

JOINT TRAUMA SYSTEM CLINICAL PRACTICE GUIDELINE (JTS CPG)



Pelvic Fracture Care (CPG ID: 34)

Provides a brief review for the stabilization and treatment of pelvic fractures sustained in combat casualties.

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Updated with aeromedical evacuation considerations, 26 Feb 2020.

BACKGROUND

Historically, injuries to the bony pelvis were relatively uncommon in the combat environment. The prevalence of Improvised Explosive Device (IED) attacks seen in the Iraq and Afghanistan operations against technologically improved tactical vehicles, as well as during dismounted operations, has led to an increased incidence of blunt trauma pelvic injuries.¹ The patterns of pelvic fracture in the combat environment tend to be more complex, more difficult to classify, and more commonly open than those seen in civilian trauma.

Hemodynamically compromised patients with pelvic fractures present a complex challenge to the trauma team as sharp spikes of bone resulting from pelvic ring injuries can lacerate surrounding soft tissues and induce brisk bleeding. The most common sources of bleeding are from fracture surfaces and the retroperitoneal venous plexus, with gluteal artery injuries occurring less commonly.^{2,3} Also at risk are the hollow visceral contents of the abdomen and pelvis, L5 nerve root, and lumbar plexus.

Pelvic fractures often occur in conjunction with other life threatening injuries. Civilian mortality rates have ranged from 6-35% with higher mortality rates associated with open fractures.⁴⁻⁸ Death within the first 24 hours of injury in these patients is most often a result of **acute blood loss and associated injuries**.⁸

Recent analysis of mortality with combat related pelvic fractures identified large vessel injury, head injury, and injury to solid abdominal organs as risk factors for mortality in the setting of combat related pelvic ring injuries.⁹

Open pelvic fractures in the combat environment have become more common most likely secondary to the increased prevalence of blast mechanisms of injury, combined with better patient survivability - attributed to rapid transport to surgical stabilization, use of tourniquets, the use of enhanced body armor and more aggressive massive transfusion protocols. These open fractures are often associated with other severe injuries, including lower extremity amputations. Combat related pelvic ring injuries are commonly high-energy and unstable injuries, frequently requiring operative fixation.

EVALUATION AND TREATMENT

NOTE: Refer to [Appendix A](#).

1. Key issues in management of pelvic fractures are to identify if the patient is hemodynamically stable and if the pelvic fracture is mechanically stable. If the patient is not hemodynamically stable, it is imperative to identify all site(s) of hemorrhage as pelvic fractures often occur in conjunction with other life threatening injuries. Appropriate **evaluation of the abdomen, chest, and other potential sites of injury and hemorrhage** cannot be overstressed. Additionally, a **thorough examination of the pelvis and perineum** is required to rule out associated injuries to the rectum and genitourinary/gynecologic systems. Pelvic fracture is a common component of Dismounted Complex Blast Injury.¹⁰
2. When pelvic fractures cause hemorrhage, the bleeding occurs from three major sources: arterial, venous, and cancellous bone. Over 70% of hemorrhage associated with blunt pelvic trauma causing pelvic fracture is venous in nature and may be controlled with maneuvers that reduce the pelvic volume and stabilize the pelvis.¹¹ The other nearly 30% is associated with an arterial source and often requires procedural interventions such as **surgical packing and/or embolization**.¹² **Pelvic packing** can be a valuable technique, particularly when the patient is in extremis, or when laparotomy is required for associated injuries.¹³
3. In the austere environment, if open pelvic fractures continue to bleed despite retroperitoneal packing, bilateral internal iliac artery ligation should be considered.¹⁴ In these dire circumstances, temporary cross-clamping of the aorta may help **control life-threatening hemorrhage** prior to dissection and ligation of the internal iliac arteries.

4. For pelvic fractures, **initial stabilization** with whatever means are available (sheet, pelvic binders, bean or sand bags, or pelvic external fixation) must be promptly implemented. In the combat environment, when fracture stability is unclear and specialist expertise is not available to determine pelvic fracture stability, stabilization with a sheet or binder is recommended. When possible, taping the knees and ankles together can minimize additional external rotational movement, and help improve the pelvic reduction achieved with a sheet or binder. Pelvic binders are correctly placed by centering over the greater trochanter of the femur, applying an internal rotational force to each hemi-pelvis through the hip joints.
5. The establishment of **standardized clinical treatment algorithms** for patients with pelvic fractures has been shown to greatly increase the probability of rapid stabilization of trauma patients.¹⁵⁻¹⁸ [Appendix A](#) shows an algorithm in unstable patients.
6. A **multidisciplinary approach with early trauma surgery and orthopedic surgery coordination** is critical. The focus of the evaluation and treatment is early identification of injury with early mechanical stabilization as necessary and determination of hemodynamic instability with aggressive resuscitation for hemorrhage. When available, angiographic exploration with early embolization by skilled interventionalist for the hemodynamically unstable patient with intrapelvic hemorrhage may be beneficial-preferably in the operating room.¹⁹
7. Given that this capability is rarely available outside of a Role 3 facility, the next most beneficial maneuver is **retroperitoneal packing via a suprapubic incision**.^{20,21} The temptation to open a retroperitoneal pelvic hematoma (as a result of a pelvic fracture) from inside the abdomen should be resisted and attempted only as a last resort although this may be necessary due to other intra-abdominal or pelvic injuries. In the casualty who remains hemodynamically compromised in spite of these efforts bilateral iliac artery ligation should be considered.¹⁴ However, these interventions should not delay the necessary acute surgical treatment for concomitant hemorrhagic injuries.

AEROMEDICAL EVACUATION CONSIDERATIONS

1. Ensure fracture stabilized prior to transport.
2. Patient should be hemodynamically stabilized, with no evidence of active bleeding prior to transport. Coordinate with Theater Validating Flight Surgeon for exceptions.
3. Vibration in flight will increase pain. Ensure adequate pain control by ordering additional breakthrough pain medications.
4. Consider DVT prophylaxis. See the [JTS Prevention of Deep Venous Thrombosis– Inferior Vena Cava Filter CPG, 02 Aug 2016](#).

PERFORMANCE IMPROVEMENT (PI) MONITORING

POPULATION OF INTEREST

Patients diagnosed with pelvic fracture.

INTENT (EXPECTED OUTCOMES)

1. Patients in the population of interest with hemodynamic instability (SBP < 100 or HR >100) receive pelvic stabilization (binder or external fixation).

2. Pelvic fracture patients who remain hemodynamically unstable after 2 units of blood product transfusion undergo hemorrhage control procedure at the same level of care where diagnosed (exploratory laparotomy, preperitoneal packing, REBOA, and/or interventional angiography embolization).

PERFORMANCE/ADHERENCE METRICS

1. Number and percentage of patients in the population of interest with hemodynamic instability (SBP < 100 or HR >100) who receive pelvic stabilization (binder or external fixation).
2. Number and percentage of patients with pelvic fracture who remain hemodynamically unstable after 2 units of blood product transfusion undergo hemorrhage control procedure at the same level of care where diagnosed (exploratory laparotomy, preperitoneal packing, REBOA, and/or interventional angiography embolization).

DATA SOURCE

- Patient Record
- Department of Defense Trauma Registry

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 Trauma System (JTS) Director and the JTS Performance Improvement Branch.

RESPONSIBILITIES

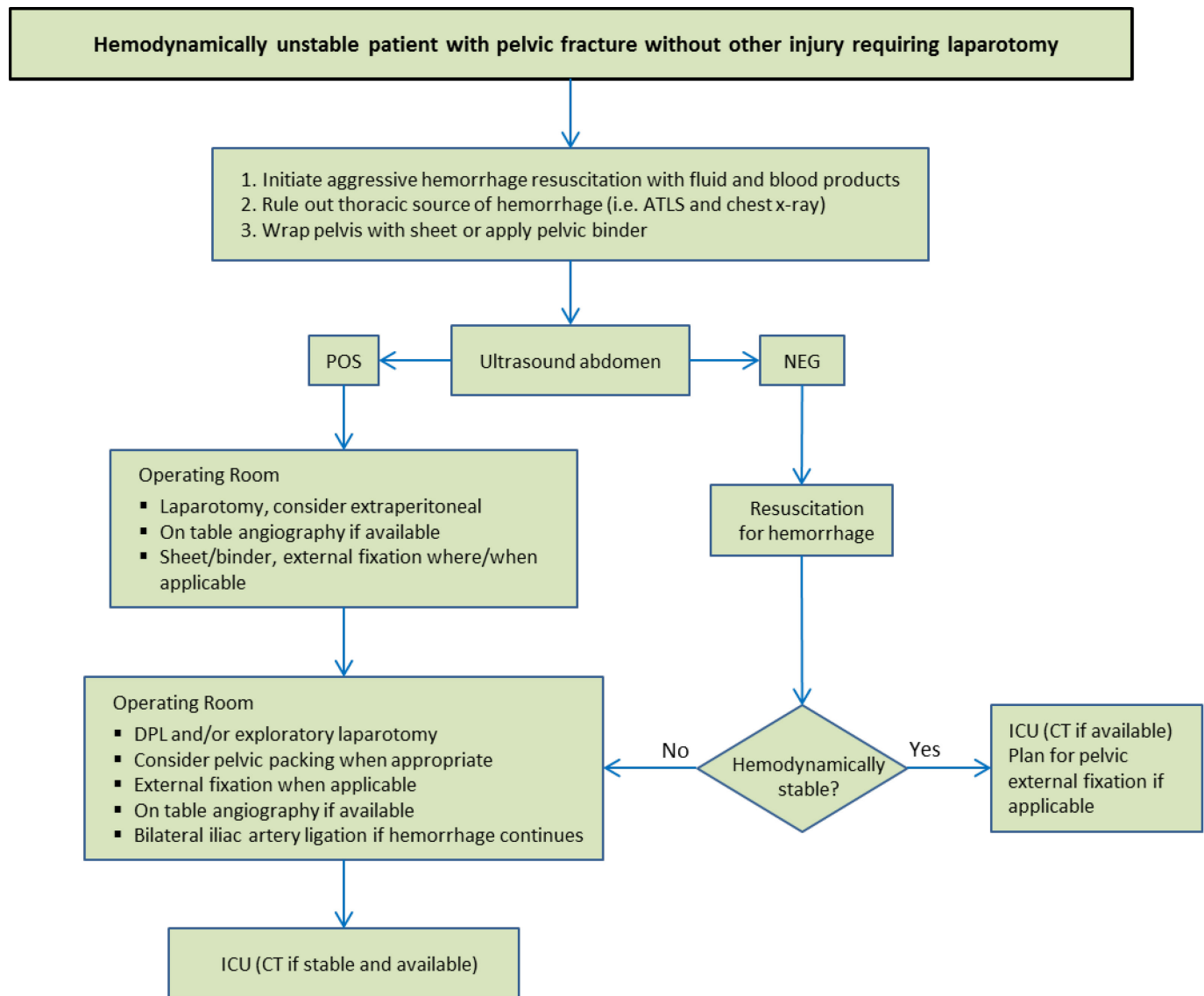
It is the trauma team leader's responsibility to ensure familiarity, appropriate compliance and PI monitoring at the local level with this CPG.

REFERENCES

1. Lewandowski L, Kluk M, Gordon WT. Outcomes and Complications of Open Combat-Related Pelvic Fractures. Unpublished data.
2. Lopez PP. Unstable pelvic fractures: the use of angiography in controlling arterial hemorrhage. J Trauma. 2007 Jun. 62(6 Suppl):S30-1.
3. Poole GV, Ward EF, Muakkassa FF. Pelvic fracture from major blunt trauma. Outcome is determined by associated injuries. Ann Surg. 1991 Jun. 213(6):532-8; discussion 538-9.
4. Dalal SA, Burgess AR, Siegel JH, et al: Pelvic fracture in multiple trauma: Classification by mechanism is key to pattern of organ injury, resuscitative requirements, and outcome. J Trauma 1989;29:981-1002.
5. McMurtry R, Walton D, Dickinson D, Kellam J, Tile M: Pelvic disruption in the polytraumatized patient: A management protocol. Clin Orthop Relat Res 1980; 151:22-30.
6. Bosch U, Pohlemann T, Haas N, Tscherne H: Classification and management of complex pelvic trauma [German]. Unfallchirurg 1992;95:189- 196.
7. Mucha P Jr, Farnell MB: Analysis of pelvic fracture management. J Trauma 1984;24:379-386.

8. Smith W, Williams A, Agudelo J, et al. Early Predictors of Mortality in Hemodynamically Unstable Pelvis Fractures. *J Orthop Trauma*. 2007;21(1):31-37.
9. Davis JM, Stinner DJ, Bailey JR, Aden JK, Hsu JR and the STREC Consortium investigators. Factors Associated With Mortality in Combat-related Pelvic Fractures. *J Am Acad Orthop Surg* 2012; 20(suppl 1):S7-S12
10. Joint Trauma System, High Bilateral Amputations and Dismounted Complex Blast Injury, 01 Aug 2016. https://jts.health.mil/index.cfm/PI_CPGs/cpgs Accessed Mar 2018.
11. Ben-Menachem Y, Coldwell DM, Young JW, Burgess AR: Hemorrhage associated with pelvic fractures: Causes, diagnosis, and emergent management. *AJR Am J Roentgenol* 1991;157:1005-1014.
12. Agolini SF, Shah K, Jaffe J, Newcomb J, Rhodes M, Reed JF III: Arterial embolization is a rapid and effective technique for controlling pelvic fracture hemorrhage. *J Trauma* 1997;43:395- 399.
13. Hak D, Smith W, Suzuki T. Management of Hemorrhage in Life-threatening Pelvic Fracture. *J Am Acad Orthop Surg*. 2009;17:447-4
14. DuBose J, Inaba K, Barmparas G, Teixeira PG, Schnüriger B, Talving P, Salim A, Demetriades D. Bilateral internal iliac artery ligation as a damage control approach in massive retroperitoneal bleeding after pelvic fracture. *J Trauma*. 2010 Dec;69(6):1507-14.
15. Biffl W, Smith W, Moore E, et al. Evolution of a Multidisciplinary Clinical Pathway for the Management of Unstable Patients with Pelvic Fractures. *Annals of Surgery*. 2001;233(6):843-850.
16. Croce MA, Magnotti LJ, Savage SA, Wood GW II, Fabian TC: Emergent pelvic fixation in patients with exsanguinating pelvic fractures. *J Am Coll Surg* 2007;204:935-942.
17. Agolini SF, Shah K, Jaffe J, Newcomb J, Rhodes M, Reed JF III: Arterial embolization is a rapid and effective technique for controlling pelvic fracture hemorrhage. *J Trauma* 1997;43:395- 399.
18. Miller PR, Moore PS, Mansell E, Meredith JW, Chang MC: External fixation or arteriogram in bleeding pelvic fracture: Initial therapy guided by markers of arterial hemorrhage. *J Trauma* 2003;54:437-443.
19. Gourlay D, Hoffer E, Routt M, Bulger E: Pelvic angiography for recurrent traumatic pelvic arterial hemorrhage. *J Trauma* 2005;59(5):1168-1174.
20. Smith WR, Moore EE, Osborn P, et al. Retroperitoneal packing as a resuscitation technique for hemodynamically unstable patients with pelvic fractures: report of two representative cases and a description of technique. *J Trauma* 2005 Dec;59(6):1510-4
21. Osborn PM, Smith WR, Moore EE, et al. Direct retroperitoneal pelvic packing versus pelvic angiography: A comparison of two management protocols for haemodynamically unstable pelvic fractures. *Injury* 2009 Jan;40(1):54-60 .

APPENDIX A: PELVIC FRACTURE CLINICAL PATHWAY



APPENDIX B: ADDITIONAL INFORMATION REGARDING OFF-LABEL USES IN CPGS

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.

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.

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.

ADDITIONAL PROCEDURES**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.

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.

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.