

Joint Theater Trauma System Clinical Practice Guideline

UROLOGIC TRAUMA MANAGEMENT

Original Release/Approval	18 Dec 2004	Note: This CPG requires an annual review.	
Reviewed:	Mar 2012	Approved:	2 Apr 2012
Supersedes:	Urologic Trauma Management, 30 June 2010		
<input type="checkbox"/> Minor Changes (or)	<input checked="" type="checkbox"/> <i>Changes are substantial and require a thorough reading of this CPG (or)</i>		
<input type="checkbox"/> Significant Changes	External genitalia injuries are the most common genitourinary trauma in war. Conservative debridement and repair of these injuries are crucial to the preservation of hormonal and sexual function; PI monitoring plan added.		

- 1. Goal.** To review indications for and the procedures associated with the initial management of genitourinary (GU) trauma sustained in combat casualties.
- 2. Background.** GU trauma accounts for approximately 5% of all combat casualties. As with all operative management, treatment of these injuries adheres to established surgical principals of hemostasis, debridement, and drainage.^{1,2} Whenever possible, proper radiographic evaluation of the GU system should be undertaken prior to operative intervention. For far forward surgical units, the goal is the preservation of as much tissue as possible (particularly when dealing with the external genitalia), followed by rapid evacuation to a higher level of care where definitive urological management can be undertaken.³
- 3. Evaluation and Treatment.** GU trauma in combat casualties may be blunt or penetrating in nature. Because of the location of the GU organs and the mechanism of injuries in combat, associated injuries to other organ systems are the rule rather than the exception. A significant reduction in kidney injuries have been noted in combat casualties wearing body armor.⁴ The predominant form of injury in the current conflicts are penetrating in nature and many are secondary to improvised explosive devices (IEDs). Not surprisingly, the most commonly injured GU structures are the external genitalia and lower urinary tract (bladder and urethra). A thorough trauma evaluation is mandatory in all severely injured patients. As nearly all patients with GU trauma have significant associated injuries to other organ systems, proper initial workup and treatment as taught in Advanced Trauma Life Support (ATLS) is crucial. Severely injured patients typically warrant Foley catheter placement.

If the urine is found to have microscopic blood or appears to be grossly bloody, further urologic workup is indicated (See Appendix A-Hematuria). Blood in the urine of a trauma patient can emanate anywhere from the kidneys to the urethral meatus. It is important to rule out significant injury to the GU tract in the face of hematuria. The medical stability of the patient, combat environment, and capabilities of the medical treatment facility will dictate what type of imaging and surgical evaluation are possible at each echelon of care. In hemodynamically stable patients with hematuria, a computed tomography (CT) scan of the abdomen and pelvis (without and with intravenous contrast) is desirable if available. The mechanism of injury (blunt or penetrating) and associated injuries (rib, vertebral or pelvic fractures) may help localize the source of hematuria. The presence or amount of hematuria does not always correlate to the severity of injury. For instance, it is possible to have significant renal injury in the face of microhematuria and minimal GU trauma with gross hematuria. In cases of blunt renal trauma, most injuries can be managed conservatively. The grading scale is listed in Appendix A-Renal Injury.

Guideline Only/Not a Substitute for Clinical Judgment

April 2012

Joint Theater Trauma System Clinical Practice Guideline

Patients with penetrating renal injuries typically have associated injuries to intra-abdominal organs. If CT imaging is available and the patient stable, the degree of injury can be assessed and a decision made as to whether renal exploration and repair is indicated. In patients undergoing exploratory laparotomy with known or suspected kidney injury (gross hematuria), certain factors influence the decision for renal exploration and repair (See Appendix A-Renal Exploration and Repair). The decision as to repair or remove the damaged kidney obviously depends on the salvageability of the renal unit and the ability of the patient to tolerate the procedure (See Appendix A-Nephrectomy). Ureteral injuries are nearly always secondary to penetrating trauma and a high index of suspicion is necessary to avoid missing the diagnosis.⁵ Hematuria may be absent and the only clue may be injuries to organs close to the path of the ureter or an unexplained rise in serum creatinine (See Appendix A-Ureteral Injuries).

Bladder injuries may be secondary to blunt or penetrating trauma. Gross hematuria is usually present and plain or CT cystogram is usually diagnostic (See Appendix-Bladder Injuries). If imaging is not possible prior to exploratory laparotomy and bladder injury is suspected, bladder patency can be tested by filling the urethral Foley catheter with 100-200 milliliters of sterile water or saline and visually checking for leakage. If bladder injury is confirmed, repair is then performed as described in the Appendix A-Bladder Injuries.

Anterior urethral injuries are usually secondary to penetrating trauma and can be primarily repaired over a catheter. Be careful to look for and repair concurrent corporal cavernosal injuries as they are easily missed. Posterior urethral injuries may be either due to blunt trauma typically secondary to pelvic fracture, or penetrating trauma with or without fracture. Complete posterior urethral transections are best managed with suprapubic catheter placement and delayed reconstruction.⁶

Penetrating injuries to the external genitalia are the most common urologic injury in recent conflicts due to the frequent use of mines and IEDs in combat.^{7,8,9,10} These external genitalia injuries are commonly associated with lower extremity trauma and rarely occur in the absence of other wounds.^{11,12} While penile injuries are readily identified and addressed, testicular injuries are easily missed due to the frequently small associated scrotal entry wounds. A high index of suspicion for testicular injuries is needed when evaluating patients with lower extremity trauma secondary to blast injury (See Appendix A-External Genitalia Injuries). Testicular repair is crucial even when there is only a small amount of viable tissue present. Conservative debridement and meticulous repair of tissues is crucial in these injuries to preserve hormonal and sexual function.

4. Performance Improvement (PI) Monitoring.

a. Intent (Expected Outcomes).

- 1) In blunt trauma, all patients with gross hematuria (regardless of initial SBP) and those patients with microscopic hematuria whose initial SBP is less than 90 mmHg should undergo contrast enhanced CT scan (where available) if/when they become hemodynamically stable.

b. Performance/Adherence Measures.

- 1) All blunt trauma patients with gross hematuria (regardless of initial SBP) and those patients with microscopic hematuria whose initial SBP is less than 90 mmHg had

Guideline Only/Not a Substitute for Clinical Judgment

April 2012

Joint Theater Trauma System Clinical Practice Guideline

contrast enhanced CT scan performed (where available) if/when they become hemodynamically stable.

c. Data Source.

- 1) Patient Record
- 2) Joint Theater Trauma Registry (JTTR)

d. System Reporting & Frequency.

The above constitutes the minimum criteria for PI monitoring of this CPG. System reporting will be performed annually; additional PI monitoring and system reporting may be performed as needed.

The system review and data analysis will be performed by the Joint Theater Trauma System (JTTS) Director, JTTS Program Manager, and the Joint Trauma System (JTS) Performance Improvement Branch.

5. Responsibilities. It is the trauma team leader's responsibility to ensure familiarity, appropriate compliance and PI monitoring at the local level with this CPG.

6. References.

- ¹ Emergency War Surgery Handbook, 3rd United States Revision 2004. Borden Institute. Walter Reed Army Medical Center, Washington, D.C. Chapter 18: Genitourinary Tract Injuries. 2004: 18.1-18.11
- ² Initial Management of War Wounds CPG
- ³ Penetrating trauma to the external genitalia in Operation Iraqi Freedom, S Waxman, A Beekley, A Morey and D Soderdahl. *International Journal of Impotence Research* (2009) **21**, 145–148; doi:10.1038/ijir.2008.59.
- ⁴ Genitourinary Trauma at a Combat Support Hospital during Operation Iraqi Freedom: The Impact of Body Armor, E Paquette. *J Urol.* 177: 2196-2199, 2007.
- ⁵ Delayed Diagnosis of Traumatic Ureteral Injuries. D Kunkle, B Kansas, A Pathak, A Goldberg, J Mydlo. *J Urol.* 176: 2503-2507, 2006.
- ⁶ The Treatment of Posterior Urethral Disruption Associated with Pelvic fractures: Comparative Experience of Early Realignment Versus Delayed Urethroplasty. V Mouraviev, M Coburn, R Santucci. *J Urol.* 173: 873-876, 2005.
- ⁷ Penetrating External Genital Trauma: A 30-Year Single Institution Experience. S Phonsombat, V Master, J McAninch. *J Urol.* 180: 192-196, 2008.
- ⁸ Battlefield Urologic Injuries: The Gulf War Experience. I Thompson, S Flaherty, A Morey. *J Am Coll Surg.* 187: 139-141, 1998.
- ⁹ Operative Management of Wartime Genitourinary Injuries at Balad Air Force Theater Hospital, 2005 to 2008. S Hudak, S Hakim. *J Urol.* 182: 180-183, 2009.
- ¹⁰ Battlefield Urogenital Injuries: Changing Patterns during the Past Century. S Hudak, A Morey, T Rozanski, C Fox. *Urology* 65: 1041-1046, 2005.

Guideline Only/Not a Substitute for Clinical Judgment

April 2012

Joint Theater Trauma System Clinical Practice Guideline

- ¹¹ Combat Urologic Trauma in US Military Overseas Contingency Operations. F Serkin, D Soderdahl, J Hernandez, M Patterson, L Blackbourne, C Wade. *J Trauma* 69: S175-178, 2010.
- ¹² Urology in the Vietnam War: Casualty Management and Lessons Learned. J Wettlaufer, J Weigel. Army Medical Department and Borden Institute, 2004.

Approved by CENTCOM JTTS Director,
JTS Director and CENTCOM SG

Opinions, interpretations, conclusions, and recommendations are those of the authors
and are not necessarily endorsed by the Services or DOD.

APPENDIX A Urological Diagnosis and Treatments

Diagnosis	Treatment
HEMATURIA	<ul style="list-style-type: none">• During trauma evaluation, place Foley catheter unless contra-indicated. Perform a retrograde urethrogram (RUG) first if blood is noted at the urethral meatus or other evidence of urethral injury (pelvic fracture). RUG - Obtain a KUB plain film first. Alternatively, C-arm or fluoroscopy can be utilized. Then, a 14-16 Fr Foley, primed with contrast to rid air, is placed in the urethra past the balloon. Use 1-2 ml saline to fill the balloon snugly in the fossa navicularis, or just secure the catheter manually or with tape at this level. Alternatively, a syringe filled with contrast and fitted with a nozzle tip will suffice. An oblique film or fluoroscopy is obtained after injecting approximately 15ml of full strength contrast (con-ray) under steady, gentle pressure. The study is considered normal only if contrast enters the bladder without any extravasation.• If anterior urethral injury, plan to repair in OR. If posterior urethral injury, attempt to gently place a Foley catheter. If unable, then place supra-pubic tube in EMT or in OR. If a partial urethral injury is seen, one may try to gently pass a floppy tip guide wire or catheter under x-ray guidance. If resistance is met, one should stop so as to not convert a partial tear into a complete urethral transaction. A supra-pubic catheter can be placed in the bladder in the operating room (OR), or percutaneously in the emergency department (ED) if the patient is not in need an exploratory laparotomy and a kit available.• If catheter passes, and gross hematuria noted, proceed with GU diagnostic evaluation for bladder injury or a renal/ureteral source. CT scan with delayed images + a CT cystogram is ideal imaging study (see technique description following).

Joint Theater Trauma System Clinical Practice Guideline

Diagnosis	Treatment
RENAL INJURY	<ul style="list-style-type: none"> • Blunt Trauma: All patients with gross hematuria (regardless of initial SBP) and those patients with microscopic hematuria whose initial SBP is less than 90 mmHg should undergo contrast enhanced CT scan if/when they become hemodynamically stable and where a scanner is available. • <u>Renal Injury Grading</u> <u>Grade 1:</u> Sub-capsular hematoma <u>Grade 2:</u> Small parenchymal laceration <u>Grade 3:</u> Deeper parenchymal laceration without entry into collecting system <u>Grade 4:</u> Laceration into collecting system with extravasation; vascular injury with contained hemorrhage <u>Grade 5:</u> Shattered kidney or renal pedicle avulsion • Hemodynamically stable patients can usually be managed without operation. • Vascular repair is indicated for salvageable kidneys with renal artery or vein injury (see vascular CPG for more details). • Ureteral stent may need to be placed for persistent urinary extravasation.
RENAL EXPLORATION DURING ABDOMINAL OPERATION	<ul style="list-style-type: none"> • Absolute indications: persistent bleeding or expanding/pulsatile hematoma • Relative indications: urinary extravasation, nonviable tissue (> 20%), and segmental arterial injury on pre-op study. • Urinary extravasation from a grade IV parenchymal laceration or forniceal rupture can be managed nonoperatively in most patients.
RENAL REPAIR AND PARTIAL NEPHRECTOMY PRINCIPLES	<ul style="list-style-type: none"> • Complete renal exposure, debridement of nonviable tissue, hemostasis by individual suture ligation of bleeding vessels, watertight closure (absorbable suture), drainage of the collecting system, and coverage/approximation of the parenchymal defect. Perform partial nephrectomy if reconstruction not possible: the collecting system must be closed and the parenchyma covered with omentum. Consider the use of hemostatic agents and tissue sealants if available. • Place ureteral stent for persistent urinary extravasation

Guideline Only/Not a Substitute for Clinical Judgment

April 2012

Joint Theater Trauma System Clinical Practice Guideline

Diagnosis	Treatment
NEPHRECTOMY	<ul style="list-style-type: none">• Total nephrectomy is immediately indicated in extensive renal injuries when the patient's life would be threatened by attempted renal repair. The preferred approach in these situations is mobilization of the kidney from lateral to medial. This approach has been shown to be faster and is associated with less blood loss compared to attempting vascular control of the renal pedicle prior to exploration. This approach is identical to the medial visceral rotation (Mattox maneuver).• Damage control by packing the wound to control bleeding and attempting to correct metabolic and coagulation abnormalities, with a plan to return for corrective surgery within 24 hours is an option.
URETERAL INJURIES	<ul style="list-style-type: none">• Hematuria not universal: a high index of suspicion must be maintained.• Can be diagnosed with IV contrast and a delayed KUB or CT, but should only be done after the patient is fully resuscitated and hemodynamically stable.• Ureteral contusions are treated by stenting. Complete transections of the ureter can be repaired using a tension free, end to end, spatulated anastomosis over a ureteral stent. As with all urologic injuries, initial debridement should be conservative in order to preserve all viable tissue. In cases of inadequate ureteral length to re-anastomose, a pediatric feeding tube or other tube may be placed in the proximal ureter and brought out through the skin and placed to closed drainage. Reconstruction of the ureter can then be performed further uprange.• Ureteral Pelvic Junction (UPJ) avulsion injuries should undergo re-anastomosis of the ureter to the renal pelvis. A stent and drain need to be placed.• Lower 1/3 ureteral injuries may be repaired primarily over a stent as described above or reimplanted into the bladder. Use of a psoas hitch or Boari flap can help bridge large gaps due to ureteral loss.

Joint Theater Trauma System Clinical Practice Guideline

Diagnosis	Treatment
BLADDER INJURIES	<ul style="list-style-type: none"> • Most patients will present with gross hematuria. If CT is planned for other injuries, a CT cystogram (<i>use DILUTED conray</i>) should be performed. If no CT, obtain a plain film cystogram (need minimum 350ml to be adequate study.) • Cystogram: Obtain scout film. Fill bladder via Foley by gravity with at least 350ml contrast (7 ml/kg for pediatrics). Obtain AP image ± Oblique view. Drain bladder completely and obtain AP image. Many bladder injuries are detected only on the post-drainage film. • Extraperitoneal extravasation of contrast can be managed with Foley catheterization alone, unless: bone fragment projecting into the bladder, open pelvic fracture, rectal perforation, or clot retention. Open repair is indicated in these cases (see below). • Intraperitoneal ruptures require open repair, two-layer closure with absorbable suture and perivesical drain placement. Last, place a large-bore suprapubic catheter and a urethral catheter to maximize bladder drainage of blood and clots.
URETHRAL INJURIES	<ul style="list-style-type: none"> • Diagnosis – a high index of suspicion must be maintained in all patients with blunt or penetrating trauma in the urogenital region, and a RUG should be performed in any case of suspected urethral injury. In partial urethral tears, gentle catheter placement under x-ray guidance may be indicated as described above. • Anterior urethral injuries (penile and bulbar urethra) may also be associated with large hematoma or swelling from extravasated urine. In severe trauma, Buck's fascia may be disrupted, resulting in blood and urinary extravasation into the scrotum. Primary repair of these injuries are indicated if circumstances dictate with absorbable suture over a catheter. • Posterior urethral injuries (prostatic and membranous urethra) are typically associated with pelvic fractures. They may also be associated with concurrent bladder injuries. Complete posterior urethral distraction injuries typically require initial suprapubic catheter placement followed by delayed reconstruction.

Guideline Only/Not a Substitute for Clinical Judgment

April 2012

Joint Theater Trauma System Clinical Practice Guideline

Diagnosis	Treatment
EXTERNAL GENITALIA INJURIES	<ul style="list-style-type: none">• Penis - superficial shaft skin wounds can be irrigated and closed primarily. Corporal injuries are repaired by approximation of the tunical margins with absorbable sutures in a watertight fashion. Glans injuries should be closed with absorbable sutures.• Scrotum/Testicle - Diagnosis is by physical exam. Equivocal cases should be explored. Explore scrotum if there is overlying shrapnel on the pelvic film or if there is a scrotal laceration and any abnormality on exam. CT or sonography may also show evidence of foreign bodies or air in the scrotum or abnormality of one or both testes. Necrotic testicular tissue should be debrieded and the capsule closed with running absorbable suture. The tunica vaginalis can be used to augment the capsular closure when deficient. Most of these scrotal injuries are contaminated with foreign bodies and thus a drain is warranted. In cases where there has been significant loss of penile or scrotal skin thus precluding complete closure, the wound can either be packed open or sealed in a wound vacuum system.⁹

Guideline Only/Not a Substitute for Clinical Judgment

April 2012

APPENDIX B

ADDITIONAL INFORMATION REGARDING OFF-LABEL USES IN CPGs

1. Purpose.

The purpose of this Appendix is to ensure an understanding of DoD policy and practice regarding inclusion in CPGs of “off-label” uses of U.S. Food and Drug Administration (FDA)–approved products. This applies to off-label uses with patients who are armed forces members.

2. Background.

Unapproved (i.e., “off-label”) uses of FDA-approved products are extremely common in American medicine and are usually not subject to any special regulations. However, under Federal law, in some circumstances, unapproved uses of approved drugs are subject to FDA regulations governing “investigational new drugs.” These circumstances include such uses as part of clinical trials, and in the military context, command required, unapproved uses. Some command requested unapproved uses may also be subject to special regulations.

3. Additional Information Regarding Off-Label Uses in CPGs.

The inclusion in CPGs of off-label uses is not a clinical trial, nor is it a command request or requirement. Further, it does not imply that the Military Health System requires that use by DoD health care practitioners or considers it to be the “standard of care.” Rather, the inclusion in CPGs of off-label uses is to inform the clinical judgment of the responsible health care practitioner by providing information regarding potential risks and benefits of treatment alternatives. The decision is for the clinical judgment of the responsible health care practitioner within the practitioner-patient relationship.

4. Additional Procedures.

- a. Balanced Discussion. Consistent with this purpose, CPG discussions of off-label uses specifically state that they are uses not approved by the FDA. Further, such discussions are balanced in the presentation of appropriate clinical study data, including any such data that suggest caution in the use of the product and specifically including any FDA-issued warnings.
- b. Quality Assurance Monitoring. With respect to such off-label uses, DoD procedure is to maintain a regular system of quality assurance monitoring of outcomes and known potential adverse events. For this reason, the importance of accurate clinical records is underscored.
- c. Information to Patients. Good clinical practice includes the provision of appropriate information to patients. Each CPG discussing an unusual off-label use will address the issue of information to patients. When practicable, consideration will be given to including in an appendix an appropriate information sheet for distribution to patients, whether before or after use of the product. Information to patients should address in plain language: a) that the use is not approved by the FDA; b) the reasons why a DoD health care practitioner would decide to use the product for this purpose; and c) the potential risks associated with such use.