Sussex Trauma Network

Guidelines for Management of:

Severe Pelvic Fractures including Urethral Injury

May 2024

Management of Severe Pelvic Fractures including Urethral Injury

Control Page

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Name of responsible committee/individual:	Sussex Trauma Network – Dr Peter Westhead, Clinical Director for the Sussex Trauma Network
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Contents

1 Executive Summary

- All hospitals and networks that are responsible for the management of patients with severe pelvic fractures must have clear emergency referral and transfer protocols that should include points of contact.
- Centres providing definitive care must have an agreed protocol and pathway standardising the management of these complex injuries.
- Most patients with severe pelvic fractures will be conveyed to hospital by pre-hospital services, using their existing triage algorithms.
- Most patients with significant pelvic fractures causing persistent haemorrhage should be conveyed directly or transferred after assessment to the appropriate Major Trauma Centre (MTC).
- For adult patients, this will be the Royal Sussex County Hospital, Brighton.
- For paediatric patients (under the age of 16), if the patient has polytrauma, they should be referred to the nearest Paediatric MTC.
- All patents with high-energy blunt trauma and any evidence of cardio-vascular compromise should have a pelvic binder applied, preferably pre-hospital.
- Patients with suspected severe pelvic fractures with any evidence of persistent haemorrhage or shock should be given high priority for assessment in hospital, such that they can be identified as requiring timely haemorrhage control.
- Management of uncontrolled bleeding from pelvic trauma will require active resuscitation, using as required, massive transfusion, interventional radiology and damage control surgery.
- All adult patients with suspected high-energy pelvic injury should have a CT Traumagram.
- Children with suspected vascular injury should be discussed with a Paediatric Radiologist to determine the need for CT scanning.
- If a patient requires transfer to get the appropriate urgent surgery, then that transfer should be done urgently and the request for transport for the transfer should convey the urgency.
- All patients should have assessment for possible urological injury and management as appropriate.
- Adult patients requiring definitive pelvic fixation, should have this done at the MTC.
- Patients with anterior pelvic injuries may be at risk of sexual dysfunction and require appropriate advice and care.

2 Introduction

Major pelvic and acetabular fractures must be managed with an established trauma system with defined referral pathways. A mismanaged pelvic injury can lead to early death from haemorrhage or major disability while delayed or poor management of an acetabular fracture can lead to accelerated osteoarthritis and avoidable permanent hip dysfunction. 5-10% of pelvic fractures will have a major urological injury.

Urological trauma is rare, and the incidence of severe urethral trauma is 1/million population/year. Most cases are due to blunt high-energy trauma with associated multi-system injuries and 80% of these cases are associated with pelvic fractures. Urological injuries are potentially fatal and can result in severe long-term disability.

3 Purpose of the Guideline

The purpose of this guideline is to clearly define the care pathway for patients with severe pelvic injury including referral pathways to and from the Major Trauma Centre (MTC) (Royal Sussex County Hospital (RSCH)) and network Trauma Units (TUs). It includes guidance for pre-hospital and hospital management, indications for surgery, pain management and rehabilitation.

3.1 Aims & Objectives

The aims and objectives of this guideline are:

- To provide a system-wide approach for management of patients with severe pelvic injuries
- To define appropriate patient pathways for these patients
- To list appropriate accepted routes of communication
- To highlight continuing areas of contention
- To help meet TQUIN requirements for creation of network-agreed guidelines for the Network and Trauma Units (TUs)

4 Definitions

4.1 Severe Pelvic Injury

For this guideline, a severe injury includes fractures of the pelvic ring in all ages, excluding isolated low energy pubic rami fractures, isolated acetabular fractures and pathological fractures.

5 Scope

The guideline covers all major trauma patients with severe pelvic injuries within the Sussex Trauma Network. It replaces and supersedes all relevant previous STN guidelines.

It is applicable to adults and children, but relevant sections contain statements where different processes apply to management of children.

6 Relevant Documents and Guidance

This guideline refers to:

- NICE Guideline [NG39] – Major trauma: assessment and initial management
- NICE Guideline [NG37] – Fractures (complex): assessment and management
- BOAST 3 Guideline – The Management of Patients with Pelvic Fractures - January 2018 - see also Appendix 2 for summary
- BOAST 14 Guideline – The Management of Urological Trauma with Pelvic Fractures - January 2018- see also Appendix 3 for summary
- Wessex Children's Major Trauma Guidelines – on the Paediatric Innovation, Education and Research Network website (piernetwork.org)

This guideline also aspires to compliance with the relevant 2016 Major Trauma Service Quality Indicators (TQUINs) issued by the NHS England Quality Surveillance Team - tquins_resources_measures_major_trauma_measures_final_230416_7_.pdf (wymtn.com) and the subsequent 2020 version applying to Trauma Units.

The relevant extracts from the indicators are:

6.1 For Trauma Networks

- **T16-1C-107**
  There should be network agreed clinical guidelines for the management of:
  - Severe pelvic fractures, including urethral injury

6.2 For Pre-hospital Providers

- **T16-2A-104**
  There should be protocols in place for the pre-hospital management of major trauma patients which includes:
  - management of major haemorrhage including:
    - the administration of tranexamic acid
    - application of pelvic binders

6.3 For Major Trauma Centres

- **T16-2B-115**
  There should be specialist surgeons and facilities (theatre/equipment) to provide fixation of pelvic ring injuries within 24 hours.
  There should be cover arrangements in place for holidays and planned absences.

- **T16-2B-116**
  The MTC should agree the network trauma management guidelines as specified in T16-1C-107.
  The MTC should include relevant local details.

- **T16-2B-119**
  Patients with significant haemorrhage should be administered Tranexamic Acid within 3 hours of injury and receive a second dose according to CRASH-2 protocol.

6.4 For Trauma Units

- **T20-2B-311**
  There are network agreed guidelines in place for the management of major trauma including:
    - Severe pelvic fractures, including urethral injury

7 Standard Operating Procedure

7.1 Pre-Hospital Care

7.1.1 Pre-Hospital Triage

Most patients with severe pelvic injury are conveyed to hospital and have pre-hospital triage by one or both of the two main pre-hospital service providers – SECAmb and AAKSS. Each of these services cover a wider area than the STN and has its own pre-hospital triage algorithms to determine which hospital an individual patient is conveyed to.

Pre-hospital practitioners are required to use clinical judgement to detect conditions such as major pelvic injury (severe pain, disruption of pelvic ring). According to the STN Patient Pathways document, an adult patient identified as having one of these conditions should be triaged to the adult Major Trauma Centre (MTC).

However, if the patient's vital signs are unmanageable, prehospital staff may consider primary transport to the nearest Trauma Unit (TU) or MTC for resuscitation, prior to transfer to the MTC for definitive treatment of active bleeding.

Children identified or suspected of having sustained these injuries should be conveyed to the nearest paediatric MTC if within 60 minutes. If the nearest paediatric MTC is >60 minutes away the child should be taken to the nearest TU or adult MTC for stabilisation.

7.1.2 Pre-Hospital Care

Pre-hospital practitioners with the requisite competence may provide the following care prior to transport or arrival at hospital:

- Large bore intravenous or intraosseous cannulation
- External haemorrhage should be controlled immediately by direct pressure with simple dressings.
- If active bleeding is suspected from a pelvic fracture after blunt high-energy trauma, they should apply a purpose-made pelvic binder.
- Give intravenous tranexamic acid as soon as possible in patients with major trauma and active or suspected active bleeding.
- Permissive hypotensive resuscitation without dilutional restoration of circulating volume is ideal. In the awake patient titrate volume replacement to maintain consciousness, or if not conscious aim for systolic BP of 80mmHg.
- All patents with high-energy blunt trauma and any evidence of cardio-vascular compromise (systolic BP <110 mmHg or paediatric equivalent) should have a purpose-made pelvic binder applied.

7.2 Hospital Care

7.2.1 Identifying the High-Risk Patient

All patients with suspected pelvic ring fractures (except for simple pubic rami fractures) should be assessed by a trauma team.

Patients with any haemorrhage or shock should be given high priority for assessment in hospital, such that they can be identified as requiring timely haemorrhage control.

The MTC should have a protocol for initiating a Code Red Trauma Call for patients with potentially life-threatening haemorrhage. Code Red Trauma Calls should result in rapid attendance of appropriate specialists including general, orthopaedic, and vascular surgeons, as well as activation of the major haemorrhage protocol.

TUs should have a mechanism to rapidly summon appropriate specialists and activate a major haemorrhage protocol for stabilisation of patients with potentially life-threatening haemorrhage.

Use physiological criteria that include the patient's haemodynamic status and their response to immediate volume resuscitation to activate the major haemorrhage protocol. Do not rely on a haemorrhagic risk tool applied at a single time point to determine the need for major haemorrhage protocol activation.

During initial assessment of the patient with suspected pelvic injury:

- Do NOT examine the pelvis for mechanical stability. Under NO circumstances should the pelvis be ‘stressed’.

- There should be minimal patient handling and rolling should occur until the pelvis is cleared.
- All patients suffering high-energy trauma must have examination of the perineum and genitalia plus a rectal examination (and vaginal if appropriate) and the findings recorded in the medical records.
- Obtain early CT Traumagram or pelvic x-ray – (see Imaging).

7.2.2 Persistent Bleeding

In all cases of persistent bleeding, whether controlled or not, permissive hypotensive resuscitation without dilutional restoration of circulating volume is ideal. In the awake patient titrate volume replacement to maintain consciousness, in the anaesthetised patient aim for systolic BP of 80mmHg. Large bore IV access and provision for rapid access to blood products should of course be made.

7.2.2.1 Uncontrolled bleeding

- The primary treatment of haemodynamically unstable patients with suspect pelvic fracture is stabilisation with a pelvic binder and adequate resuscitation.
- If not already done, these patients with suspected pelvic injury should have a purpose-made pelvic binder applied.
- If the binder is already present, its position should be checked and optimised if required.
- Active bleeding from the pelvis in patients who do not respond to resuscitation can be managed EITHER by interventional radiology with selective embolization of active arterial bleeding vessels OR surgical packing of the pelvis (damage-control surgery).
- Interventional Radiology (IR) is indicated in patients who remain unstable despite adequate resuscitation with active arterial bleed on imaging who do not need to go to theatre for any other reason. The presence of arterial blush on the initial scan is not an absolute indication for IR.

7.2.2.2 Tranexamic Acid

- Use intravenous tranexamic acid as soon as possible in patients with major trauma and active or suspected active bleeding.
- Do not use intravenous tranexamic acid more than 3 hours after injury in patients with major trauma unless there is evidence of hyperfibrinolysis.

7.2.2.3 Anticoagulant reversal in hospital settings

- Rapidly reverse anticoagulation in patients who have major trauma with haemorrhage.
- Hospital trusts that admit patients with major trauma should have a protocol for the rapid identification of patients who are taking anticoagulants and the reversal of anticoagulation agents.

- Use prothrombin complex concentrate immediately in adults (16 or over) with major trauma who have active bleeding and need emergency reversal of a vitamin K antagonist.
- Do not use plasma to reverse a vitamin K antagonist in patients with major trauma.
- Consult a haematologist immediately for advice on adults (16 or over) who have active bleeding and need reversal of any anticoagulant agent other than a vitamin K antagonist.
- Consult a haematologist immediately for advice on children (under 16s) with major trauma who have active bleeding and may need reversal of any anticoagulant agent.
- Do not reverse anticoagulation in patients who do not have active or suspected bleeding.

7.2.2.4 Interventional Radiology (IR)

- IR is one of two options for management of persistent uncontrolled bleeding from pelvic fractures.
- It consists of selective embolization of active arterial bleeding vessels supplying the pelvis.
- Interventional Radiology (IR) is indicated in patients who remain unstable despite adequate resuscitation with active arterial bleed on imaging who do not need to go to theatre for any other reason. The presence of arterial blush on the initial scan is not an absolute indication for IR.
- IR should only be done by radiologists trained in the specific procedure and should only be done in facilities with available on-site surgical expertise in case rescue surgery is required.
- See STN Guideline - Interventional Radiology in Trauma for more detail.

7.2.2.5 Pelvic Packing

- Pelvic Packing is one of two options for management of persistent uncontrolled bleeding from pelvic fractures.
- It consists of surgical packing of the pelvis and may be combined with application of an external fixator to the pelvis and reduction of the pelvic/sacral fractures.
- It should only be done by surgeons trained in the procedure.

7.2.3 Urological Assessment and Injury

- A single, gentle attempt at catheterization, by an experienced doctor, is permissible, even if the clinical or CT findings suggest urethral injury. In adults a 16F soft, silicone catheter should be used. The procedure and the presence of clear or blood-stained urine must be recorded in the medical records.
- The finding of blood-stained urine mandates a retrograde cystogram via the catheter.

- If the catheter will not pass or passes and drains only blood, do NOT inflate balloon. Withdraw catheter and perform a retrograde urethrogram.
- If there is a urethral or bladder injury, the on-call urologist should be informed immediately so that a treatment plan can be formulated and recorded in the notes.
    - The on-call urologist for the MTC is not resident and is based at Princess Royal Hospital, Haywards Heath. However, they can be contacted via the switchboard at the Royal Sussex County Hospital – 01273 696955.

7.2.3.1 Suprapubic Catheter Insertion

- If a urethral catheter cannot be passed, a suprapubic catheter is required. This can be inserted during emergency laparotomy but otherwise a percutaneous suprapubic catheter should be placed.
- A percutaneous, suprapubic catheter should be placed using a Seldinger technique under ultrasound control by a doctor experienced in this technique. The skin insertion point MUST be in the midline and should be 3 to 4 fingers-breadths above the symphysis. A 16F silicone catheter should be used.
- The placement of a suprapubic catheter may alter the timing of pelvic fracture surgery and so the pelvic fracture service should be involved at an early stage.

7.2.3.2 Further Urological Care and Surgery

- If there is a urine leak from either the bladder or urethra, the pelvic fracture should be treated like an open long-bone fracture with appropriate antibiotics for 72 hours and early fracture fixation if the patient's physiology allows.
- Intraperitoneal bladder rupture requires emergency laparotomy and direct repair.
- Extraperitoneal rupture of the bladder may be treated by catheter drainage alone. However, in the presence of an unstable pelvic fracture, it is recommended that fracture reduction and fixation is performed along with primary repair of the bladder.
- Extraperitoneal rupture of the bladder neck continues to leak even in the presence of a catheter and requires primary repair.
- Bladder injuries identified during pelvic fracture surgery should be repaired at the same time and bladder drainage (via urethral or suprapubic catheter, as appropriate) ensured.
- Bladder injury in children is rare but often more complex than adults. A paediatric urologist should always be involved early in the care of these injuries.
- All urethral injuries in females and children must be discussed at a very early stage with the appropriate supra-regional specialist in urology.
- The indications for primary (within 48 hours) urethral repair are: associated ano-rectal injury, perineal degloving, bladder neck injury,
- massive bladder displacement and penetrating trauma to the anterior urethra.

- The recommended definitive treatment for urethral rupture in adult males is delayed repair at 3 months post injury. Each MTC should have a clear referral pathway to a recognised centre for reconstructive urethral surgery with a named urological lead consultant.
- Primary re-alignment of the urethra during fracture surgery is not recommended as, in the hands of an inexperienced (urethral) surgeon, the risk of additional damage probably out-weighs the benefits. Accurate reduction of the bony pelvic ring indirectly realigns the urethra and facilitates delayed repair.

7.2.4 Imaging

According to the STN – Imaging for Trauma Guideline, for seriously injured adult patients, whole-body contrast-enhanced head-to-thigh CT (CT Traumagram) is the default imaging procedure of choice.

If, however, the patient is undergoing emergency laparotomy for damage-control surgery prior to CT traumagram, a plain x-ray of the pelvis should be taken prior to surgery.

For children with suspected pelvic injury, CT Traumagram is NOT the default investigation. The choice of imaging to define the pelvic injury is a joint decision-making process involving the consultant orthopaedic surgeon and on call paediatric radiologist.

As indicated above - Urological Assessment and Injury – retrograde cystogram or retrograde urethrogram may be required to identify urethral or bladder injury in both adults and children.

7.2.5 Pelvic Binders

The purpose of a pelvic binder is to decrease the volume of the disrupted pelvis and promote haemostasis by splinting fractured bone. Repeatedly stressing and moving the patient dislodges blood clots and map promote bleeding.

A pelvic binder should be used in all patients, adults and children, who have potential or obvious pelvic disruption from blunt trauma especially with any evidence of cardio-vascular compromise or instability.

The pelvic binder should ideally be applied pre-hospital but should be applied in hospital if required and not already present.

If the binder has been applied pre-hospital, the position should be checked by the trauma team after arrival in hospital.

The binder should be placed at the level of the greater trochanters. Positioning is important as a badly positioned binder may serve to open the pelvis. The endpoint of the binder is to bring the pelvic bones into a near anatomical position. Avoid overtightening of binders as this may compromise soft tissues and may cause over-displacement in some fractures.

7.2.5.1 Removal of pelvic binder

A pelvic binder can be removed under the guidance of the orthopaedic team when the patient is haemodynamically stable, and the pelvic fracture has been characterised. A team member competent in application of a pelvic binder and with the skills, competence and resources to manage acute decompensation of a trauma patient should be present for removal of binder and during acquisition of "binder off" x-rays due to rare but potentially dangerous risk of patient deterioration following removal of pelvic binder.

If haemodynamic instability occurs after removal of the binder if haemodynamic instability occurs – replace the binder and investigate/resuscitate.

Ideally patients should have the binder removed within 24 hours.

After removal of the binder repeat radiographs should be taken in all major trauma patients.

All patients with pelvic injury having emergency damage-control surgery should have a pelvic binder in-situ during surgery and this should not be removed for a post binder pelvic X-ray until the patient is haemodynamically stable.

7.2.6 Traction

In displaced vertical shear fractures, skeletal traction should be considered when early definitive surgery cannot be performed. This should be determined by the Trauma & Orthopaedic team and, if necessary, should be done in the Emergency Department.

7.2.7 Secondary Transfer (TUs)

Patients with significant pelvis injury may present to TUs or be transported there by prehospital services either because the patient does not appear to meet the present criteria for primary transport to the MTC, or because the patient is deemed to be too unstable for primary transport.

All TUs should have mechanisms in place to accurately assess, triage and resuscitate these patients. Patients should not be turned away whilst still in an ambulance. On rare occasions, surgical haemorrhage control may be needed at the TU.

However, most patients with significant pelvic injury will warrant secondary transfer to the appropriate MTC. As described in STN Patient Pathways, adult patients with immediately life-threatening injuries, such as persistent haemorrhage that cannot be managed within the TU, may be managed via the Immediate Secondary Transfer protocol, with Emergency Department to Emergency Department referral.

All other adult patients who are admitted to a TU and require surgical stabilisation of the pelvis, should be managed via the Non-Immediate Secondary Transfer protocol with referral from specialist to appropriate specialist. To make an non-immediate referral from a TU to the

MTC Trauma & Orthopaedic surgeons for pelvic surgery – follow Processes for Urgent Referral to the Trauma and Orthopaedic Service at the Major Trauma Centre at the Royal Sussex County Hospital. This policy involves:

- Completion of the relevant electronic online referral form that can be found on the following webpage on the old BSUH Intranet nww.bsuh.nhs.uk/clinical/teams-and-departments/trauma-and-orthopaedics/pelvic-and-acetabular-ext-referral-form/. This can ONLY be accessed from hospital computers.

  Attach any photographs to the electronic form.

- Then make a telephone referral in person by phone either from a Trauma and Orthopaedic (T&O) Registrar to the on-call T&O Registrar at RSCH (01273 696955 bleep 8629) or from a T&O Consultant to the on-call T&O Consultant at RSCH.

Although current guidelines dictate that secondary transfer to the MTC for severe pelvic injury should be done within 24 hours, current resources and staffing levels do not always permit compliance. Patients with cardiovascular stability, may have to wait a few days as an inpatient in a TU prior to transfer to the MTC for definitive care. The Network accepts that this a better way of managing limited MTC beds and theatre time.

7.2.8 Medications

7.2.8.1 Antibiotics

Early antibiotic administration should be started on all patients who have:

- open wounds adjacent to pelvic fractures
- vaginal lacerations and pelvic fracture
- urine leak from either the bladder or urethra

All patients should be regarded as having open fractures and treated as dictated by local antibiotics policy. See also STN Guideline – Management of Open Fractures.

7.2.8.2 Thromboprophylaxis

Patients with pelvic fractures who are haemodynamically stable should have VTE prophylaxis. Ideally this should be within 48 hours. This includes those awaiting surgery.

7.2.9 Surgical Management

Surgical treatment of pelvic fractures can be done for two main indications:

- haemorrhage control – see damage control surgery
- definitive fixation of the unstable pelvis.

7.2.9.1 Definitive fixation

For adult patients requiring it, this is undertaken by the Trauma & Orthopaedic Department at the Royal Sussex County Hospital.

7.2.9.2 External fixation

This should be considered for temporary mechanical stabilisation when early definitive surgery cannot be performed.

7.2.10 Discharge

Male and female patients suffering displaced anterior pelvic fractures or urethral injury have a high incidence of urinary and sexual dysfunction. All patients who may be sexually active should receive written advice on sexual dysfunction.

All Major Trauma Centres should have a linked Andrological service and all male patients with displaced anterior pelvic fractures should be offered access to this service.

7.3 Rehabilitation

No specific guidance at present.

7.4 Audit

Any patients whose treatment falls outside this guideline should be reported via the network Clinical Governance Framework and discussed through internal clinical governance mechanisms.

All patients with severe pelvic injury with or without urethral injury are eligible for inclusion in and should be entered into the National Major Trauma Registry (NMTR).

8 Training Implications

This document represents the standard of practice acceptable for trauma networks and so all participating clinicians should already have relevant skills and training. No extra training requirements have been identified.

Staff in both TUs and the MTC should have training sufficient to allow adequate care for patients with chest wall injury. This includes nursing on general and trauma wards.

9 Documentation

There is no formal documentation of these processes, other than the following:

- Written and computer patient medical records
- Electronic order comms records
- PACS images
- Paper and/or electronic imaging reports

10 Monitoring Arrangements

These include:

- STN Clinical Governance Framework
- NMTR Audit

11 Equality Impact Assessment Screening

None in process.

12 Links to other SOPs and Trust policies

This guidance refers to and links with the following STN and Trust publications:

- STN Patient Pathways (present version 9.10)
- STN Guideline – Imaging for Trauma – adults and children (present version 1.0)
- STN Guideline – Interventional Radiology (present version 1.1)
- STN Guideline – Management of Open Fractures (present version 1.0)
- Processes for Urgent Referral to the Trauma and Orthopaedic Service at the Major Trauma Centre at the Royal Sussex County Hospital

13 References

- NICE Guideline [NG39] – Major trauma: assessment and initial management
- NICE Guideline [NG37] – Fractures (complex): assessment and management
- BOAST 3 Guideline – The Management of Patients with Pelvic Fractures - January 2018 - see also Appendix 2 for summary
- BOAST 14 Guideline – The Management of Urological Trauma with Pelvic Fractures - January 2018- see also Appendix 3 for summary
- Wessex Children's Major Trauma Guidelines – on the Paediatric Innovation, Education and Research Network website (piernetwork.org)

14 Appendices

14.1 Appendix 1 – Abbreviations

AAKSS	Air Ambulance Kent, Surrey and Sussex
BOAST	British Orthopaedic Association Audit Standards for Traum a
BSUH	Brighton and Sussex University Hospitals
CT	Computed Tomography
ED	Emergency Department
EDs	Emergency Departments
MTC	Major Trauma Centre
NHS	National Health Service
NMTR	National Major Trauma Registry
PACS	Picture Archiving and Communication System
IR	Interventional Radiology
RSCH	Royal Sussex County Hospital
SECAmb	South East Coast Ambulance Service
STN	Sussex Trauma Network
T&O	Trauma and Orthopaedic
TQUIN	Trauma Quality Indicator
TU	Trauma Unit
TUs	Trauma Units
UHSx	University Hospitals Sussex, NHS Foundation Trust

14.2 Appendix 2 – BOAST 3 Guideline – The Management of Patients with Pelvic Fractures

British Orthopaedic Association | Association of Surgeons of Great Britain and Ireland | The Association of Coloproctology of Great Britain and Ireland

BRITISH ORTHOPAEDIC ASSOCIATION AUDIT STANDARDS for TRAUMA JAN 2018

The Management of Patients with Pelvic Fractures

Background and justification
Pelvic fractures must be managed within a trauma system with defined referral pathways. They can be associated with significant haemorrhage, urological injury and other injuries. Specialist units, based at Major Trauma Centres, should have the ability to provide multidisciplinary care for these patients as well as specialist orthogeriatric care for those sustaining fragility fractures.

Inclusions:
Patients of all ages with fractures of the pelvic ring.

Exclusions:
Isolated acetabular fractures, isolated low energy pubic rami fractures and pathological fractures.

Standards for Practice

1. When there is a suspected active bleeding from a pelvic fracture, apply a pelvic binder in the correct position. Thisshould be applied pre-hospital.
2. Patients with suspected pelvic fractures with signs of haemodynamic instability should be transported directly to aMajor Trauma Centre in accordance with network guidelines. If received into a trauma unit then resuscitation shouldbe commenced followed by immediate transfer to the Major Trauma Centre for definitive treatment of active bleeding.
3. All patients require IV Tranexamic Acid as soon as possible and ideally within an hour of injury. In the presence ofhaemodynamic instability, patients should be urgently resuscitated using blood products according to MassiveTransfusion Protocols.
4. Patients with suspected pelvic fractures from high-energy trauma should have a CT scan with IV contrast including head,chest, abdomen and pelvis on admission. This should include a head to toe scanogram.
5. All patients with blunt polytrauma undergoing damage control laparotomy should have imaging of the pelvis beforesurgery (X-ray or CT). All patients should have a pelvic binder in-situ during surgery and this should not be removed fora post binder pelvic X-ray until the patient is haemodynamically stable.
6. Active bleeding from the pelvis in patients who do not respond to resuscitation can be managed by surgical packing ofthe pelvis or interventional radiology with selective embolization of active arterial bleeding vessels. Major TraumaCentres must have a clear protocol in place for managing this situation.
7. All polytraumatised patients require a post-binder X-ray after resuscitation, even in the presence of a 'negative' CT scanbecause a well-applied pelvic binder can mask a catastrophic pelvic ring injury.
8. Each trauma network must have a clear protocol for binder removal but, ideally, it should be removed within 24-hoursof injury.
9. External fixation should be considered for temporary mechanical stabilisation when early definitive surgery cannot beperformed.
10. In displaced vertical shear fractures, traction should be considered when early definitive surgery cannot be performed.
11. Potential injury to the bladder or urethra should be suspected, diagnosed and managed according to The Managementof Urological Trauma Associated with Pelvic Fractures BOAST.
12. Open pelvic fractures associated with wounds to the lower abdomen, groin, buttocks, perineum, anus (includingsphincters) and rectum require urgent assessment by a consultant general or colorectal surgeon and wounddebridement as per the Open Fractures BOAST. Clinically and/or radiologically proven or suspected injuries to the anusand/or rectum may initially require construction of a defunctioning stoma. Nursing care of wounds to the perineum orbuttocks may also require a defunctioning stoma, although this is unlikely to be necessary for open pelvic fracturesassociated with wounds to the groin or lower abdomen alone. Please see over for further guidance.
13. Patients who are admitted to Trauma Units and require surgical stabilisation should be referred and safely transferredto a specialist centre within 24 hours.
14. Reconstruction of the pelvic ring should occur within 72 hours of the stabilisation of the patient's physiological state ifassociated injuries allow.
15. Patients who suffer displaced low energy fragility fractures of the pelvic ring, who are unable to mobilise due to pain,should be discussed with the specialist centre for consideration of surgical stabilisation.
16. Specialised units should have written local policies for thromboprophylaxis for patients with pelvic fractures, whichshould be followed and documented in the medical records.
17. Each network should submit appropriate data to the TARN, monitor performance against national standards and audittheir outcomes.
18. Patient follow-up should occur in a specialist pelvic trauma unit or rehabilitation clinic, to ensure full advice is availablefor the pain, physical, psychological, and urological disabilities, which are common adverse outcomes.
19. All patients who may be sexually active should receive written advice on sexual dysfunction in accordance to theguidelines from the British Association of Urological Surgeons.Each hospital should submit data to national databases (NHFD, FLS-DB and TARN) to monitor its performance against national benchmarks and quality standards.

Evidence base:
Professional Consensus. NICE Complex Trauma Guidelines: www.nice.org.uk/guidance/ng37; The Management of Urological Trauma Associated With Pelvic Fractures BOAST

Guidance for stoma formation with open pelvic fractures from the Association of Coloproctology of Great Britain and Ireland and the Association of Surgeons of Great Britain and Ireland:

- Each case should be considered carefully on its merits with regard to both the need for a stoma and optimum timing, as stoma formation is not without morbidity.
- Whenever possible, arrangements should be made to obtain and document informed consent beforehand. Stoma formation is usually not appropriate at initial damage control laparotomy.
- When a defunctioning colostomy is required simply for diversion after distal injury, the stoma may be created laparoscopically, depending upon available surgical expertise.
- A double barrelled, or a loop stoma with the distal end stapled off (to minimise overspill) is acceptable. In either case, the gastrointestinal tract distal to the stoma should be irrigated thoroughly, in order to reduce the risk of contamination resulting from retained stool.
- The position of the stoma should be determined, whenever possible, in conjunction with the orthopaedic surgical team. It should usually be sited in the upper abdomen, to ensure that it is sufficiently remote from the site of potential definitive pelvic surgical fixation.
- Injuries to the colon or rectum associated with open pelvic fractures should be treated, where possible, by resection or repair, defunctioning, irrigation of the distal bowel segment and pelvic drainage.

14.3 Appendix 3 – BOAST 4 Guideline – The Management of Urological Trauma Associated with Pelvic Fractures

British Orthopaedic Association

The British Association of Urological Surgeons

BRITISH ORTHOPAEDIC ASSOCIATION AUDIT STANDARDS for TRAUMA AUG 2016

The Management of Urological Trauma Associated with Pelvic Fractures

Background and justification
Urological trauma is rare and the incidence of severe urethral trauma is 1/million population/year. The majority of cases are due to blunt high-energy trauma with associated multi-system injuries and 80% of these cases are associated with pelvic fractures. Urological injuries are potentially fatal and can result in severe long-term disability.

Inclusions
Patients of all ages with potential bladder or urethral trauma.

Standards for Practice

1. All Major Trauma Centres and Trauma Units should have agreed written guidelines for the management of suspected urological trauma and these must be easily available within the Emergency Department.
2. All patients suffering high-energy trauma must have examination of the perineum and genitalia plus a rectal examination and the findings recorded in the medical records.
3. A single, gentle attempt at catheterization, by an experienced doctor, is permissible, even if the clinical or CT findings suggest urethral injury. In adults a 16F soft, silicone catheter should be used. The procedure and the presence of clear or blood stained urine must be recorded in the medical records.
4. The finding of blood stained urine mandates a retrograde cystogram via the catheter.
5. If the catheter will not pass or passes and drains only blood, do NOT inflate balloon. Withdraw catheter and perform a retrograde urethrogram.
6. If there is a urethral or bladder injury, the on-call urologist should be informed immediately so that a treatment plan can be formulated and recorded in the notes.
7. If a urethral catheter cannot be passed, a suprapubic catheter is required. This can be inserted during emergency laparotomy but otherwise a percutaneous suprapubic catheter should be placed.
8. A percutaneous, suprapubic catheter should be placed using a Seldinger technique under ultrasound control by a doctor experienced in this technique. The skin insertion point MUST be in the midline and should be 3 to 4 fingers-breadths above the symphysis. A 16F silicone catheter should be used.
9. The placement of a suprapubic catheter may alter the timing of pelvic fracture surgery and so the pelvic fracture service should be involved at an early stage.
10. If there is a urine leak from either the bladder or urethra, the pelvic fracture should be treated like an open long-bone fracture with appropriate antibiotics for 72 hours and early fracture fixation if the patient's physiology allows.
11. Intraperitoneal bladder rupture requires emergency laparotomy and direct repair.
12. Extraperitoneal rupture of the bladder may be treated by catheter drainage alone. However, in the presence of an unstable pelvic fracture, it is recommended that fracture reduction and fixation is performed along with primary repair of the bladder.
13. Extraperitoneal rupture of the bladder neck continues to leak even in the presence of a catheter and requires primary repair.
14. Bladder injuries identified during pelvic fracture surgery should be repaired at the same time and bladder drainage (via urethral or suprapubic catheter, as appropriate) ensured.
15. Bladder injury in children is rare but often more complex than adults. A paediatric urologist should always be involved early in the care of these injuries.
16. All urethral injuries in females and children must be discussed at a very early stage with the appropriate supra-regional specialist in urology.
17. The indications for primary (within 48 hours) urethral repair are: associated ano-rectal injury, perineal degloving, bladder neck injury, massive bladder displacement and penetrating trauma to the anterior urethra.
18. The recommended definitive treatment for urethral rupture in adult males is delayed repair at 3 months post injury. Each MTC should have a clear referral pathway to a recognised centre for reconstructive urethral surgery with a named urological lead consultant.
19. Primary re-alignment of the urethra during fracture surgery is not recommended as, in the hands of an inexperienced (urethral) surgeon, the risk of additional damage probably out-weighs the benefits. Accurate reduction of the bony pelvic ring indirectly re-aligns the urethra and facilitates delayed repair.
20. Male and female patients suffering displaced anterior pelvic fractures or urethral injury have a high incidence of urinary and sexual dysfunction. All patients should be provided with a written information sheet on this issue.
21. All Major Trauma Centres must have a linked Andrological service and all patients with displaced anterior pelvic fractures should be offered access to this service.
22. Hospitals receiving patients with these severe injuries must be part of the Trauma Audit and Research Network (TARN) and all centres performing delayed urethral reconstruction should participate in the national audit of this procedure.

Evidence base:
Consensus meeting BOA and BAUS 2015. www.nice.org.uk/guidance/ng37

Retrograde Urethrogram:

- Usually in Resuscitation room.
- X-ray plate under pelvis.
- 20 ml dilute IV contrast medium (10 ml contrast + 10 ml saline).
- Balloon of small Foley catheter into penile meatus and gently inflated.
- Hold catheter in place and inject contrast.
- AP Pelvis x-ray taken. Additional lateral if possible.

Catheter Cystogram:

- Usually in Resuscitation room.
- X-ray plate under pelvis.
- 300ml dilute IV contrast medium (150 ml contrast + 150 ml saline).
- Push catheter in a further 2-3 cm so balloon not blocking bladder neck.
- Inject contrast down catheter with bladder syringe and clamp catheter.
- AP Pelvis x-ray taken. Additional lateral if possible.
- Evacuate contrast and repeat AP Pelvis x-ray.