CORTICES
ADVANCING EVIDENCE-BASED ORTHOPEDIC CARE

Boston Children's Orthopedics & Sports Medicine

CORTICES: Type III Open Fractures

Data Entry Guide

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INTRODUCTION

Gustilo-Anderson Type III open fractures represent a severe subset of musculoskeletal injuries encountered in pediatric orthopaedic trauma and are associated with substantial risks of infection, complications, and additional surgical intervention. Treatment principles have largely been extrapolated from adult literature and there remains limited multicenter pediatric data describing contemporary management practices and outcomes following these injuries. The impact of antibiotic timing, antibiotic selection, and perioperative management strategies on infection risk remains incompletely understood in children. Through a multicenter retrospective review of pediatric patients treated for Type III open long bone fractures at CORTICES institutions, this study aims to characterize infection rates, complication profiles, and current practices while identifying factors associated with adverse outcomes.

Objectives

- Primary Objectives
  - Determine the final follow-up infection rate following treatment of pediatric Type III open long bone fractures.
  - Characterize infection severity, antibiotic requirements, and need for surgical washout.

- Secondary Objectives
  - Evaluate the relationship between antibiotic management (timing, regimen, and duration) and infection.
  - Assess the association between perioperative factors and infection risk.
  - Estimate the overall 180-day complication rate following treatment.
  - Describe contemporary treatment practices across participating CORTICES institutions

Formatting Record IDs

When entering your patient data, you will be asked to enter a new or existing Record ID. Please use your 2-digit Unique Site Number (shown below) for your site's data.

Site #	Site	Site #	Site
20	Boston Children's	32	Nationwide Children's
22	Children's Atlanta	33	Rady Children's
23	Children's Colorado	34	Seattle Children's
24	Children's Dallas	35	St. Louis Children's
25	Children's LA USC	36	Texas Children's
26	Children's Philadelphia	37	Vanderbilt Children's
27	Cincinnati Children's	38	UCSF
28	CS Mott Children's (Michigan)	39	Nemours Children's Delaware
29	Gillette Children's	40	Nemours Children's Florida
30	Le Bonheur Children's	41	Phoenix Children's
31	Lurie Children's		

To generate your REDCap Record IDs, please use the following format (below), where '**S**' is the 2-digit site code and '**P**' is the 3-digit record ID. The IDs should be sequentially recorded.

S S – P P P

2-digit Unique **Site** Number

3-digit Sequential **Patient** ID Number

For example, BCH's first patient would have a REDCap ID of "20-001". BCH's twentieth patient would have a REDCap ID of '20-020'. It is crucial that sites use the correct site ID to avoid duplicating REDCap IDs.

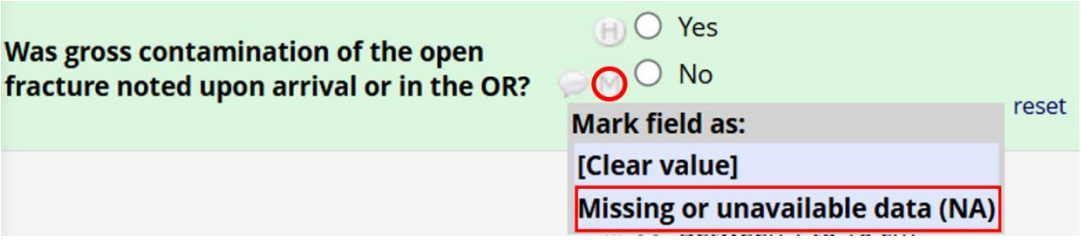
NOTE: If you were a site involved with beta-testing this REDCap and are inputting training data, please review all fields for your test patients as the REDCap could have changed after beta testing. You may keep the same Record ID for the test patient, but the **data must be re-validated**.

Data Collection Housekeeping

When entering data, please make note of the following rules:

1. **Data Collection Form Status:** Mark REDCap page status for each form as appropriate:
   a. Use Incomplete **(RED)** to indicate that data has not been fully entered yet.
   b. Use Complete **(GREEN)** to indicate all data points are fully entered including missing codes.

2. **Missing Code:** Please utilize the missing code (i.e., no fields should be left blank) when appropriate. All fields marked with circular "**M**" indicate that a **missing data code** may be used. Apply **"NA" [Missing or Unavailable]** when information cannot be found in the medical record or reasonably inferred from available documentation. Use this code only after confirming the data is truly missing (see screenshot below).



Acquiring a Patient Cohort

Please use the following combination of medical codes to identify the appropriate patient cohort:
Eligible patients will be identified via text searches and/or chart review using ICD9/10 codes. The keywords for the text search include "GA Type III", "Grade III", and "open fracture". These search terms are often present in orthopaedic consultation notes, orthopaedic clinic visit notes, operative reports, and ED admission notes.

Diagnostic Codes

For **ICD-10** searches, the letter 'C' in the final position indicates a type III open fracture. The base codes for each eligible bone are as follows:

Femur -- S72.XXXC
Tibia/Fibula -- S82.XXXC
Humerus -- S42.XXXC
Radius/Ulna -- S52.XXXC

For **ICD-9** codes, eligible patients will fall within the code range 810-829 with an odd value after the decimal point (ex: 810.3)

Natural Language Processing (optimal strategy)

If available at your site, search operative notes, ED notes, orthopaedic consult notes, hospital discharge summaries, inpatient progress notes for the following text: "type III open fracture", "grade III open fracture", "GA III", "GA IIIa", "GA IIIb", "GA IIIC", "type IIIa", "type IIIb", "type IIIc"

CPT Codes

11010, 11011, and 11012

These codes will capture all open surgical management of a fracture, including ineligible fractures. Please confirm patient eligibility and remove any GA I/II or Salter Harris type III fractures that may be identified via these codes.

Ideal Cohort Search Strategy

- Natural language processing (NLP) model for type III open fractures (if available at your institution)
- Cross-reference with ICD-9/10 diagnosis codes
- CPT code + relevant ICD pairing should capture open GA III fractures
- Manually screen ED visit note, orthopaedic progress notes, operative reports, and postoperative clinic visit notes to confirm that all fractures are open GA type III fractures

We recommend the following approach in being able to generate a viable patient cohort for this study:

1) Enter the recommended approach to acquire patient list.
2) Screen the complete list of patients and confirm that each patient has an open fracture.
3) Confirm that the open fracture is a Gustilo-Anderson Type III open fracture. Please refer to the images below for assistance with fracture classification:

ABRIDGED VERSION

- Type I
  - wound ≤1 cm, minimal contamination or muscle damage
- Type II
  - wound 1-10 cm, moderate soft tissue injury
- Type IIIA
  - wound usually >10 cm, high energy, extensive soft-tissue damage, contaminated
  - adequate tissue for flap coverage
  - farm injuries are automatically at least Gustillo IIIA
- Type IIIB
  - extensive periosteal stripping, wound requires soft tissue coverage (rotational or free flap)
- Type IIIC
  - vascular injury requiring vascular repair, regardless of degree of soft tissue injury
- Most accurate way to grade open fratures is by intra-operative examination

COMPLETE VERSION

Gustilo Classification					
	I	**II**	**IIIA**	**IIIB**	**IIIC**
Images					
Energy	Low	Moderate	High	High	High
Wound size	≤ 1 cm	1-10 cm	usually >10 cm	usually >10 cm	usually >10 cm
Soft tissue damage	Minimal	Moderate	Extensive	Extensive	Extensive
Contamination	Clean	Moderate	Extensive	Extensive	Extensive
Fracture Comminution	Minimal	Moderate	Severe	Severe	Severe
Periosteal Stripping	No	No	Yes	Yes	Yes
Skin Coverage	Local coverage	Local coverage	Local coverage	**Free tissue flap or rotational flap coverage**	Typically requires flap coverage
Vascular Injury	Normal	Normal	Normal	Normal	**Exposed fracture with arterial damage that requires repair**

Antibiotics based on Gustilo Classification			
	Grade I and II	Grade IIIA, IIIB and IIIC	Special considerations
Antibiotics	1st generation cephalosporin (e.g. cefazolin)	1st generation cephalosporin for gram positive coverage Aminoglycoside (such as gentamicin) for gram negative coverage	Penicillin should be added if concern for anaerobic organism (farm injury) Flouroquinolones (e.g. ciprofloxacin) should be used for fresh water wounds or salt water wounds (can be used if allergic to cephalosporins or clindamycin Doxycycline and 3rd or 4th-generation cephalosporin (e.g. ceftazidime) can be used for salt water wounds

Please note that some notes may reference a type III fracture using the Salter-Harris fracture classification system. This fracture classification is NOT the same as a Gustilo-Anderson classification, and the presence of an open fracture should be confirmed even when the note says 'type III'

4) If the fracture type is unclear, confirm cases with your respective site PI to determine if patient meets eligibility criteria.
5) All GA type III open fractures identified as eligible should be entered into the REDCap eligibility form for final verification.
6) Please keep an internal record of eligible fractures caused by lawnmower or ballistic injury mechanisms for identification for future follow-up studies. Although these patients will be marked as ineligible on the REDCap screening form, they should still be entered.

DATA COLLECTION

Eligibility Form

Inclusion:

1) Is the participant between 0 and 18 years of age at presentation?

Yes (**Include**) No (**Exclude**)

2) Has the patient been diagnosed with a Gustilo-Anderson Type III open fracture of a long bone?

Yes (**Include**) No (**Exclude**)

3) Was the patient's Type III open fracture treated between the time period of 01/01/2015 to 05/31/2026?

Yes (**Include**) No (**Exclude**)

Exclusion:

1) Is the patient immunocompromised?

Yes (**Exclude**) No (**Do not exclude**)

Conditions include known immunodeficiency, undergoing chemotherapy, taking chronic immunosuppressive medications, or otherwise having a condition that impairs the immune system

2) Was the mechanism of injury a firearm-related incident (ballistic injury)? ***

Yes (**Exclude**) No (**Do not exclude**)

3) Was the mechanism of injury a lawnmower-related incident? ***

Yes (**Exclude**) No (**Do not exclude**)

***If patient's mechanism of injury was lawnmower or ballistics related, please indicate so in your internal screening log and save the patient's MRN for potential future spin-off studies. Please also input their record IDs in REDCap and mark them ineligible.

Please confirm eligibility of the patient with the final question before moving onto the 'Data Collection' form

Is the participant eligible for data collection?

a. **Yes** ➔ Proceed with data collection
b. **No**

NOTE: If your answers to eligibility questions are not aligned with prior responses, you will get a warning:

Warning: Your responses to the eligibility questions do not align with the final eligibility determination.

Please confirm all values above

If the warning appears, please re-visit the prior questions and make sure there are no inconsistencies when determining eligibility.

Data Collection Forms

Instrument #1: Demographic & Injury Data

PATIENT & DEMOGRAPHIC DATA

Q) Date of Birth [Input format: MM-DD-YYYY]

Q) Sex at Birth

- 1 Male
- 2 Female

Q) Ethnicity

- 1 Hispanic/Latino
- 0 Not Hispanic/Latino

Q) Race (Checkbox)

- 1 White
- 2 Black or African American
- 3 Native American or Alaskan Native
- 4 Asian
- 5 Hispanic or Latino
- 6 Hawaiian or Pacific Islander
- 99 Other **enter as textbox when branching**
  - Q) If other, please specify: [Input as a text box]
- 555 Refused

Q) Height at presentation [Go up to 2 decimal points (cm)]

Q) Weight at presentation [Go up to 2 decimal points (kg)]

Q) BMI [Auto calculated (if both height and weight provided)]

Q) Does the patient have any serious comorbidities?

- 1 Yes **select Yes and specify type of comorbidities if any of the following apply**
  - Q) If yes, specify comorbidities:
    - 1 Metabolic or primary bone disease (OI, Rickets, etc.)
    - 2 Neuromuscular disorder (CP, SMA, Spina bifida, developmental delay, etc.)
    - 3 Endocrine
    - 4 Gastrointestinal/hepatic
    - 5 Immunologic
    - 6 Cardiopulmonary
    - 7 Renal
    - 99 Other **enter as textbox when branching**
      - Q) If other, please specify: [Input as a text box]
- 0 No

INJURY CHARACTERISTICS

Q) Date of Injury [Input format: MM-DD-YYYY]

Q) Mechanism of injury [Commonly listed on the ED visit note]

- 1 Motor vehicle collision **specify patient's role if MVC selected**
  - Q) Patient's role in the motor vehicle collision:
    - 1 Driver

2 Passenger

2 Pedestrian struck by motor vehicle

3 Bicycle/Scooter **specify if motor vehicle was involved**

Q) For bicycle/E-bike or scooter/E-scooter injuries, was a motor vehicle involved?

0 No, motor vehicle involved was not involved

1 Yes, patient struck by motor vehicle while on bicycle/e-bike or scooter/e-scooter

4 E-bike/E-scooter **specify if motor vehicle was involved**

5 Playground

6 Trampoline

7 Sport

8 Fall

9 ATV/UTV **inclusive of go-karts**

10 Motorcycle **specify if motor vehicle was involved**

99 Other **enter as textbox when branching**

Q) If other, please specify: [Input as a text box]

If options **3**,**4**, or **10** was selected for mechanism of injury, answer the following question:

Q) For bicycle/E-bike, scooter/E-scooter injuries, or motorcycle injuries, was a motor vehicle involved?

0 No, motor vehicle involved was not involved

1 Yes, patient struck by motor vehicle while on bicycle/e-bike or scooter/e-scooter

Q) Did the patient sustain multiple Type III open fractures at the designated long bone fracture sites?***

1 Yes **see branching question**

0 No

If yes: Q) Do the Type III open fractures involve distinct eligible fracture site, different articulating surfaces, or separate injury patterns that were treated as discrete injuries?***

1 Yes (if Yes, please fill out multiple events of the repeating "Fracture & Surgical Characteristics" instrument)

0 No

***** Data Collection Instruction**

For this study, eligible Type III open long bone fracture sites include:

Upper extremity: humerus and radius/ulna

Lower extremity: femur and tibia/fibula

In REDCap, Type III open fractures should generally be recorded as separate injury events when they involve distinct eligible long bone sites. Each separate injury event should receive its own repeatable **"Fracture & Surgical Characteristics"** instrument.

However, if multiple Type III open fractures are part of the same joint-level injury complex within the same limb, they should be recorded as **one injury event**. This applies when the fractures involve the same articulating region, share the same soft-tissue/open injury zone, and are treated clinically as one combined injury.

Example: An **ipsilateral distal humerus and olecranon Type III open fractures** may be recorded as **one elbow injury event** because they involve the same articulating region and are likely managed as a single periarticular injury complex.

By contrast, fractures involving distinct eligible long bone sites should be recorded separately, even if they occur on the same side of the body.

Example: A **right Type III open shaft humerus fracture** and a **right Type III open shaft radius fracture** should be recorded as **two separate injury events** unless they are clearly part of the same elbow-level injury complex.

Please see below for additional different clinical scenarios and how the fracture should be recorded in the database:

Clinical Scenario	Classification	Number "Fracture & Surgical Characteristics" Repeating Instruments
Ipsilateral distal humerus and olecranon Type III open fractures	Same extremity and one injury complex (at the elbow level)	1
Ipsilateral tibial shaft and distal tibia Type III open fractures	Same tibia injury region within one extremity	1
Right Type III open humeral shaft fracture and right Type III open radial shaft fracture	Distinct long bone injury involvement within one extremity	2
Right Type III open tibia fracture and left Type III open femur fracture	Different extremities on contralateral sides	2
Right Type III open humerus fracture and right Type III open tibia fracture	Different extremities/body regions	2

Q) Did the patient sustain other fractures (other than the open fracture)?
Commonly listed on initial ED visit notes or orthopaedic consult/inpatient progress notes

1 Yes **enter as textbox when branching**
Q) If other fractures are noted, please specify: [Input as a text box]
0 No

Q) Injury severity score (ISS): [Input format: Integer]
At BCH, this is collected as part of our trauma registrar, but please defer to your site-specific resources to determine this score. Emergency medicine and trauma specialties will be the most familiar with these metrics and their collection strategy.

Q) ISS Category **specify based on ISS score; leave blank if ISS cannot be determined with chart review**

1 Mild (1-8)
2 Moderate (9-15)
3 Severe (16-75)

Q) Is the open fracture injury part of a polytrauma incident?
Polytrauma may be indicated on an ED visit note, with an ISS greater than 15, or injuries to multiple body systems

1 Yes
0 No

Q) Non-orthopaedic injuries sustained?

1 Yes **specify if additional non-ortho surgery required**
0 No

If yes: Q) Non-orthopaedic surgery required?

1 Yes **specify type of non-ortho surgery**
0 No

If yes: Q) Type of non-orthopaedic surgery performed (**Checkbox**) **Please refer to the specialty of the surgeon performing the procedure**

1 General/Trauma surgery
2 Plastic surgery
3 Urology
4 Neurosurgery
5 Dental
6 Vascular surgery
7 Oral & Maxillofacial Surgery (OMFS)
99 Other **enter as textbox when branching**

Q) Specify other type of non-orthopaedic surgery: [Input as a text box]

Q) Head injury sustained. **Includes concussion or head bleeding (including intracranial hemorrhage)**
Likely noted in ED note or trauma/neurosurgery consultation.

1 Yes
0 No

Instrument #2: Fracture & Surgical Characteristics

FRACTURE CHARACTERISTICS

Please create separate repeating instance for **each distinct extremity** sustaining a Type III open fracture. Multiple Type III open fractures may be grouped into one instance only if they are part of the same limb and periarticular/joint-level injury complex and treated as one combined injury.

Q) Open fracture location **specify the relevant anatomical location where the open fracture occurred**

1 Femur
2 Tibia and/or fibula
3 Humerus
4 Radius and/or ulna

Q) Open fracture location **specify the relevant anatomical location where the open fracture occurred**

1 Left
2 Right

Q) Gustilo-Anderson Type III Fracture Subtype

1. Type IIIa → adequate soft tissue coverage of fracture despite high energy trauma or extensive laceration or skin flaps
2. Type IIIb → Inadequate soft tissue coverage with periosteal stripping that requires a rotational or free flap. Please reference operative notes for skin coverage details with special attention to plastic surgery notes
3. Type IIIc → any open fracture that is associated with a vascular injury requiring repair. Will be noted in ED note or as a repair procedure in operative reports)

All GA Type III open fractures have extensive soft tissue injury, usually greater than <10cm. Any open fracture caused by a farm injury is automatically a Type III. Some GA Type III fractures may be less than 10 cm if there is a high-energy injury mechanism, extensive soft tissue injury, requiring flap and/or graft coverage, vascular injuries, or farm contamination.

Type IIIB operative note example:

Procedure:
1. Surgical preparation of wound bed measuring 8 cm x 5 cm (40 cm²)
2. IRRIGATION AND DEBRIDEMENT WITH VAC DRESSING CHANGE (Right),
SPLIT THICKNESS SKIN GRAFT (Right) measuring 40 cm²

Type IIIc operative note example:

PRE-OPERATIVE DIAGNOSIS: Left upper extremity distal intraarticular distal humerus fracture (open injury) with median nerve and brachial artery compromise.

POST-OPERATIVE DIAGNOSIS: Left distal humerus intraarticular fracture (open fracture) with complete laceration of left brachial artery and left median nerve.

PROCEDURES PERFORMED: 1. Reconstruction of left brachial artery with autogenous reversed saphenous vein graft over a distance of 10 centimeters. 2. Reconstruction of median nerve over a distance of 7 centimeters with three
7 centimeter sural nerve autografts, cabled. 3. Left forearm flexor compartment fasciotomy. 4. Left hand fasciotomy for ischemia re-perfusion injury.

Reference orthopaedic consult notes, operative notes, and postoperative clinic visit notes to search for GA III fracture subtype mentions.

ABRIDGED VERSION

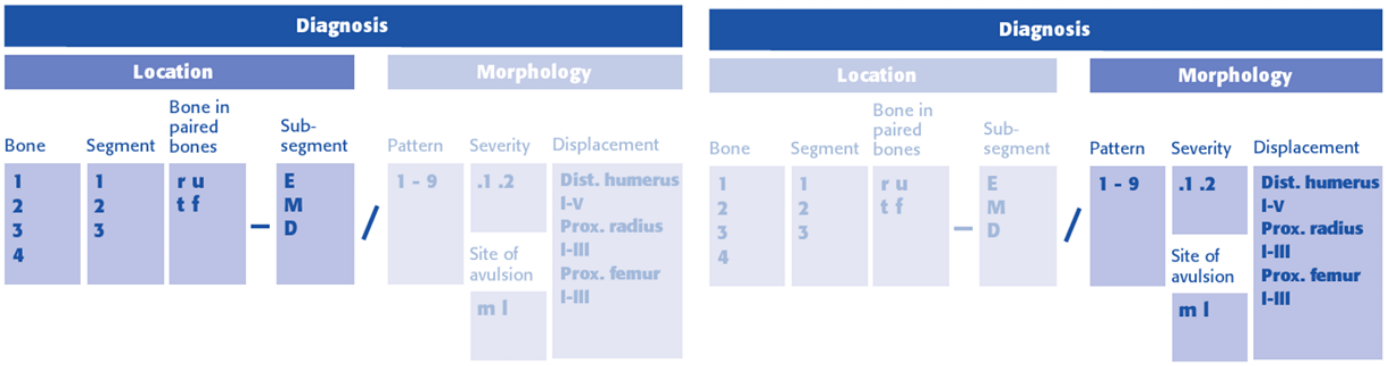
- Type I
  - wound ≤1 cm, minimal contamination or muscle damage
- Type II
  - wound 1-10 cm, moderate soft tissue injury
- Type IIIA
  - wound usually >10 cm, high energy, extensive soft-tissue damage, contaminated
  - adequate tissue for flap coverage
  - farm injuries are automatically at least Gustillo IIIA
- Type IIIB
  - extensive periosteal stripping, wound requires soft tissue coverage (rotational or free flap)
- Type IIIC
  - vascular injury requiring vascular repair, regardless of degree of soft tissue injury
- Most accurate way to grade open fratures is by intra-operative examination

COMPLETE VERSION

Gustilo Classification					
	I	**II**	**IIIA**	**IIIB**	**IIIC**
Images					
Energy	Low	Moderate	High	High	High
Wound size	≤ 1 cm	1-10 cm	usually >10 cm	usually >10 cm	usually >10 cm
Soft tissue damage	Minimal	Moderate	Extensive	Extensive	Extensive
Contamination	Clean	Moderate	Extensive	Extensive	Extensive
Fracture Comminution	Minimal	Moderate	Severe	Severe	Severe
Periosteal Stripping	No	No	Yes	Yes	Yes
Skin Coverage	Local coverage	Local coverage	Local coverage	**Free tissue flap or rotational flap coverage**	Typically requires flap coverage
Vascular Injury	Normal	Normal	Normal	Normal	**Exposed fracture with arterial damage that requires repair**

Q) AO/OTA Fracture and Dislocation Classification ***To be inputted by PI****

Text Format = [Bone][Segment]-[Subsegment] / [Child][Severity][Displacement].



Please download the Pediatric Poster & Brochure for Long-bone fracture classification as a reference from this link: https://www.aofoundation.org/trauma/clinical-library-and-tools/journals-and-publications/classification

Q) Was gross contamination of the open fracture noted upon arrival or in the OR?

1 Yes

0 No

Gross contamination refers to a large volume of dirt, gravel, or other foreign substances contaminating the wound. This is often noted in the first operative note for an irrigation and debridement procedure or in the ED visit note, often with an initial trauma survey.

YES Gross contamination text example from operative note:

INDICATIONS FOR PROCEDURE: The patient is a 14-year-old male who fell off his bicycle and sustained a grade 3 open midshaft tib-fib fracture. Surgical intervention was recommended. Given that he had open proximal tibial physis, was greater than 85 kg and had an unstable fracture pattern with exposed bone and gross contamination of the wound, it was recommended that he be treated with irrigation and debridement of the open fracture followed by fixation with an external fixator device as a better option than plating, flexible intramedullary nailing or solid intramedullary nailing.

NO gross contamination text examples from operative note:

left leg as the site of surgery. It was exsanguinated by gravity elevation, tourniquet inflated to 250. The open wound was not grossly contaminated. Both bone ends were delivered and had some mild comminution but

We started by examining the wounds. She had a 8 x 3 cm wound at the level of
the fracture site that was slightly oblique but more transverse than
vertical. This probed down to bone. There was some mild contamination
within the wound which was removed. We systematically

Q) Measurement of open wound (cm)

1 Lest than 1 cm
2 Between 1 to 10 cm
3 Greater than 10 cm

Measurements are often recorded in the first operative note, ED visit note, or orthopaedic surgery consultation note.

Text Examples from operative notes:

We started by examining the wounds. She had a 8 x 3 cm wound at the level of
the fracture site that was slightly oblique but more transverse than
vertical. This probed down to bone. There was some

DETAILS OF PROCEDURE AND FINDINGS:
There was a large open wound measuring greater than 10 x 10 cm on the medial aspect of the distal third tibia. On inspection of the wound we found tears to the flexor digitorum longus and tibialis posterior muscle bellies. All flexor hallucis longus, flexor digitorum longus and tibialis posterior tendons were intact. The neurovascular bundle was intact. There was excellent alignment and stability after plating with a 2+ DP pulse.

SURGICAL CHARACTERISTICS

Please record surgical details for the initial procedure and any subsequent operative treatments related to that same injury event. For a separate Type III open fracture at a distinct eligible site, create a new repeating instance and complete the surgical details separately.

Q) Total number of orthopaedic surgical procedures performed during initial hospitalization for open fracture treatment **Please count **every separate trip to OR** during initial hospital visit (prior to discharge) related to fracture treatment and/or wound management**

1	1
2	2
3	3
4	4
5	5+

Surgery #1 (Index Surgery)

Q) Surgery 1: Date [Input format: MM-DD-YYYY]

Q) Surgery 1: Bone stabilization procedure (**Checkbox**)

1 Internal fixation (open reduction internal fixation "ORIF")

2 External fixation ("ex-fix", "external fixator")

PROCEDURES PERFORMED:
1. Irrigation and debridement right knee and right thigh wounds.
2. Decompressive anterior compartment fasciotomy right lower leg.
3. Closed reduction and spanning external fixator right leg.

3 Percutaneous pin fixation (i.e. K-wires) without formal open reduction

4 Cast or splint only

5 None

99 Other **enter as textbox when branching**

If other, Q) Surgery 1: Bone stabilization type – other [Input as a text box]

Q) Surgery 1: Procedure specialty involved (**Checkbox**)

1 Orthopaedics

2 Plastic surgery

99 Other **enter as textbox when branching**

If other, Q) Surgery 1: Specify other specialties involved [Input as a text box]

Q) Surgery 1: Soft tissue procedure (**Checkbox**) The procedure list on operative notes provide relevant information about soft tissue procedures.

1 Irrigation & debridement
2 Complete primary closure (at index surgery)
Select this option if all wounds on the affected limb were closed at the primary surgery.
3 Partial primary closure (at index surgery)
Select this option if only part of the open fracture wound was closed or if other wounds on affected limb were deliberately left open*
4 Local or rotational flap (Indicated on operative note procedure, often associated with plastic surgery)
5 Free flap (Indicated on operative note procedure, often associated with plastic surgery)
6 Skin graft (split thickness, full thickness, synthetics) (Indicated on operative note procedure, often associated with plastic surgery)
7 Wound vac (Indicated on operative note procedure below, often associated with plastic surgery)

immediately 2+ to the foot. We then used 3-0 nylon to close the extensile incision I had made up along the medial tibial border proximally and distally and left the open wound open. This was then dressed with a VAC

8 Not closed/wound care (e.g. wet-to-dry dressings) and/or left to close by secondary intention
Select this option when the wound is not closed and a wound VAC/drain are not used.
9 Antibiotic bead or powder
10 Fasciotomy
Select this option if a fasciotomy procedure is listed on the operative report

PROCEDURES PERFORMED:
1. Irrigation and debridement right knee and right thigh wounds.
2. Decompressive anterior compartment fasciotomy right lower leg.
3. Closed reduction and spanning external fixator right leg.

11 Amputation
99 Other **enter as textbox when branching**
If other, Q) Surgery 1: Soft tissue procedure - other [Input as a text box]

Repeat Surgeries – Surgeries #2, 3, 4

For patients who underwent additional operative procedures after index surgery, complete the corresponding repeat surgery section. The same surgical variables are collected for each subsequent procedure (Surgeries #2–#4). Please complete all applicable fields for each surgery performed.

Q) Surgery 2-4: Date [Input format: MM-DD-YYYY]

Q) Surgery 2-4: Bone stabilization procedure (**Checkbox**)
1 Internal fixation
2 External fixation
3 Percutaneous pin fixation (i.e. K-wires) without formal open reduction
4 Cast or splint only
5 None
99 Other **enter as textbox when branching**
If other, Q) Surgery 2-4: Bone stabilization type – other [Input as a text box]

Q) Surgery 2-4: Procedure specialty involved (**Checkbox**)

1 Orthopaedics
2 Plastic surgery
99 Other **enter as textbox when branching**
If other, Q) Surgery 1: Specify other specialties involved [Input as a text box]

Q) Surgery 2-4: Soft tissue procedure (**Checkbox**)
1 Irrigation & debridement
2 Delayed primary closure (complete) **closure is "Delayed" if completed in secondary procedure**
3 Delayed primary closure (partial) **closure is "Delayed" if completed in secondary procedure**
4 Local or rotational flap
5 Free flap
6 Skin graft (split thickness, full thickness, synthetics)
7 Wound vac
8 Not closed/wound care (e.g. wet-to-dry dressings) and/or left to close by secondary intention
9 Antibiotic bead or powder
10 Fasciotomy
11 Amputation
99 Other **enter as textbox when branching**
If other, Q) Surgery 2-4: Soft tissue procedure - other [Input as a text box]

CLOSURE CHARACTERISTICS

Please create a *repeating instance* and complete a separate wound closure detail for *each* instance of an eligible long bone Type III open fracture.

Q) Was definitive wound closure or coverage achieved?
1 Yes *(wound closed – See follow-up questions regarding **Condition 1****)*
0 No *(wound not closed – See follow-up questions regarding **Condition 2****)*

Definitive wound closure and/or coverage is defined clinically as the complete repair of a wound with tissue continuity restored, and the wound edges are brought together with sutures, staples, tissue flaps, or surgical skin grafts.

Definitive wound closure and/or coverage is not achieved with 'secondary intention'. This is defined clinically as a wound that is purposefully left open to heal gradually and is often used when tissue loss is extensive.

***** Data Collection Instruction**

Condition 1: Wound Closed

Q) Total number of surgical procedures to achieve skin closure or definitive coverage

Each trip to the OR is counted as a single procedure, even if multiple procedures are performed by different specialties. For example, if a patient first underwent an irrigation & debridement with wound vac placement on hospital day 1, and then returned to the OR on hospital day 3 later to undergo an ORIF with orthopaedics and delayed primary closure with plastics under the same instance of anesthesia, this would be marked as requiring 2 surgical procedures to achieve skin closure or definitive coverage.

1 1
2 2

3	3
4	4
5	5+

Q) Date of surgical procedure where definitive coverage/skin closure achieved
[Input format: MM-DD-YYYY]

Q) Time from injury to skin closure (days)
[Auto calculated (date of injury and date of wound closure both required for calculation)]

Condition 2: Wound NOT Closed

Q) If wound was not closed, date of final wound management surgery
[Input format: MM-DD-YYYY]

Q) Time from injury to final wound management surgery (days)
[Auto calculated (date of injury and date of final wound management both required for calculation)]

Q) Date of surgical procedure where definitive fracture fixation was performed
[Input format: MM-DD-YYYY]
For patients who are treated first with an ex-fix and later with an ORIF, please record the date of the ORIF here.

Q) Time from injury to definitive fracture fixation (days):
[Auto calculated (date of injury and date of definitive fracture fixation both required for calculation)]

Instrument #3: Hospital Course & Antibiotic Data

HOSPITAL COURSE

Q) Date of ED admission (Defined as the date that a patient arrives/presents to the emergency department. This does NOT refer to the date that the patient is admitted to the hospital)
[Input format: MM-DD-YYYY]

Q) Datetime of ED admission (Defined as the datetime that a patient arrives at the emergency department)
[Input format: MM-DD-YYYY HH:MM]
Please use military time (24 hour) for all timing calculated fields

Q) ED arrival mode

1	Ambulance
2	Medical flight
3	Walk or private transport
4	Transfer from outside hospital

Q) Admitting service

Please record the hospital service to which the patient is first admitted to from the emergency department. This is often noted in specialty consultation notes in the ED, inpatient progress notes, or the hospital course summary in a patient's discharge note.

1 Orthopaedics
2 Trauma
3 General surgery
4 Plastic surgery
5 ICU (inclusive of the medical ICU (MICU), medical surgical ICU (MSICU), cardiac ICU (CICU), and the pediatric ICU (PICU))
99 Other **enter as textbox when branching**

If other, Q) Specify other admitting service: [Input as a text box]

Q) Orthopedic surgery procedure start datetime (wheels in the OR)

Record the time that the patient is brought into the operating room (aka wheels in time) for first surgery that occurs during the patient's hospitalization. The "in room"/wheels in time will occur before the procedure start time. Wheels in time can be found in the intraprocedure summary on Epic under the case tracking notes header. The anesthesia record may also record these times.

Case Tracking Events

Event	Time In
Setup Start	
Setup Complete	
GI Scope Setup Complete	
In Room	0738
Proceduralist Start	
Sedation Start	
Case Start	0816
Convert to Open	
Case Closing	
PACU Announcement	1102
ICU Announcement	
Case Finish	1200
Out of Room	1209

[Input format: MM-DD-YYYY HH:MM]

Please complete for the index (first) surgery

Q) Orthopedic surgery procedure end datetime (wheels out of OR)

Wheels out or "out of room" time refers to the time that the patient is transported out of the OR. This occurs after the case finish time and will be found alongside other case tracking events in the patient's medical record.

Case Tracking Events

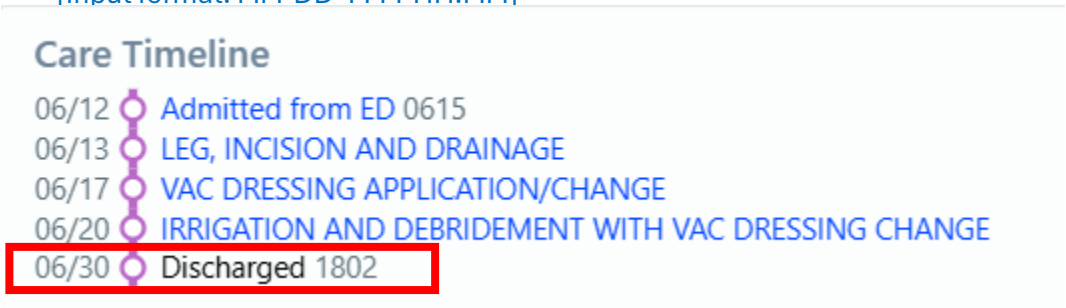
Event	Time In
Setup Start	
Setup Complete	
GI Scope Setup Complete	
In Room	0738
Proceduralist Start	
Sedation Start	
Case Start	0816
Convert to Open	
Case Closing	
PACU Announcement	1102
ICU Announcement	
Case Finish	1200
Out of Room	1209

[Input format: MM-DD-YYYY HH:MM]
Please complete index surgery

Q) Operative time (minutes)
[Auto calculated (index surgery start time (wheels in) and index surgery end time (wheels out) required for calculation)]

Q) Time from ED admission to OR (hours)
[Auto calculated (ED admission time and surgery start time required for calculation)]

Q) Hospital discharge datetime
[Input format: MM-DD-YYYY HH:MM]



Q) Length of hospitalization (days)
[Auto calculated (ED admission datetime and Hospital discharge datetime required for calculation)]

ANTIBIOTIC DATA

Q) Datetime of first IV antibiotics administration

Navigate to the medications tab on your institution's EMR and locate the earliest instance of an IV antibiotic administration after the patient has arrived at the emergency department. Please record the intravenous antibiotic time of administration, NOT the time the order was placed. In Epic, please click on the drug and navigate to the administration record to open the full administration report and record the earliest action time. In other EMRs, this may be listed as the medication start datetime. "Pyxis" injections may count as intravenous administrations.

[Input format: MM-DD-YYYY HH:MM]

All Administrations of cefTRIAXone (Rocephin) injection in D5W 1,000 mg

ⓘ The administrations shown are only for this specific order and not for other orders for the same medication that

Administration	Action Time	Recorded Time
New Bag : 1,000 mg : : intravenous	06/18/24 0833	06/18/24 0833
New Bag : 1,000 mg : : intravenous	06/17/24 0849	06/17/24 0849
New Bag : 1,000 mg : : intravenous	06/16/24 0839	06/16/24 0839
New Bag : 1,000 mg : : intravenous	06/15/24 1000	06/15/24 1144
New Bag : 1,000 mg : : intravenous	06/14/24 0820	06/14/24 0821
New Bag : 1,000 mg : : intravenous	06/13/24 0859	06/13/24 0905
New Bag : 1,000 mg : : intravenous	06/12/24 1050	06/12/24 1051

Q) Time from ED admission to IV antibiotics (minutes)

[Auto calculated (ED admission datetime and datetime of IV administration required for calculation)]

Q) Name(s) of **first** IV antibiotic(s) administered. Please select all antibiotics the patient received upon arrival to the ED (**Checkbox**)

List of IV antibiotic options: Ampicillin; Ampicillin/Sulbactam (Unasyn); Cefazolin; Cefepime; Ceftriaxone; Ciprofloxacin; Clindamycin; Fluconazole; Gentamicin; Linezolid; Meropenem; Metronidazole; Penicillin; Piperacillin/Tazobactam (Zosyn); Tobramycin; Vancomycin; Voriconazole; Other **enter as textbox when branching**

If other, Q) Specify other IV antibiotic administered: [Input as a text box]

Q) Other IV antibiotics administered in first 24 hours (from ED presentation)?

1 Yes **if yes, specify additional antibiotics administered**

0 No

If yes, Q) Check additional IV antibiotics administered in first 24 hours (**Checkbox**)

List of IV antibiotic options: Ampicillin; Ampicillin/Sulbactam (Unasyn); Cefazolin; Cefepime; Ceftriaxone; Ciprofloxacin; Clindamycin; Fluconazole; Gentamicin; Linezolid; Meropenem; Metronidazole; Penicillin; Piperacillin/Tazobactam (Zosyn); Tobramycin; Vancomycin; Voriconazole; Other **enter as textbox when branching**

If other, Q) Specify other additional antibiotic administered in first 24 hours: [Input as a text box]

Q) Datetime of final IV antibiotics administration

[Input format: MM-DD-YYYY HH:MM]

Q) Duration of IV antibiotics course (days)

[Auto calculated (IV antibiotics start and end times required for calculation)]

Q) Duration of IV antibiotics course (days)

This data point aims to collect any oral antibiotics that were administered during the patient's index hospitalization or that were prescribed at hospital discharge.

1 Yes **if yes, specify oral antibiotics administered and duration of prescription**

0 No

If yes, Q) Specify oral antibiotic(s) prescribed (**Checkbox**)

Information on oral antibiotics can be located in the same general medications tab on the electronic medical record. If administered while inpatient, this will also be listed in inpatient progress notes. If prescribed at discharge, the oral antibiotic course will be listed in the hospital discharge note.

List of oral antibiotic options: Amoxicillin; Augmentin; Bactrim; Cephalexin; Ciprofloxacin; Clindamycin; Doxycycline; Levofloxacin; Rifampin; Other **enter as textbox when branching**

If other, Q) Specify other oral antibiotic prescribed: [Input as a text box]

From medication administration record and discharge summary:

Administration	Action Time
Given : 500 mg : : oral	06/26/24 0906
Given : 500 mg : : oral	06/25/24 2012
Given : 500 mg : : oral	06/25/24 1402
Given : 500 mg : : oral	06/25/24 0923
Given : 500 mg : : oral	06/24/24 2031
Given : 500 mg : : oral	06/24/24 1431
Given : 500 mg : : oral	06/24/24 0816
Given : 500 mg : : oral	06/23/24 2002
Given : 500 mg : : oral	06/23/24 1615
Not Given : 500 mg : : oral	06/23/24 1120
Given : 500 mg : : oral	06/23/24 1114

Medications on Discharge

	What	How Much	When
	acetaminophen (acetaminophen 500 mg oral tablet)	1 tab(s) by mouth	Every 4 hours
	aspirin (aspirin 81 mg oral tablet, chewable)	1 tab(s) by mouth	Once a day
	bisacodyl (bisacodyl 5 mg oral delayed release tablet)	2 tab(s) by mouth	Once a day as needed for Constipation
	cephalexin (cephalexin 250 mg oral capsule)	2 cap by mouth	Three times a day
	diazePAM	2 Milligram by mouth	Every 6 hours as needed for Spasm

Q) Date of first oral antibiotic administration

[Input format: MM-DD-YYYY]

Q) Date of final oral antibiotic administration

[Input format: MM-DD-YYYY]

Q) Duration of oral antibiotics course (days)

[Auto calculated (first and last date administration of oral antibiotics required for calculation)]

Instrument #4: Clinical Follow-up & Outcome Data

CLINICAL FOLLOW-UP

Q) Date of last recorded orthopaedic follow-up (orthopaedics and/or sports medicine follow-up related to injury)

[Input format: MM-DD-YYYY]

Q) Total length of follow-up (days)

[Auto calculated (Date of ED Admission and final follow-up required for calculation)]

Q) Full return to activity/clinical recovery by final recorded follow-up?

1 Yes
0 No

This may be directly (return to sports/activity permitted) or indirectly (patient played basketball last season or has pain in gym class) documented in orthopaedic follow-up notes. Please reference the examples of complete return to activity below:

Since then she has been doing well. She is in the 6th grade, likes karate, has an adult blue belt! Report no pain, able to ambulate long distances, no PT/ OT formally anymore. Parents notice that she slouches when she sits. No concerns

She is doing well without pain
She is walking well without boot
She is doing PT
She is running

Radiographic Fracture Union(s): These fields are linked to the fractures entered in the repeating Fracture & Surgical Characteristics instrument. For each fracture at a unique limb/extremity, record the corresponding date of radiographic union. For example, Date of Union (Fracture #1) corresponds to Fracture #1 in the repeating instrument, while Date of Union (Fracture #2) corresponds to Fracture #2.

Q) Date of radiographic fracture union (Fracture #1 [or #2, #3, #4 for additional fractures]) ***To be inputted by PI****

Radiographic union is defined as progressive bridging callus across at least 3 of 4 cortices on radiographs, and a minimum RUST score of 10. Each of the four cortices will be assigned a score between 1-3. Total RUST scores range from 4-12. A RUST score of 10 or above is indicative of bony union.

[Input format: MM-DD-YYYY]

RUST score[6]

Radiographic criteria		
Score	**Fracture line**	**Callus**
1	Visible	Absent
2	Visible	Present
3	Invisible	Present

Q) Time from injury to radiographic union for fracture #1 [or #2, #3, #4 for additional fractures] (days):

[Auto calculated (Date of injury and date of union [for each fracture] required for calculation)]

POSTOPERATIVE COMPLICATIONS

Q) Did the patient develop a complication?

1 Yes **if yes, specify type and describe complication**

0 No

Q) Specify complication(s) (**Checkbox**)

1 Unexpected return to ED
2 Need for additional surgery (UPROR) **if checked, see **Condition 1****
3 Infection **if checked, see **Condition 2****
4 Wound/surgical site complications (non-infectious)
5 Delayed union or nonunion (time to union >180 days)
6 Acute compartment syndrome
7 Amputation or loss of limb
8 Neurological deficit
9 Vascular injury
10 DVT or PE
11 Sepsis
12 Death
99 Other **enter as textbox when branching**
If other, Q) Describe additional complication(s) not listed above: [Input as a Notes Box (Paragraph Text)]

Condition 1: Need for additional surgery

Please count only surgeries that occur *after* initial hospitalization (post-discharge) as a true complication event requiring revision.

Q) Specify additional surgical procedure (**Checkbox)**

1 Irrigation & debridement
2 Hardware removal → Planned hardware removals should NOT be recorded as complications/UPROR.
3 Revision fixation
4 Soft tissue coverage (local flap, free flap, skin graft)
5 Fasciotomy
6 Antibiotic bead placement
99 Other **enter as textbox when branching**
If other, Q) Specify other additional surgical procedure: [Input as a text box]

Condition 2: Development of post-operative infection

Q) Type of postoperative infection

1 Superficial (requiring local wound management and/or oral antibiotics)
If a superficial infection is suspected via the presence of irritation, dehiscence, pus, etc. but not confirmed to be an infection, please select the wound/surgical-site complication option instead.
2 Deep (requiring surgical wound management and/or IV antibiotics)

Q) Infection requiring antibiotic treatment? (**Checkbox)**

0 None
1 Intravenous (IV)
2 Oral (PO)

Q) Describe complication: [Input format: Notes Box (Paragraph Text]
Please use the notes field to provide additional details regarding any postoperative complications. For patients with Type III open fractures involving multiple extremities, please specify corresponding fracture location and fracture number associated with each complication.
A description/treatment/outcome framework is preferred.

Q) Date complication was first recorded in the patient's chart
[Input format: MM-DD-YYYY]

Q) Clavien-Dindo-Sink (CDS) Complication Classification
If the patient has multiple complications, please record the CDS grade of the most severe complication

1 Grade I: Any deviation from normal postop course (ex: early dressing change, skin irritation without intervention)
2 Grade II: Pharmacological treatment (ex: oral antibiotics for superficial infection, blood transfusion, IV iron)
3 Grade III: Surgical, endoscopic, or radiologic intervention (ex: surgical washout, unplanned hardware removal, CT scan)
Grade IV: Life- or limb-threatening and/or requires ICU admission:
4 Grade IVa: Potential for long-term disability, but treatable (may require organ/joint resection/replacement) (ex: malunion or nonunion)
5 Grade IVb: not treatable or with long-term disability, requiring organ/joint resection/replacement (ex: subsequent major reconstructive surgery)
6 Grade V: Death