

Sussex Trauma Network

Guidelines for:

# Management of Open Lower-Limb Fractures



# Management of Open lower limb fracture

## Control Page

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## 1. Introduction

Open lower limb fractures are potentially limb threatening injuries and can lead to long term disability when complications in healing occur. National standards of care have been issued jointly by the British Association of Plastic, Reconstructive and Aesthetic Surgeons (BAPRAS) and the British Orthopaedic Association (BAO). (Appendix 1) These standards set out very clearly the standards of care expected to be followed by those involved in managing open lower limb fractures. The standards principally deal with initial wound and fracture management, antibiotic prophylaxis, definitive skeletal and soft tissue management and timing of this. A multidisciplinary approach is required for this patient cohort. Adverse outcomes such as infection and non-union are strongly linked to delays in definitive management or incorrect initial care and can result in loss of a potentially salvageable limb.

## 2. Purpose

The purpose of this SOP is to clearly define the care pathway for patients with open lower limb fractures including referral pathways to and from the Major Trauma Centre (MTC) (Royal Sussex County Hospital (RSCH)) and network Trauma Units (TUs), initial management of the limb, antimicrobial requirements and definitive skeletal and soft tissue management. This SOP will be linked to BOAST 4 guidelines (appendix 2) which are drawn from the BAPRAS/BOA national standards.

## 3. Definitions

Open fracture: A broken bone in communication with the environment through a wound in the skin.

Gustilo Anderson classification of open fractures:

Grade I:

The wound is less than 1cm long. It is usually a moderately clean puncture, through which a spike of bone has pierced the skin. There is little soft-tissue damage and no sign of crushing injury. The fracture is usually simple, transverse, or short oblique, with little comminution.

Grade II:

The laceration is more than 1 cm long, and there is no extensive soft-tissue damage, flap, or avulsion. There is slight or moderate crushing injury, moderate comminution of the fracture, and moderate contamination.

Grade III:

These are characterized by extensive damage to soft-tissues, including muscles, skin, and neurovascular structures, and a high degree of contamination. The fracture is often caused by high velocity trauma, resulting in a great deal of comminution and instability.

- III A – Soft tissue coverage of the fractured bone is adequate
- III B – Extensive injury to, or loss of soft tissue, with periosteal stripping and exposure of bone, massive contamination, and severe comminution of the fracture. After debridement and irrigation a local or free flap is needed for coverage.

- III C – Any open fracture that is associated with an arterial injury that must be repaired, regardless of the degree of soft tissue injury.

Time from injury to...:            Time in hours from injury occurring to (intervention)

#### **4. Responsibilities, Accountabilities and Duties**

##### **4.1 Polytrauma Consultant on call:**

The polytrauma consultant takes overall responsibility for patients with open lower limb fractures once notified of their arrival. Duties include ensuring patients are managed according to the SOP and that junior orthopaedic staff are aware of the SOP and BOAST 4 guidelines. The polytrauma consultant of the day will ensure availability to assess patients with open lower limb fractures and liaise with the plastic surgery consultant of the day regarding joint surgical procedures and soft tissue coverage plans.

##### **4.2 Emergency Medicine Consultant on duty (MTC):**

The emergency medicine consultant on duty on the MTC takes overall responsibility for the patients with open lower limb fractures from the time they arrive in the emergency department until the polytrauma consultant takes over care. They also are responsible for ensuring that junior staff are aware of and follow this SOP and BOAST 4 guidelines for open lower limb fractures.

##### **4.3 Emergency Medicine Consultant on duty (TU):**

The emergency medicine consultant on duty on the TU takes overall responsibility for the patients with open lower limb fractures from the time they arrive in the emergency department until the orthopaedic consultant on call (TU) takes over care or the patient is transferred to the MTC. They also are responsible for ensuring that junior staff are aware of and follow this SOP and BOAST 4 guidelines for open lower limb fractures.

##### **4.4 Consultant Plastic/Orthoplastic Surgeon of day (MTC) (Monday – Friday):**

The plastic surgery consultant of the day in the MTC will ensure availability to assess patients with open lower limb fractures and liaise with the polytrauma consultant on call regarding joint surgical procedures and soft tissue coverage plans. If the patient requires transfer to Queen Victoria Hospital for free tissue transfer to cover the leg wound, it is the responsibility of the plastic surgeon of the day to arrange this and ensure it is done in a timely manner and to liaise with the Trauma consultant of the week and Trauma coordinators in Queen Victoria Hospital regarding the transfer, patient details, necessity for theatre and any other relevant issues such as other injuries or need for CT angiograms.

##### **4.5 Consultant Orthopaedic Surgeon on call (TU):**

The orthopaedic surgery consultant on duty on the TU takes overall responsibility for the patients with open lower limb fractures from the time they are notified of the patients arrival in the TU until discharge or the patient is transferred to the MTC. They are responsible for ensuring patients that need to be transferred to the MTC

are transferred safely and promptly in accordance with transfer protocols. They also are responsible for ensuring that junior staff are aware of and follow this SOP and BOAST 4 guidelines for open lower limb fractures.

#### 4.6 Orthopaedic Registrar on call (MTC):

The orthopaedic registrar on call (MTC) is responsible for implementation of this SOP and managing the patient accordingly.

#### 4.7 Orthopaedic Registrar on call (TU):

The orthopaedic registrar on call (TU) is responsible for implementation of this SOP and managing the patient accordingly.

#### 4.8 Emergency Medicine Registrar on duty (MTC):

The emergency medicine registrar on duty (MTC) is responsible for implementation of this SOP and managing the patient accordingly.

#### 4.9 Emergency Medicine Registrar on duty (TU):

The emergency medicine registrar on duty (TU) is responsible for implementation of this SOP and managing the patient accordingly.

#### 4.10 Consultant Vascular Surgeon on call (MTC):

The consultant vascular surgeon on call (MTC) takes joint responsibility with the polytrauma consultant for patients with open lower limb fractures with vascular injuries. The vascular surgery consultant on call in the MTC will ensure availability to assess patients with open lower limb fractures with vascular injuries and liaise with the polytrauma consultant on call regarding joint surgical procedures and vascular surgery plans.

#### 4.11 Vascular Registrar on call (MTC):

The emergency medicine registrar on duty is responsible for implementation of this SOP and managing the patient accordingly for patients with a vascular injury and an open lower limb fracture.

#### 4.12 Prehospital Paramedic in charge on scene:

The prehospital paramedic in charge on scene is responsible for managing the patient in accordance with Advanced Trauma Life Support (ATLS) guidelines and for ensuring the patient is brought to the correct treatment location.

#### 4.13 Sussex Trauma ODN Board:

Sussex Trauma ODN Board is responsible for disseminating this SOP and for investigation of non-compliance with the SOP. They are also responsible for ensuring that the SOP is updated to reflect newer clinical guidelines as necessary.

## 5. Standard Operating Procedure

## 5.1 Prehospital Care:

After initial management of the patient at the scene in accordance with ATLS guidelines, the patient should be transferred without delay to the emergency department of the TU or MTC. The majority of patients with open lower limb fractures and all those with grade 3 fractures or other injuries will require transfer to the MTC.

## 5.2 Emergency department management:

5.2.1 Intravenous antibiotics are administered as soon as possible, ideally within 3 hours of injury: Co-amoxiclav(1.2g) 8 hourly and are continued for 72 hours or until definitive wound closure, whichever is sooner. In penicillin allergic patients, Teicoplanin 400mg iv 12 hourly for three doses, then 400mg once daily (increase to 600mg once daily if over 100kg) and Gentamicin 5 mg/kg iv as per protocol and Metronidazole 500 mg iv 8 hourly should be given for 72 hours or until definitive wound closure whichever is sooner.

5.2.2 The vascular and neurological status of the limb is assessed systematically and repeated at intervals, particularly after reduction of fractures or the application of splints.

5.2.3 The wound is handled only to remove gross contamination and to allow photography, then covered in saline soaked gauze and an impermeable film to prevent desiccation.

5.2.4 The limb, including the knee and ankle, is splinted.

5.2.5 Anteroposterior (AP) and lateral xrays of the full length of the lower leg including knee and ankle joints are obtained and of the hip, femur and foot if indicated.

5.2.6 The wound in open lower limb fractures in children is treated in the same way as adults

5.2.7 The polytrauma on call team are informed of the patient's arrival and status.

5.2.8 The plastic/orthoplastic surgeon of the day (Monday – Friday) is informed by the polytrauma team of the patient.

## 5.3 Initial wound debridement:

5.3.1 The 6 hour rule does not apply for solitary open fractures. Vascular impairment requires immediate surgery and restoration of the circulation using shunts, ideally within 3-4 hours, with a maximum acceptable delay of 6 hours of warm ischaemia. Compartment syndrome also requires immediate surgery, with 4 compartment decompression via 2 incisions. ( See BOAST 4 guidelines for incision locations) Urgent surgery is also needed in some multiply injured patients with open fractures or if the wound is heavily contaminated by marine, agricultural or sewage matter.

- 5.3.2 The primary surgical treatment (wound excision and fracture stabilisation) of severe open lower limb fractures only takes place in a non-specialist centre if the patient cannot be transferred safely.
- 5.3.3 The wound, soft tissue and bone excision (debridement) is performed by Consultant Orthopaedic Surgeons (and Plastic/Orthoplastic Surgeons if possible) on the scheduled polytrauma operating list within normal working hours and within 24 hours.
- 5.3.4 At the time of surgery Co-amoxiclav (1.2g) is given if the dose is due and Teicoplanin 600 mg iv and Gentamicin (160 mg iv) are administered at first debridement, soft tissue closure or skeletal stabilisation (i.e. before every surgical procedure).
- 5.3.5 If definitive skeletal and soft tissue reconstruction is not to be undertaken in a single stage, then vacuum foam dressing or an antibiotic bead pouch is applied until definitive surgery.
- 5.4 Definitive skeletal fixation and definitive soft tissue cover:
  - 5.4.1 Definitive skeletal stabilisation and wound cover are achieved within 72 hours and should not exceed 7 days. This should be done at the time of definitive skeletal fixation if possible and in conjunction with the Plastic/Orthoplastic Consultant if possible.
  - 5.4.2 Vacuum foam dressings are not used for definitive wound management in open fractures.
  - 5.4.3 After wound closure is achieved, antibiotics are stopped.
  - 5.4.4 The wound in open lower limb fractures in children is treated in the same way as adults
- 5.5 Transfer of patient to Queen Victoria Hospital:
  - 5.5.1 If the patient requires transfer to Queen Victoria Hospital for definitive soft tissue wound coverage, the plastic/orthoplastic surgery consultant of the day should be informed as soon as possible. They will coordinate transfer of the patient. Copies of operations and investigations to date need to accompany the patient. Definitive skeletal fixation should be in place before transfer and a clear orthopaedic postoperative and follow up plan should be documented.
  - 5.5.2 If there is no plastic surgeon on site that day, the plastic surgeon of the next day should be contacted regarding the patient. Should they not be available, the trauma consultant of the week in Queen Victoria Hospital should be contacted next.

## **6. Training Implications**

All within the trauma team must be aware of the Guideline and ensure that the guideline is followed

## **7. Monitoring Arrangements**



7.1 Any patients whose treatment falls outside this guideline should be raised onto the network clinical governance log, and discussed through internal clinical governance mechanisms.

7.2 TARN

7.3 Lower Limb Database

Outcomes: Time to definitive fixation

Time to definitive soft tissue cover

Grade of most senior orthopaedic surgeon for initial debridement

Grade of most senior orthopaedic surgeon for definitive skeletal fixation

Presence of plastic surgeon for initial debridement

Grade of most senior orthopaedic surgeon for definitive skeletal fixation

Skeletal fixation and soft tissue coverage achieved at same procedure

Infection rate

Superficial

Deep

Time to union

Non union rate

## **8. Equality Impact Assessment Screening**

## **9. Links to other SOPs and Trust policies**

This SOP should link to other trauma SOPs including polytrauma and trauma SOPs.

## **10. Associated documentation and Appedices**

Appendix 1:

Management of Severe Open Lower Limb Fractures (Polytrauma and Isolated)  
Flowchart

Appendix 2

Version Control Sheet

Appendix 3

Plan for Dissemination of Standard Operating Procedures

## **11. References**

British Association of Plastic, Reconstructive and Aesthetic Surgeons (BAPRAS) / British Orthopaedic Association (BAO). Standards for the management of open fractures of the lower limb. 2009

Guideline title

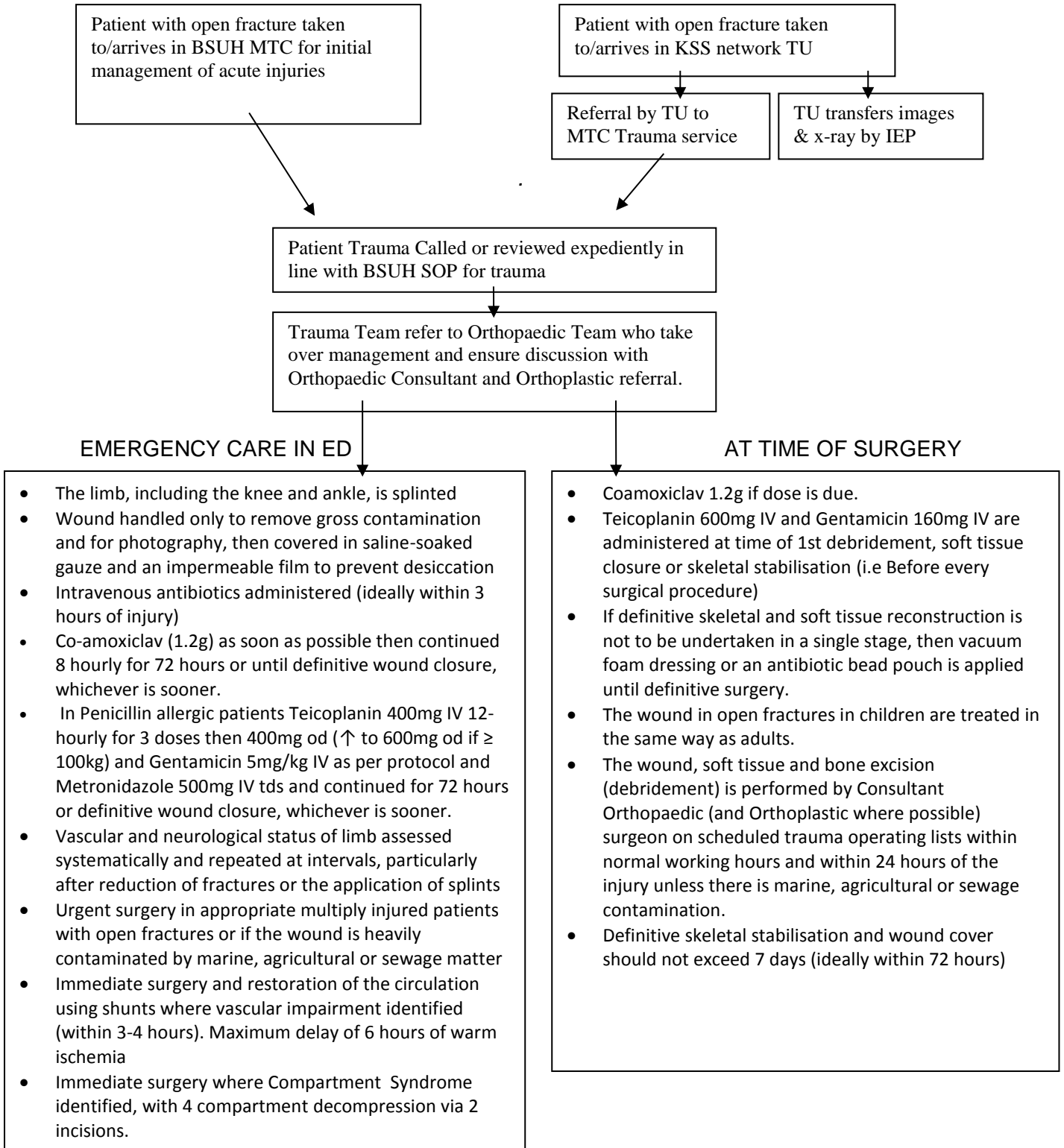
British Orthopaedic Association and British Association of Plastic, Reconstructive and Aesthetic Surgeons. Standard for Trauma – 2009 BOAST 4: The management of severe open lower limb fractures.

National major trauma peer review measures 2016 – 1C-107

**Appendix 1**

**Appendix 1**

**The Management of Severe Open Lower Limb Fractures (Polytrauma and Isolated)**



All clinicians treating open fractures should have read the BOAST 4 guidelines.

Surgical debridement and skeletal stabilisation should be undertaken by a senior surgeon experienced in the management of open fractures.

Please note that local antibiotic guidelines differ from national BOAST 4 guidelines.

**Appendix 2 - Version Control Sheet**

<b>Version</b>	<b>Date</b>	<b>Author</b>	<b>Status</b>	<b>Comment</b>
1				

### Appendix 3 - Plan for Dissemination of Guidelines

To be completed and attached to any document which guides practice when submitted to the appropriate committee for consideration and approval.

<b>Title of document:</b>	<b>Management of open lower limb fractures</b>		
<b>Date finalised:</b>		<b>Dissemination lead:</b>	
<b>Previous document already being used?</b>	<b>No</b>	<b>Print name and contact details</b>	
<b>If yes, in what format and where?</b>	N/A		
<b>Proposed action to retrieve out of date copies of the document:</b>	N/A		
<b>To be disseminated to:</b>	<b>How will it be disseminated, who will do it and when?</b>	<b>Format (i.e. paper or electronic)</b>	<b>Comments:</b>
<b>Orthopaedic Department</b>	<b>Trust email Trauma ODN</b>	<b>electronic</b>	
<b>Emergency Department</b>	<b>Trust email Trauma ODN</b>	<b>electronic</b>	
<b>Anaesthetic Department</b>	<b>Trust email Trauma ODN</b>	<b>electronic</b>	
<b>Micorbiology Department</b>	<b>Trust email Trauma ODN</b>	<b>electronic</b>	
<b>Theatres</b>	<b>Trust email Trauma ODN</b>	<b>electronic</b>	
<b>Plastic Surgery Consultants (visiting from QVH)</b>	<b>QVH trust email Trauma ODN</b>	<b>electronic</b>	

#### Dissemination Record - to be used once document is approved

<b>Date put on register / library of SOPs:</b>		<b>Date due to be reviewed:</b>	
<b>BSUH</b>			
<b>ESHT</b>			
<b>WSHT</b>			

<b>Disseminated to: (either directly or via meetings, etc.)</b>	<b>Format (i.e. paper or electronic)</b>	<b>Date disseminated:</b>	<b>No. of copies sent:</b>	<b>Contact details / comments:</b>
Network CAG	Electronic			Barbara Rayner

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