



MONTANA CHILDREN'S
KALISPELL REGIONAL HEALTHCARE

Pediatric Blunt Trauma Solid Organ Injury Guideline: Renal Injury

Purpose

To coordinate and standardize care of the pediatric patient with a blunt renal injury following acute resuscitation. These guidelines are based on combined reviews from the *American Pediatric Surgical Association*(2019), the *Eastern Association for the Surgery of Trauma*, the *Pediatric Trauma Society*, the *World Society of Emergency Surgery*, and the *American Association for the Surgery of Trauma*.

	Grade 1 & 2	Grade 3	Grade 4	Grade 5
Admit to	Pediatric Floor	Pediatric Floor	Floor/PICU	PICU
Hospital LOS	Observation status vs ED disposition (if vital signs normal, eating, no gross hematuria, minimal abd pain)	1-2 days (if vital signs normal, eating, no gross hematuria, minimal abd pain)	2-3 days (if vital signs normal, eating, no gross hematuria, minimal abd pain)	3-4 days (if vital signs normal, eating, no gross hematuria, minimal abd pain)
Urology Consult	Not Necessary	Not Necessary	If urinoma, consult Urology	Consult Urology
Lab Tests	Hct 12hrs post injury	Hct 12 & 24hrs post injury	Hct 12, 24, and 48hrs post injury	Hct 6, 12, 24, and 48hrs post injury
Clinical Assessment and Monitoring	VS q 4hrs, Daily BP, Strict I/O	VS q 4hrs, BP q 4hrs, Strict I/O	VS q 2hrs (if in PICU) x 24hrs, then q 4hrs, Strict I/O	VS q 1hr x 12hrs, then q 2hrs until stable for transfer, Strict I/O
Treatment and Procedures	Incentive Spirometry prn	Incentive Spirometry prn Consider Transfusion of Balanced Blood Products (1:1:1): - If unstable vital signs after 20ml/kg crystalloid - Or Hgb <7 - Or Signs of	Incentive Spirometry until ambulatory, NG and foley as indicated Consider Transfusion of Balanced Blood Products (1:1:1): - If unstable vital signs after 20ml/kg crystalloid - Or Hgb <7 - Or Signs of	Incentive Spirometry until ambulatory, NG and foley as indicated Consider Transfusion of Balanced Blood Products (1:1:1): - If unstable vital signs after 20ml/kg crystalloid - Or Hgb <7 - Or Signs of

		ongoing bleeding OR/IR: - If unstable despite balanced blood product transfusion - Consider massive transfusion protocol	ongoing bleeding OR/IR: - If unstable despite balanced blood product transfusion - Consider massive transfusion protocol	ongoing bleeding OR/IR: - If unstable despite balanced blood product transfusion - Consider massive transfusion protocol
Nutrition	NPO x 12hrs then Clear Liquid, ADAT	NPO x 12hrs, Clear Liquid, ADAT	NPO x 24hrs, Clear Liquid x 8hrs then ADAT	NPO x 24hrs, Clear Liquid x 8hrs then ADAT
Activity	Bedrest with bathroom privileges	Strict bedrest until gross hematuria resolved	Strict bedrest until gross hematuria resolved	Strict bedrest until gross hematuria resolved
IV Fluids	Maintenance IV while NPO, then saline lock with good PO intake	Maintenance IV while NPO, then saline lock with good PO intake	Maintenance IV while NPO, then saline lock with good PO intake	Maintenance IV while NPO, then saline lock with good PO intake
Pre and Post D/C Imaging	None (US 2-3d post-injury only if unexplained fever)	None (US 2-3d post-injury only if unexplained fever)	US 2-3d post injury and 6wk post injury	US 2-3d post injury and 6wk post injury
Medications	Mild – Tylenol Mod – Oxycodone Severe – Morphine No NSAIDS	Mild – Tylenol Mod – Oxycodone Severe – Morphine No NSAIDS	Mild – Tylenol Mod – Oxycodone Severe – Morphine No NSAIDS	Mild – Tylenol Mod – Oxycodone Severe – Morphine No NSAIDS
Restricted activity for PE, full contact sports or play	Until microscopic hematuria clears (less than 5RBC/hpf)	Until microscopic hematuria clears (less than 5RBC/hpf)	6 weeks + microscopic hematuria clears (less than 5RBC/hpf)	6 weeks + microscopic hematuria clears (less than 5RBC/hpf)
Return to School	1 week or less	1 week	1-2 weeks	1-2 weeks
Follow up clinic visit	Only for concerns	6 weeks with Pediatric Surgery	6 weeks with an ultrasound	6 weeks with an ultrasound
PCP f/u	Weekly UA until urine clears (less than 5RBCs/hpf), Annual BP Check	BP at 6 wk, 6 mos, & yearly, weekly UA until urine clears (less than 5RBC/hpf)	BP at 6 wk, 6 mos, & yearly, weekly UA until urine clears (less than 5RBC/hpf)	BP at 6 wk, 6 mos, & yearly, weekly UA until urine clears (less than 5RBC/hpf)

Considerations

1. For Renal Injury Grade see the American Association for the Surgery of Trauma's [Injury Scoring Scale](#)

2. Patients with clinical instability may be removed from the pathway and treated as appropriate. Location of admission is at the discretion of the admitting trauma surgeon.
3. Gross hematuria alone does not necessitate foley placement. However, a foley is indicated for a bladder leak, to better monitor fluid status, or if the patient is on bedrest and unable to void using a urinal/bedpan.
4. Angioembolization is associated with less morbidity, lower rate of complications, shorter length of stay and decreased rate of renal loss than operative management. If immediately available, it should be considered for patients with moderate and severe injuries with active bleeding and contrast blush (or rebleeding), ongoing hemodynamic instability, and/or pseudoaneurysm. If angiography is not immediately available, consider operative intervention for hemodynamically unstable patients or patients non-responsive to resuscitative efforts, including those with severe renal vascular injuries without self-limiting bleeding.

Diagnostic and Follow up imaging

1. In the pediatric population there is no correlation between presence or type of hematuria and the degree of kidney injury. Consider initial imaging in pediatric blunt trauma patients with >50 RBC/hpf. Other factors that should be considered include mechanism of injury and transfer of energy, a drop in Hct associated with any degree of hematuria, or physical findings such as hypotension, flank hematoma and ecchymosis, rib fractures, or cutaneous signs on the abdomen.
2. Delayed bleeding is rare in pediatric patients. It is usually caused by rupture of a pseudoaneurysm or AV fistula within 2 weeks of injury. Hematuria is the most common sign.
3. Follow up imaging should be limited to high grade injuries. US is considered the method of choice. If inconclusive, MRI should be considered.

Education/discharge planning and follow up

1. The incidence of trauma-induced hypertension developed in the index hospitalization or during follow up months to years after the injury is reported between 0 and 7%. Yearly blood pressure checks are recommended.
2. Contact sports/activities include but are not be limited to: recess, bicycling, skateboarding, roller-skating, rollerblading, running or jogging, jungle gyms, gymnastics, dance, skiing, snowboarding, sled riding, swimming, diving, surfboard, windsurf, basketball, soccer, football, hockey, wrestling, lacrosse, boxing, horseback riding/rodeo, martial arts, rugby, handball, and mountain climbing.
Non-contact physical activities are allowed and include walking, running on even surfaces (treadmill), stationary bike, swimming laps in a private pool. No public pools, diving, or playing with friends/siblings in the pool. No ocean swimming. Other allowed quiet activities include reading, coloring, arts and crafts, video games, television, etc.
3. All patients will be counseled on activity restrictions, safety instructions, and further injury prevention (seatbelt, helmet use, etc.).

4. Patients will be counseled to call for nausea, vomiting, increased or uncontrolled pain, fever greater than 101 degrees, shortness of breath, lethargy, dizziness, fainting, blood in urine, stools or vomit, or other concerns.

References

1. Gates RL, Price M, Cameron DB, Somme S, Ricca R, Oyetunji TA, Guner YS, Gosain A, Baird R, Lal DR, Jancelewicz T, Shelton J, Diefenbach KA, Grabowski J, Kawaguchi A, Dasgupta R, Downard C, Goldin A, Petty JK, Stylianos S, Williams R. “ *Non-operative management of solid organ injuries in children: An American Pediatric Surgical Association Outcomes and Evidence Based Practice Committee systemic review.*” J Pediatr Surg. 2019 Aug; 54(8):1519-1526.
2. Coccolini F, Moore EE, Kluger Y, Biffl W, Leppaniemi A, Matsumura Y, Kim F, Peitzman AB, Fraga GP, Sartelli M, Ansaloni L, Augustin G, Kirkpatrick A, Abu-Zidan F, Wani I, Dieter W, Emmanouil P, Larrea M, Arvieux C, Manchev V, Reva V, Coimbra R, Khokha V, Mefire AC, Ordonez C, Chiarugi M, Machado F, Sakakushev B, Matsumoto J, Maier R, diCarlo I, Catena F. “*Kidney and uro-trauma: WSES-AAST guidelines.*” World Journal of Emergency Surgery. 2019 14:54.
3. Hagedorn JC, Fox N, Ellison JS, Russell R, Witt C, Zeller K, Ferrada P, Draus J. “*Pediatric blunt renal trauma practice management guidelines: Collaboration between the Eastern Association for the Surgery of Trauma and the Pediatric Trauma Society.*” J Trauma Acute Care Surg. 2019; 86(5):916-925.
4. American Association for the Surgery of Trauma, *Injury Scoring Scale*, 2006, <https://www.aast.org/resources-detail/injury-scoring-scale>