

MUSCULOSKELETAL · ORTHOPEDIC SURGERY · NCLEX 2026

Internal & External *Fixation*

Surgical stabilization of bone fractures using hardware — either implanted inside the body (ORIF) or anchored to an external frame through the skin. Nursing priorities center on neurovascular checks, infection prevention, pin-site care, and early complication recognition.

HIGH-YIELD

5 P'S

PIN SITE CARE

COMPARTMENT SYNDROME

FAT EMBOLISM

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Definition & Overview

Two surgical strategies, one goal — stable alignment for healing

Internal Fixation (ORIF)

INSIDE THE BODY

Open Reduction with Internal Fixation — the surgeon opens the fracture site and stabilizes the bone with **plates, screws, rods, pins, or wires** implanted permanently inside.

- ▶ Hardware is **not visible** externally
- ▶ Closed incision; standard surgical wound care
- ▶ Best for closed, clean fractures (hip, femur, wrist, ankle)
- ▶ Hardware usually stays for life

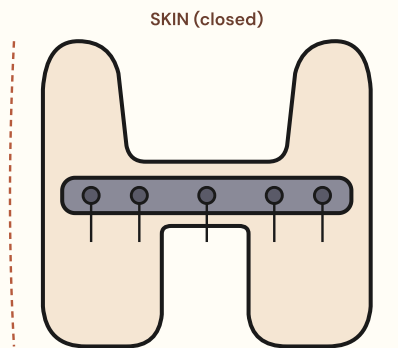
External Fixation

OUTSIDE THE BODY

Pins or wires are drilled **through the skin into the bone** and connected to an external metal frame that holds alignment from outside.

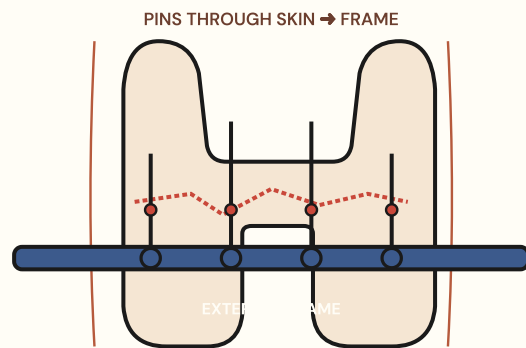
- ▶ Hardware **visible** as a frame on the limb
- ▶ Used for open/comminuted fractures, severe soft-tissue injury, infected fractures, or pelvic fractures
- ▶ Allows wound access without disturbing alignment
- ▶ Pin sites are direct portals for infection

Internal Fixation — Plate & Screws



Hardware is implanted; the skin is closed over it.

External Fixation — Frame & Pins

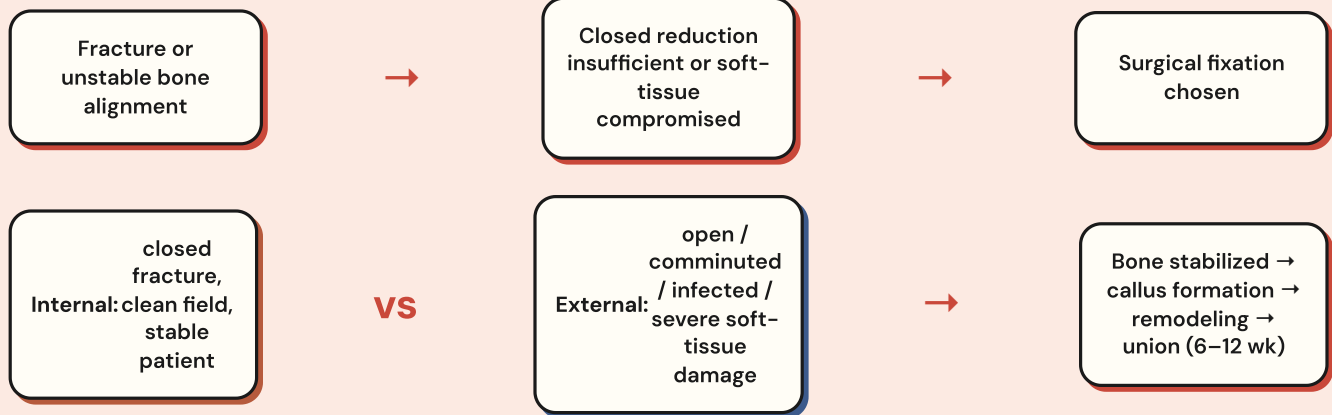


Pins exit the skin (red = pin sites) and attach to an external frame.

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Pathophysiology & Surgical Decision

Why fixation? Why one over the other?



Healing depends on stability + perfusion

If the hardware loosens, infection sets in, or perfusion is compromised by swelling — **nonunion, malunion, or osteomyelitis** result. Nursing assessments protect this window.

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Assessment Findings

What you're watching for after fixation

Expected / Normal

- Mild incisional or pin-site pain controlled with prescribed analgesia
- Small amount of **clear serous drainage** at pin sites (early)
- Mild edema around surgical site for 24–72 hours
- Slight crusting at pin entry (clean per protocol)
- Warm, pink extremity with brisk capillary refill (< 3 sec)
- Intact sensation & movement distal to fixation

Abnormal — Report Now

- **Purulent** or foul-smelling pin-site drainage
- Erythema, heat, induration spreading from pin site
- **Loose, wobbly, or bent pin**
- Fever, chills, ↑ WBC → osteomyelitis suspicion
- Pain unrelieved by opioids, especially on passive stretch
- Pale, cold, dusky extremity; sluggish or absent capillary refill
- Numbness, tingling, paralysis distal to fixation
- Sudden dyspnea, chest pain, petechiae over chest/axilla



The 5 P's of Neurovascular Compromise

- ▶ **Pain** — disproportionate, deep, unrelieved by opioids (compartment syndrome hallmark)
- ▶ **Pallor** — pale or dusky skin distal to injury
- ▶ **Pulselessness** — diminished or absent distal pulses (late sign)
- ▶ **Paresthesia** — numbness, tingling, burning
- ▶ **Paralysis** — inability to move toes/fingers distal to fixation
- ▶ (+ 6th P: **Poikilothermia** — cool extremity)



Fat Embolism Syndrome (long-bone & pelvic fx)

Classic triad — onset 24–72 hours post-injury:

- ▶ **Respiratory:** dyspnea, tachypnea, hypoxia, crackles
- ▶ **Neurologic:** confusion, restlessness, altered LOC
- ▶ **Petechiae** on chest, axilla, conjunctiva, soft palate (pathognomonic)

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Priority Nursing Interventions

Ranked by ABCs & NCLEX prioritization

1 Neurovascular Checks

q1h × 24 hr, then q2–4h. Compare bilaterally. Assess color, temp, capillary refill, pulses, sensation, movement, pain. Document the 5 P's.

2 Pin-Site Care (External Fix)

Clean each pin site individually with **sterile chlorhexidine 2 mg/mL** per facility protocol. Use a fresh swab per pin. Never share. Monitor for purulence.

3 Surgical Wound Care (Internal Fix)

Sterile dressing changes. Monitor incision for redness, dehiscence, drainage. Hemovac/JP drains documented Q shift; empty when ½ full.

4 Pain Management

Multimodal: opioids + acetaminophen + ice. Reassess 30–60 min after. **Pain unrelieved by opioids = compartment syndrome until ruled out.**

5 VTE / DVT Prophylaxis

Enoxaparin (Lovenox) SQ, SCDs on unaffected leg, ankle pumps, early ambulation per WB orders, hydration.

6 Infection Prevention

Hand hygiene, prophylactic antibiotics (cefazolin), monitor temp q4h, WBC trend, sterile technique with every dressing change.

7 Mobility & Positioning

Elevate limb above heart × 24–48 hr to reduce edema. ROM joints above & below. Weight-bearing strictly per HCP order (NWB → TDWB → PWB → FWB).

8 Frame Safety (External Fix)

NEVER adjust the frame. Tape sharp pin ends with cork or covers. Support frame with both hands when moving the patient. Check for loose hardware.

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Pharmacology

High-yield drugs in orthopedic post-op care

Drug / Class	Mechanism	Key Side Effects	Nursing Considerations
Cefazolin (Ancef) <i>1st-gen cephalosporin</i>	Inhibits bacterial cell wall synthesis	Diarrhea, rash, C. diff, anaphylaxis	Ask about PCN allergy (cross-sensitivity); give within 60 min before incision; monitor BUN/Cr
Enoxaparin (Lovenox) <i>LMWH anticoagulant</i>	Inhibits factor Xa → prevents clot formation	Bleeding, hematoma, thrombocytopenia (HIT)	SQ in abdomen (avoid 2 in from umbilicus); do NOT expel air bubble ; do NOT massage site; monitor platelets, Hgb/Hct
Morphine / Hydromorphone <i>Opioid analgesic</i>	Mu-receptor agonist → CNS pain modulation	Respiratory depression, constipation, sedation, hypotension, N/V	Monitor RR (hold if < 12); naloxone at bedside; stool softener; reassess pain 30–60 min
Acetaminophen <i>Non-opioid analgesic</i>	Central COX inhibition	Hepatotoxicity	Max 4 g/day (3 g if liver disease/EtOH); count combo products (Percocet, Norco)
Ketorolac (Toradol) <i>NSAID</i>	Inhibits COX-1 & COX-2	GI bleed, renal injury, ↓ platelet function, delays bone healing	Max 5 days; not first-line in fracture recovery; monitor BUN/Cr, GI bleeding
Docusate (Colace) <i>Stool softener</i>	↑ water in stool	Mild cramping	Routine with opioid orders; encourage fluids 2–3 L/day
Chlorhexidine 2 mg/mL <i>Antiseptic</i>	Disrupts microbial cell membranes	Skin irritation, allergy	Evidence-based pin-site cleanser (per most current ortho guidelines); use sterile swab per pin
Calcium + Vitamin D <i>Bone supplement</i>	Substrate for new bone matrix; D ↑ Ca absorption	Constipation, hypercalcemia (rare)	Encourage dairy, leafy greens, fortified foods; sunlight exposure 15 min/day

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NCLEX Test Traps

Wrong-vs-right thinking the test is checking

✗ TRAP ANSWER

"Tighten the loose pin on the external fixator."

✓ RIGHT ANSWER

Notify the HCP immediately. Nurses NEVER adjust, tighten, or loosen fixator hardware.

✗ TRAP ANSWER

"Pain 8/10 after opioid — give more morphine."

✓ RIGHT ANSWER

Assess for compartment syndrome. Pain unrelieved by opioids is the #1 early sign. Check 5 P's and notify HCP.

✗ TRAP ANSWER

"Elevate the casted/fixated extremity below heart level to improve circulation."

✓ RIGHT ANSWER

Elevate ABOVE heart × 24–48 hr to reduce edema. Lowering it ↑ swelling and worsens compartment risk.

✗ TRAP ANSWER

"Use the same swab to clean all four pin sites — saves supplies."

✓ RIGHT ANSWER

One sterile swab per pin site. Cross-contamination spreads bacteria to multiple sites → osteomyelitis.

✗ TRAP ANSWER

"Patient with new femur fracture suddenly confused — give anti-anxiety medication."

✓ RIGHT ANSWER

Assess for fat embolism. Check SpO₂, RR, look for petechiae on chest/axilla. Apply O₂, notify HCP STAT.

✗ TRAP ANSWER

"Diminished distal pulse — wait and reassess in an hour."

✓ RIGHT ANSWER

Notify HCP immediately — pulselessness is a late but critical neurovascular finding. Time matters.

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Patient & Family Education

Discharge teaching for safe healing at home



Perform pin-site care daily using clean technique at home (sterile in hospital). Wash hands first.



Report fever > 101°F (38.3°C), chills, redness, swelling, foul drainage, or worsening pain.



Eat a bone-healing diet: protein, calcium (dairy, leafy greens), vitamin D, vitamin C; avoid smoking — nicotine delays healing.



Follow weight-bearing orders **exactly** (NWB, TDWB, PWB, FWB) — do not advance without HCP clearance.



Keep dressing clean and dry; shower only when cleared. No tub baths or swimming until pins/incision healed.



Use assistive devices (crutches, walker) correctly; remove tripping hazards (rugs, cords) at home.



Self-inject Lovenox in abdomen — rotate sites, do not expel the air bubble, do not rub.



Do not pick scabs at pin sites; loose scabs trap drainage and cause infection.



Never adjust the external fixator yourself; cover sharp pin ends to avoid catching on clothing.



Call 911 for: chest pain, severe SOB, sudden confusion, leg swelling with pain, or numbness/coldness in fixated limb.



Keep all follow-up appointments — x-rays confirm bone healing and hardware position.



Tell every future provider (including dentists, MRI techs) about your hardware — affects future imaging & antibiotic prophylaxis.

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Memory Boosters & Mnemonics

Fast recall on test day

5 P's of Neurovascular Compromise

P · P · P · P · P

Pain (disproportionate, unrelieved) — earliest

Pallor (pale, dusky)

Pulselessness (late)

Paresthesia (numbness, tingling)

Paralysis (cannot move)

+ Poikilothermia (cool limb) = 6 P's

"FAT BAD" — Fat Embolism Cues

F · A · T · B · A · D

Fat globules in blood

Altered mental status

Tachypnea / tachycardia / hypoxia

Breathing difficulty (dyspnea)

Axilla/chest petechiae

Day 1–3 post long-bone fracture

"PINS" — External Fix Priorities

P · I · N · S

Pin-site care (sterile, one swab per pin)

Infection watch (purulence, fever, redness)

Neurovascular checks q1h × 24h

Safety — never adjust frame, cover sharp ends

Internal vs External — "I-E"

I = INSIDE · E =

EXPOSED

Internal = In the body (plates/screws hidden)

External = Exposed frame (pins through skin)

Internal → wound care priority

External → **pin-site** care priority

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NCJMM Clinical Judgment Scenario

Next Generation Clinical Judgment Measurement Model — 6 cognitive steps

Scenario: A 32-year-old male is admitted after a motorcycle crash. He has an open comminuted tibial fracture and was placed in an external fixator 6 hours ago in the OR. Current vitals: T 100.1°F · HR 118 · BP 138/82 · RR 24 · SpO₂ 92% on room air. He reports right calf pain of 9/10 unrelieved 30 minutes after IV morphine 4 mg. The right foot is pale, cool, and capillary refill is 5 seconds. He asks why his "leg feels like it's on fire."

1

Recognize Cues

- Open comminuted tibial fracture + external fixator (high-risk anatomy)
- Pain 9/10 unrelieved by opioid — disproportionate
- Pale, cool foot; capillary refill > 3 seconds
- HR 118, RR 24, SpO₂ 92% — early signs of distress
- Low-grade fever (100.1°F)

2

Analyze Cues

- **Pain + pallor + cool + delayed cap refill** = 4 of the 5 P's → acute compartment syndrome strongly suspected
- Tachypnea + hypoxia + tachycardia 24–72 h post long-bone fracture also raise **fat embolism** concern
- Low-grade fever may be inflammatory response — not yet infection at this hour
- Open fracture = ↑↑ infection risk over time

3

Prioritize Hypotheses

- **#1 — Acute compartment syndrome** (limb-threatening, narrow window)
- **#2 — Early fat embolism syndrome** (life-threatening)
- **#3 — Hardware/positioning issue** compressing vessels
- **#4 — Pin-site or deep wound infection** (less acute at 6 h)

4

Generate Solutions

- Notify HCP / surgeon STAT — fasciotomy if compartment syndrome confirmed
- Loosen any constrictive dressings; elevate limb at heart level (NOT above — controversial in compartment syndrome)
- Apply O₂, prepare for ABG and chest imaging for fat embolism workup
- Hold opioids until cause of pain identified; do not mask symptoms
- Assess pin sites, vital signs q15 min, prepare patient for possible OR
- Anticipate orders for compartment pressure measurement

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Take Action

- Call HCP and rapid response — SBAR communication
- Apply O₂ 2–4 L NC, target SpO₂ ≥ 94%
- Place limb at heart level; remove tight dressings; loosen splint straps
- Repeat full neurovascular check, document time
- Establish second large-bore IV; obtain CBC, BMP, CK, ABG, type & cross
- NPO status, prepare informed consent for emergent fasciotomy
- Stay with patient; reassure family

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Evaluate Outcomes

- Pain decreases to ≤ 4/10 after fasciotomy / definitive intervention
- Capillary refill returns to < 3 seconds; foot warms and pinks
- 5 P's resolve; sensation and movement preserved distal to fixation
- SpO₂ ≥ 94%, RR < 20, HR returns < 100
- No development of petechiae; mental status remains clear
- No new pin-site purulence; afebrile within 24 h

NGN NCLEX 2026 Visual Study Library · Internal & External Fixation · Musculoskeletal Module

Drawn from standard NGN NCLEX 2026 references (Saunders, ATI, Lippincott) — topic not present in uploaded notes.

For exam prep only. Always follow current facility policy & provider orders in clinical practice.