

WOUND CARE

Emergency Management & Surgical Categorization

Mechanism • CDC Surgical Wound Class • Tetanus Risk • Open Fracture Grading

Source & Method

Categorisation and management steps are aligned with the CDC/HICPAC Guideline for Prevention of Surgical Site Infection (Surgical Wound Classification, Classes I-IV), CDC Clinical Guidance for Wound Management to Prevent Tetanus (ACIP recommendations), the Gustilo-Anderson classification for open fractures with EAST practice management guidelines on prophylactic antibiotics, and current emergency medicine literature on wound closure timing. Content is paraphrased and reorganised for clinical reference, not reproduced verbatim from any single source.

1. IMMEDIATE PRIORITIES (PRIMARY SURVEY)

Hemorrhage control and life-threat exclusion come before wound classification

First 60 Seconds

- **Catastrophic haemorrhage:** direct pressure first; apply a tourniquet high-and-tight for uncontrolled limb bleeding (per Stop the Bleed / TCCC principles) if direct pressure fails
- **ABCDE assessment:** airway, breathing, circulation, disability, exposure — exclude other life-threatening injury before focusing on the wound itself
- Wound packing with haemostatic gauze for junctional or deep cavity wounds not amenable to tourniquet
- Do not remove impaled objects in the field or ED — stabilise in place and arrange surgical removal in a controlled setting

Rapid Wound Assessment

- **Mechanism:** blunt vs. penetrating, crush, blast, thermal, bite
- **Contamination:** soil, faecal matter, saliva, foreign bodies, devitalised tissue
- **Neurovascular status distal to the wound:** pulses, capillary refill, motor and sensory function — document before any anaesthesia or exploration
- **Tendon/joint involvement:** examine through full range of motion; explore under direct vision if suspected
- **Time since injury** — relevant to closure decision and antibiotic timing, not an absolute cut-off (see Section 5)

2. Categorisation by Mechanism

Descriptive wound types seen in emergency and trauma practice

Wound type	Description	Key management concern
Abrasion	Superficial skin loss from friction/shear	Debris embedding (tattooing) — irrigate/scrub to prevent traumatic tattooing
Laceration	Tearing of tissue by blunt or sharp force	Irregular edges may need debridement before closure
Incision	Clean, sharp-edged cut	Usually straightforward primary closure if uncontaminated

Wound type	Description	Key management concern
Puncture	Small entry, potentially deep track	High infection/foreign-body risk; imaging if depth uncertain
Avulsion / degloving	Tissue torn from underlying structures	Assess viability of the flap; may need vascular/plastics input
Crush injury	Compression injury with tissue devitalisation	Watch for compartment syndrome and rhabdomyolysis
Bite (animal/human)	Contaminated puncture/laceration	High infection risk — treated as contaminated regardless of appearance
Burn (thermal/chemical/electrical)	Coagulative or chemical tissue injury	Assess depth/%TBSA; irrigate chemical burns copiously
Gunshot / blast	High or low velocity penetrating trauma	Assume deep contamination and tissue damage beyond visible entry/exit

3. CDC Surgical Wound Classification (Class I-IV)

The core surgical categorisation, based on degree of microbial contamination

Class	Definition	Typical example	SSI risk
I - Clean	Uninfected wound, no inflammation; respiratory, alimentary, genital or urinary tract not entered	Elective incision, non-penetrating (blunt) traumatic wound meeting these criteria	Low (~1-2%)
II - Clean-Contaminated	Tract entered under controlled conditions, no unusual contamination	Planned bowel/biliary/genitourinary surgery without spillage	Low-moderate (~3-5%)
III - Contaminated	Fresh open accidental wounds; major break in sterile technique; gross GI spillage; acute non-purulent inflammation	Fresh traumatic laceration, open fracture, penetrating trauma	Moderate-high (~6-10%)
IV - Dirty-Infected	Old traumatic wound with devitalised tissue, existing clinical infection, or perforated viscus	Delayed-presentation wound, abscess, established infection	High (~10-15%+)

Most fresh traumatic wounds presenting to the emergency department default to Class III unless clearly minor and clean; delayed presentation, retained devitalised tissue, or established infection escalates to Class IV.

4. Gustilo-Anderson Classification

For open (compound) fractures - guides antibiotic choice and surgical urgency

Type	Wound size / features	Soft tissue injury
I	< 1 cm, clean	Minimal
II	> 1 cm, without extensive damage, flaps or avulsion	Moderate
III	> 10 cm or high-energy mechanism (gunshot, farm injury, traumatic amputation)	Extensive

Type	Wound size / features	Soft tissue injury
IIIA	Type III with adequate soft tissue coverage of bone	Extensive but coverable
IIIB	Significant soft tissue loss; exposed bone requires flap coverage	Extensive, needs reconstruction
IIIC	Associated vascular injury requiring repair for limb salvage	Extensive + vascular compromise

Antibiotic Prophylaxis by Type (adjunct to surgical debridement)

- **Type I-II:** first-generation cephalosporin (e.g. cefazolin) — Gram-positive cover
- **Type III:** cefazolin plus consideration of broader Gram-negative cover per local protocol; routine aminoglycoside addition is increasingly questioned by recent evidence and should follow institutional guidance
- **Additional cover by contamination context:** freshwater exposure → fluoroquinolone; saltwater exposure → doxycycline; faecal/barnyard contamination → high-dose penicillin
- Early antibiotic administration (within ~1-3 hours of injury) matters more than antibiotic choice — do not delay for imaging or transfer
- Surgical debridement remains the primary intervention; antibiotics are an adjunct, not a substitute

5. Wound Closure Decisions

Primary vs. delayed primary vs. secondary intention

The "Golden Period" — Use With Caution

Traditional teaching cites 6-8 hours from injury to closure ('golden period'), extending up to 24 hours for well-vascularised areas such as the face. This originates from 1898 animal experiments and is not strongly supported by modern evidence — systematic reviews have not established a validated time cut-off. Wound length, contamination, location, foreign body presence, and diabetes are more predictive of infection than time alone.

Suitable for Primary Closure

- Clean or minimally contaminated wounds with viable edges and no significant tissue loss
- Low-risk location, adequately irrigated, no retained foreign body

Consider Delayed Primary Closure (~48 hours)

- Heavily contaminated wounds, animal/human bites, crush injuries
- Wound is debrided, left open, and closed only once no signs of infection develop

Heal by Secondary Intention

- Established infection, significant tissue loss, or wounds where closure would trap contamination

6. Tetanus Prophylaxis

Based on wound risk category and vaccination history

Wound Risk Categories

Clean, minor wounds

All other (tetanus-prone) wounds

- Low tetanus risk
- No devitalised tissue, no contamination
- Punctures, avulsions, crush injuries, burns, frostbite
- Contaminated with dirt, faeces, soil, or saliva

Vaccination history	Clean/minor: vaccine	Clean/minor: TIG	Other wounds: vaccine	Other wounds: TIG
Unknown or < 3 doses	Yes	No	Yes	Yes
≥3 doses, <5 yr since last	No	No	No	No
≥3 doses, 5-10 yr since last	No	No	Yes	No
≥3 doses, >10 yr since last	Yes	No	Yes	No

TIG dose: 250 IU IM (regardless of age); give in a separate syringe and site from the vaccine. Patients with HIV or severe immunodeficiency should receive TIG for any contaminated wound regardless of vaccination history. Antibiotics are not a substitute for tetanus prophylaxis.

7. General Emergency Wound Care Steps

Practical sequence for most traumatic wounds

- **1. Control bleeding** — direct pressure, tourniquet, or packing as needed
- **2. Analgesia** — local/regional anaesthesia before exploration or irrigation where possible
- **3. Explore and assess** — neurovascular status, tendon function, foreign bodies, depth
- **4. Irrigate** — copious low-pressure irrigation with normal saline or clean tap water; this reduces bacterial load more than antiseptic choice
- **5. Debride** — remove devitalised tissue and foreign material; converts contaminated wounds toward a cleaner class
- **6. Classify** — mechanism, CDC surgical wound class, tetanus risk, (if fracture) Gustilo-Anderson grade
- **7. Decide on closure** — primary, delayed primary, or secondary intention (Section 5)
- **8. Tetanus prophylaxis** — per Section 6
- **9. Antibiotics** — reserved for bites, contaminated/Class III-IV wounds, open fractures, immunosuppressed patients, or wounds with delayed presentation; not routinely required for clean lacerations
- **10. Disposition and safety-netting** — wound care instructions, review timing, red-flag advice for infection

8. Red Flags — Escalate Urgently

Findings requiring surgical/specialist involvement beyond standard ED closure

Finding	Concern	Action
Expanding haematoma, pulsatile bleeding, absent distal pulse	Vascular injury	Immediate surgical/vascular referral; do not delay for imaging if actively bleeding
Disproportionate pain, pain on passive stretch, tense swelling	Compartment syndrome	Urgent surgical review; measure compartment pressures if available
Grossly contaminated wound, retained foreign body, exposed bone/tendon/joint	High infection or functional risk	OR debridement rather than ED closure
Crepitus, rapidly spreading erythema, systemic toxicity	Necrotising soft tissue infection	Emergency surgical debridement, broad-spectrum antibiotics, do not wait for imaging to confirm

Finding	Concern	Action
Bite wound with joint/tendon/bone proximity or hand involvement	High complication risk	Low threshold for surgical/hand-service referral
Circumferential burn or crush injury of a limb	Impending compartment syndrome/vascular compromise	Continuous neurovascular monitoring; escharotomy/fasciotomy if indicated