

Protocol 14 · Open fractures: NPWT as a bridge between debridement and soft-tissue cover

Evidence position: **Not supported** · Source: NPWT Evidence Library, www.wondsortg.co.za/NPWT.html, content as at 2026-10-04

Indication

Open fractures: NPWT as a bridge between debridement and soft-tissue cover.

Evidence position: Not supported. The best trials are negative on healing, function and cost.

What this means

An open fracture is a broken bone with a wound that connects it to the outside. The bone is contaminated from the moment of injury, and the soft tissue over it may be crushed, stripped or missing. The treatment is urgent surgical cleaning (debridement), stabilisation of the bone, antibiotics, and early soft-tissue cover with a flap or graft, ideally within 72 hours. NPWT is used for one purpose: to dress the wound between the first debridement and definitive cover when the wound cannot be closed at the first operation. It is a temporary bridge, never the destination.

Why NPWT is used here

The best trials are negative on what matters most: WOLFF (460 severe open lower-limb fractures, now held in full) found no improvement in disability at 12 months (adjusted difference minus 3.9, 95% CI minus 8.9 to plus 1.2, which does not exclude a clinically important harm), infection (7.1 versus 8.1 percent) or quality of life; the Cochrane review (7 trials, 1,377 patients) found no difference in healing at six weeks (risk ratio 1.01, moderate certainty), an uncertain effect on infection (risk ratio 0.48, 95% CI 0.20 to 1.13, very low), and the trial's own economic evaluation found NPWT cost-effective with a probability never above 27 percent (the often-quoted 268,000 pounds per QALY is a ratio of two differences that both span zero). NPWT is a reasonable way to manage a wound that cannot be closed today; it has not been shown to change how the fracture heals or how the patient functions.

Patient selection

- Gustilo-Anderson grade IIIB (and some IIIA) fractures with substantial soft-tissue loss, contamination or swelling, where cover cannot be achieved at the first debridement.
- After the first debridement, with the bone stabilised (external fixator or definitive fixation) and antibiotics started.
- A named plan and date for definitive cover exist. NPWT must not delay the flap: cover within 72 hours is the target, and NPWT is what fills the gap up to it.
- Not for a wound that can be closed or covered at the first operation, and not as a substitute for a flap in a wound that needs one.

For all NPWT

- The patient must be compliant and compos mentis: able to understand what the device does, keep the seal, protect the tubing and pump, report bleeding, pain or alarms, and attend or receive dressing changes.
- The patient's circle of care must be included: family, carers, home-nursing service or ward team, whoever will be present when the seal fails at night. Document who was told what and who is responsible for the device between visits.

Contraindications

Specific to this indication

- Dead or devitalised tissue that has not been removed: debride first, and again as needed. Suction does not clean a wound.
- Uncontrolled ischaemia in the limb before revascularisation, and active bleeding.
- A wound where an airtight seal cannot be achieved (around external fixator pins, plan the drape carefully).
- Exposed vessel, nerve or fracture surface with no non-adherent layer between it and the foam.

For all NPWT: do not apply if

- Active bleeding beyond capillary ooze. Stop it first; NPWT does not control bleeding.
- An uncorrected clotting disorder.
- An exposed vessel, graft, anastomosis, organ or nerve with no barrier between it and the foam.
- Dead tissue not yet debrided, untreated bone infection, or cancer in the wound bed.

Proceed with caution and record the decision

- Blood thinners: a caution, not a bar. Lowest effective pressure, barrier over any vessel, inspect at every change, record the decision.
- Pacemaker or defibrillator: the pump of the canister-free single-use device (PICO) holds a magnet. Keep it 10 to 15 cm from the device, away from the chest, and record where it sits.
- Fragile surrounding skin or adhesive allergy. Children: no NPWT system was cleared for them as at 2011; treat as a hard limit unless current labelling says otherwise.

Potential risks and side-effects

- Delay. The commonest harm is a well-dressed wound that waits too long for its flap. Each week of delay raises infection and flap failure; the 3.5-day interval to cover in one trial went with far fewer infections than a 12.7-day interval in a comparison series.
- Foam adhering to exposed bone or tendon; desiccation of exposed bone if the seal leaks.
- Do not extend this protocol to the sutured wound after fixation: WHIST (1,548 patients) found no reduction in deep infection with a closed-incision device there. One improvised-VAC trial in open fractures does not reproduce statistically and must not be quoted.
- Bleeding: the serious harm. All six deaths in the regulator's first two-year series, and nine of twelve overall, were bleeds in patients whose bleeding risk had been missed (12 deaths, 174 injuries).
- Skin blistering: about 3.5 times more likely than with an ordinary dressing (risk ratio 3.55, 95% CI 1.43 to 8.77).
- Pain at changes (pre-medicate; soak a stuck sponge with saline) and anxiety in the first days, which settles. Say so beforehand.
- Retained foam, the regulator's commonest injury: count every piece in and out, and never cut foam over the wound. Adhesive damage to skin.

Treatment protocol

Pressure	Minus 125 mmHg continuous is the setting used in six of seven trials. A randomised comparison of minus 75 against minus 125 found no difference in infection (risk ratio 1.04), so minus 75 to minus 100 is acceptable over fragile or marginally perfused tissue. Where a vessel, arterial repair or vascular graft lies in the wound bed, exposed or under a barrier: minus 100 mmHg or less (this library's setting; reasons and technique in protocol 1).
Mode	Continuous for the first 48 hours and whenever the bed is bleeding-prone or unstable; intermittent may follow once stable.
Interface	Black foam over the soft-tissue bed. A non-adherent contact layer over exposed bone, tendon, hardware and any vessel or nerve. Count every piece; a fracture wound has recesses that hide foam.
Change interval	At each planned debridement, typically every 48 to 72 hours in theatre, until definitive cover.
Duration; instillation	Days, not weeks: set the cover date at the first operation and escalate if it slips past a week. Instillation shortened closure in one acute-trauma trial (6.1 versus 10.0 days) but with more graft loss: only for a heavily contaminated bed, and change to standard NPWT before grafting.

Step by step

1. First debridement in theatre: remove all dead tissue and foreign material, irrigate, stabilise the bone, culture, start antibiotics. Decide today when and how the wound will be covered.
2. If it cannot be closed or covered now, protect exposed bone, tendon and hardware with a non-adherent layer, fill the soft-tissue defect with foam, seal around pins and contours, and set minus 125 mmHg continuous (lower over marginal tissue).
3. Record the piece count, the pressure and the planned cover date in the notes and on the ward board.
4. Return to theatre every 48 to 72 hours: remove all foam and reconcile the count, re-debride if needed, re-apply.
5. Cover (flap or graft) as early as the bed allows, ideally within 72 hours of injury. If cover slips past a week, review the plan with the orthopaedic and plastic teams the same day.

When to stop and call for help

- Fresh bleeding into the canister or dressing: pump off, pressure on, call the surgeon.
- New or rising pain, spreading redness, fever or a foul smell: review the same day.
- A seal that cannot be held for more than two hours.
- No progress at four weeks: stop and re-plan.

Outcome measures

- Days from injury to definitive soft-tissue cover: the measure that predicts infection.
- Deep infection or osteomyelitis at 30 days and at union, separately from superficial infection.
- Debridements before cover; flap or graft failure; union and time to union; any amputation.
- Function at 12 months (disability score) and length of stay.

What to document at every change

- Indication; which contraindications were checked and excluded.
- Pressure, mode, interface, and the number of foam pieces placed and removed.
- Wound length, width and depth, a dated photograph, exudate, any bleeding, and the pain score.
- The planned review date and the endpoint (closure, graft or flap).

A point worth knowing

The largest trials show what NPWT does not do in open fractures: it does not improve function at a year, does not clearly reduce infection, and is not cost-effective. What it does is make a wound that cannot be closed manageable for a few days. A request that asks for a bounded bridge to a dated flap is supportable; one that promises better healing or fewer infections is contradicted by the evidence a reviewer will find first.

Funding note (South Africa)

ICD-10: The fracture code (S72 or S82 series) with the open-fracture fifth character, plus the open-wound code. PMB 900H applies to open fractures. **PMB:** 900H: open fracture/dislocation of bones and joints (S72.x1, S82.x1 listed).

References

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