4HPRN (160 mg/5 ml) PRN P M I

Maximum Dose: 1,000 MG

Ibuprofen [Motrin]

Ibuprofen [Motrin Suspension]

195 mg PO Q6HPRN suspension 10 mg/kg Q6HPRN (100 mg/5 ml) PRN P M I

Maximum Dose: 800 MG

Ketorolac Tromethamine [Toradol]

9.9 mg IV Q6HPRN injection 0.5 mg/kg IV Q6HPRN (wt <= 30 kg) PRN P M I

Maximum Dose: 15 MG

9.9 mg IV Q6HPRN injection 0.5 mg/kg IV Q6HPRN (wt > 30 kg) PRN P M I

Maximum Dose: 30 MG

Antiemetics

Ondansetron [Zofran Injection]

3 mg IV Q8HPRN injection PRN M I

0.15 mg/kg IV Q8HPRN

Maximum Dose: 8 MG

Ondansetron [Zofran Oral Solution]

3 mg PO Q8HPRN solution 0.15 mg/kg Q8HPRN Oral (4 mg/5 ml) PRN M

Maximum Dose: 8 MG

Ondansetron [Zofran Oral Disintegrating Tablet]

Other Medications

Melatonin

DOSE mg PO QHSRPN liquid PRN M I

3 mg PO HSRPN tab PRN M

5 mg PO HSRPN tab PRN M

Neurosurgery Consult

Physician Consult

Yes

Neurology Consult

Physician Consult

Yes

Forensics Consult

Physician Consult

Yes

General Surgery Consult

Physician Consult

Yes

Social Work Consult

Social Work Consult

Yes

CPG Consult

CPG Hospitalist Consult

Yes

Discharge Orders

Discharge Additional Order

Yes New Thu Jun 24 08:26 Edit

Comment: *Once patient meets discharge criteria, bedside nurse should print ACE form and provide to family for fill out. The nurse will enter results in Meditech on ACE intervention. *Follow up arranged with PCP, neurology, NS or sports medicine as indicated.

Discharge Criteria

Yes New Thu Jun 24 08:26 Edit

* Discharge Criteria: Normal Mental Status, adequate pain and nausea control on PO meds.

Discharge Education By Nurse

Yes New Thu Jun 24 08:26 Edit

Comment: Address timeline for return to School and play.

Give Discharge Forms

Yes New Thu Jun 24 08:26 Edit

* Comment: Provide family with Concussion Patient Education brochure

Return to Page 7: [Concussion Care Map](#)

Metrics

- Readmission rates at 7 days
- Reencounter rates at 7 and 30 days
- ACE score assessed at inpatient discharge in patients greater >5
- Percent of patients that received a CT scan in the ED presenting to our ED
- Percent of patients that received a CT scan at an outside ED presenting in transfer.

Return to Page 5: [Concussion Care Map](#)

References

- [Identification of children at very low risk of clinically important brain injuries after head trauma: a prospective cohort study. *Lancet* 2009; 374: 1160–70](#)
- [Management of Concussion and Mild Traumatic Brain Injury: A Synthesis of Practice Guidelines. *Archives of Physical Medicine and Rehabilitation* 2020;101:382-93](#)
- [CDC Heads Up: Safe Brain, Stronger Future.](#)
- [ETCH grand rounds](#)

Executive Summary

EXECUTIVE SUMMARY

OBJECTIVES

1. To provide standardized, evidence-based preoperative and postoperative care for patients admitted with non-complicated and complicated appendicitis (this includes diagnosis, admission, surgical treatment, and post-operative care).
2. To limit use of CT scan as a diagnostic tool, by first relying on a standardized appendicitis score for pediatric patients (PAPY score), and by supplementing this data with use of targeted ultrasound.
3. To streamline admission procedures for children with acute appendicitis regardless of time of day or the route of initial presentation (ER, outpatient imaging, hospital transfer).

RECOMMENDATIONS

1. Diagnostic workup should include history, physical exam, supporting laboratory tests, and ultrasound of the appendix. For females, an ultrasound of the pelvis can also be useful to rule out pelvic source of pain.
2. If diagnosis remains uncertain, a CT scan can be obtained using IV contrast only.
3. For complicated appendicitis, duration of antibiotic treatment should be for total of seven days, with at least the first three in IV form, after which can transition to PO.

RATIONALE

1. **Safety** will be improved by limiting exposure to ionizing radiation from CT scans during initial stages of diagnosis.
2. **Quality, Efficiency, and Delivery of care** will be improved by eliminating unnecessary steps in the workup, and streamlining admission and preop procedures.
3. **Cost** will be reduced by minimizing application of high cost imaging to only select patients.

EVIDENCE

*Siddiqui A, Sammons H, Lippman J, et al. Ciprofloxacin safety in pediatrics: A systematic review. *Arch Dis Child (Appendix)*. 2013;98(12):1274-1280.

*Lee SL, Islam S, Cassidy LD, Abdullah F, Jorgensen MJ, et al. American Pediatric Surgical Association Outcomes and Clinical Trials Committee. Antibiotics and appendicitis in the pediatric population: An American pediatric surgical association outcomes and clinical trials committee systematic review. *J Clin Child Psychol (Appendix)*. 2013;98(12):1281-1285.

*Salem JS, Mays JE, Bradley JS, et al. Diagnosis and management of complicated intra-abdominal infection in adults and children: Guidelines by the surgical infection society and the infectious diseases society of America. *Clin Infect Dis (Appendix)*. 2013;98(12):1286-1291.

*Salem JS, Mays JE, Baron EJ, et al. Guidelines for the selection of anti-infective agents for complicated intra-abdominal infections. *Clin Infect Dis (Appendix)*. 2013;98(12):1292-1297.

IMPLEMENTATION ITEMS

1. Pediatric Appendicitis Score (PAPY)—to be included in template for children presenting to ER with chief complaint of abdominal pain.
2. Standardization of order sets
3. Standardization of Preop Scrub
4. Standardization of post-op care through POD#7
5. Patient education materials at time of discharge.

METRICS PLAN

CORE METRICS

1. Length of Stay
2. 7 day and 30 day readmit rate
3. Volume
4. % of total pt with abdominal pain from home who receive either US or CT (already have that)
5. % of total pt presenting with abdominal pain with a final diagnosis of appendicitis (already have that)
6. % of patient with a final diagnosis of appendicitis who receives (This is a little variation of the metric we have which includes the broader abdominal pain)
 - a. An Ultrasound alone
 - b. ACT alone
 - c. Or both

3

Physician Disclaimers: Concussion Care Map

Medical Disclaimer

Medicine is an ever-changing science. As new research and clinical experience broaden our knowledge, changes in treatment and drug therapy are required.

The authors of this Care Map have checked with sources believed to be the most current and reliable in their efforts to provide information that is complete and generally in accord with the standards accepted at the time of publication.

However, in view of the possibility of human error or changes in medical sciences, neither the authors nor East Tennessee Children's Hospital warrants that the information contained herein is in every respect accurate or complete, and they are not responsible for any errors or omissions, or for the results obtained from the use of such information. Readers should make every effort to confirm the information contained herein with other sources, and are encouraged to consult with other health care providers in the making of clinical care decisions.

References to specific products, processes, websites, or services within this Care Map neither constitute nor imply corporate recommendation or endorsement by East Tennessee Children's Hospital.

Return to Page 4: [Concussion Care Map](#)

Return to Page 5: [Concussion Care Map](#)

Contact and Revisions Number

- **For questions concerning this care map, contact: CareMap@etch.com**
- **Last Update: 07/01/21**