NGN NCLEX 2026 | VISUAL STUDY GUIDE | MUSCULOSKELETAL SYSTEM

Musculoskeletal Diagnostics & imaging

Series: Diagnostic Procedures • **System:** Musculoskeletal • **Focus:** Pre/Post-Procedure Nursing Care •

Framework: NCJMM Clinical Judgment

01 — Overview & Why It Matters

DEFINITION

Musculoskeletal diagnostics identify fractures, joint disease, bone tumors, soft-tissue injury, and metabolic bone disease — guiding nursing priorities before and after the procedure.

- **Imaging** (X-ray, CT, MRI, Bone Scan, DEXA) evaluates bone density, structure, alignment, and occult injury.
- **Invasive tests** (Arthroscopy, Arthrocentesis, Bone biopsy, EMG, Myelogram) carry infection, bleeding, and neurovascular risks.
- **Labs** confirm inflammation, autoimmune disease, muscle damage, and calcium/phosphorus balance.

02 — The Tests — What Each One Sees

MECHANISM

X-Ray (Radiograph)

IMAGING · NON-INVASIVE

DETECTS	Fractures, dislocations, bone alignment, degenerative changes, foreign bodies.
PREP	Remove all **metal objects** (jewelry, snaps). Assess for **pregnancy** → shield abdomen.
POST	None — no recovery needed. NO SEDATION

CT Scan

CROSS-SECTIONAL · ± CONTRAST

DETECTS	Complex fractures, tumors, spinal injury, deep soft-tissue trauma.
PREP	If **contrast**: check **iodine/shellfish allergy**, **BUN/creatinine**, hold **metformin 48 hr**.
POST	**Push fluids** to flush contrast. Monitor for allergic reaction. KIDNEY WATCH

MRI

MAGNETIC · SOFT-TISSUE GOLD STANDARD

DETECTS	Ligament/tendon tears, meniscus injury, spinal cord, disc herniation, bone marrow.
PREP	Screen for **metal implants**: pacemaker, aneurysm clips, cochlear implants = **ABSOLUTE contraindication**. Ask about **claustrophobia**.
POST	None. If **gadolinium** contrast → monitor renal function. NO METAL

Bone Scan

NUCLEAR · RADIOISOTOPE

DETECTS	Metastatic bone cancer, osteomyelitis, occult fractures, Paget disease.
PREP	**IV radioisotope** injected → wait **2–3 hours** before imaging. **Push fluids** during wait. Empty bladder before scan.
POST	**Push fluids 24–48 hr** to excrete isotope. LOW RADIATION

DEXA Scan
BONE DENSITOMETRY · OSTEOPOROSIS

DETECTS Bone mineral density. **T-score ≤ -2.5 = osteoporosis**; -1 to -2.5 = osteopenia.

PREP No calcium supplements **24 hr** before. Wear no metal. Lie still.

POST None. Painless, low radiation. NO RECOVERY

Arthroscopy
INVASIVE · VISUALIZES JOINT INTERIOR

DETECTS Meniscus/ligament tears, loose bodies, synovitis. Often **diagnostic + surgical**.

PREP NPO 6–8 hr. Informed consent. Assess **neurovascular status** (baseline).

POST Ice, elevate, **neurovascular checks q1–2 hr**. Weight-bearing per HCP. Report fever, ↑ pain, numbness. INFECTION RISK

Arthrocentesis
JOINT ASPIRATION · SYNOVIAL FLUID

DETECTS Gout (urate crystals), septic arthritis, hemarthrosis, rheumatoid effusions.

PREP Consent. Clean site. Local anesthetic.

POST Pressure dressing, ice, **rest joint 8–24 hr**. Assess for infection, bleeding. BLEEDING RISK

Electromyography (EMG)
ELECTRICAL · MUSCLE & NERVE FUNCTION

DETECTS Muscular dystrophy, myasthenia gravis, ALS, peripheral neuropathy, radiculopathy.

PREP **Avoid caffeine & smoking 3 hr** before. No lotions on skin. Hold muscle relaxants & cholinergics per HCP.

POST Mild soreness at needle sites. Warm compresses; mild analgesics. NEEDLE ELECTRODES

Myelogram
SPINAL IMAGING · CONTRAST VIA LP

DETECTS Spinal cord lesions, herniated disks, nerve root compression, spinal stenosis.

PREP NPO 4–8 hr. Consent. Allergy check. Hold phenothiazines, tricyclics (lower seizure threshold).

POST **Water-based dye:** HOB **elevated 30–45°** × 8 hr. **Oil-based: flat** 12–24 hr. **Push fluids.** Watch for HA, seizures, meningeal signs. SEIZURE RISK

Bone Biopsy
TISSUE SAMPLE · NEEDLE OR OPEN

DETECTS Bone cancer (1° or metastatic), osteomyelitis, unexplained bone lesions.

PREP NPO, consent, baseline coagulation studies.

POST **Pressure dressing**; monitor for **bleeding, infection, fracture**. Ice site. Analgesics. BLEEDING + INFECTION

03 — Key Lab Findings

SIGNS & VALUES

LAB	NORMAL RANGE	CLINICAL MEANING (↑ ELEVATED)
Calcium (Ca^{2+})	9.0 – 10.5 mg/dL	↑ = bone metastasis, hyperparathyroidism; ↓ = osteomalacia, hypoparathyroidism. Watch for **Chvostek / Trousseau**.
Phosphorus	3.0 – 4.5 mg/dL	Inverse relationship with calcium. ↑ in renal disease.
Alkaline Phosphatase (ALP)	30 – 120 U/L	↑ in **Paget disease, bone cancer, healing fracture, osteomalacia**.
Creatine Kinase (CK / CPK)	55 – 170 U/L	↑ with **muscle injury**, muscular dystrophy, rhabdomyolysis, crush injuries.
ESR (Sed Rate)	0 – 30 mm/hr	Nonspecific **inflammation marker** — ↑ in RA, osteomyelitis, lupus.
C-Reactive Protein (CRP)	< 1.0 mg/dL	Acute **inflammation / infection**. Rises/falls faster than ESR.
Uric Acid	M: 4–8.5 · F: 2.7–7.3 mg/dL	↑ in **gout**; confirms crystal arthropathy.
Rheumatoid Factor (RF)	< 60 U/mL (negative)	Positive in **rheumatoid arthritis** (~80%); also Sjögren, lupus.

LAB	NORMAL RANGE	CLINICAL MEANING (↑ ELEVATED)
Anti-CCP	< 20 U/mL	**Most specific marker for RA** — earlier & more specific than RF.
ANA	Negative	Positive in **SLE**, scleroderma, mixed connective tissue disease.
HLA-B27	Negative	Positive in **ankylosing spondylitis**, reactive arthritis, psoriatic arthritis.

04 — Red Flag Findings Post-Procedure

ASSESS

Expected / Mild

NORMAL RECOVERY

- → **Mild soreness** at needle, biopsy, or arthroscopy site
- → **Small ecchymosis** or mild swelling at puncture site
- → Transient **fatigue** after bone scan or sedated procedures
- → Low-grade headache post-myelogram (water-based dye)
- → **Warmth** or metallic taste during IV contrast (brief)

Severe / Emergent

CALL HCP

- ⚠ **Fever > 101°F** , chills, increasing site redness → **infection**
- ⚠ **Uncontrolled bleeding** or expanding hematoma
- ⚠ Cold, pale, pulseless, paresthetic extremity → **compartment syndrome**
- ⚠ Severe HA, stiff neck, photophobia, **seizure** post-myelogram
- ⚠ **Dyspnea, wheezing, urticaria, hypotension** → contrast anaphylaxis
- ⚠ ↓ urine output, flank pain post-contrast → **contrast-induced nephropathy**

Compartment Syndrome — The 6 P's

Pain (out of proportion), **Pallor**, **Pulselessness**, **Paresthesia**, **Paralysis**, **Poikilothermia**. This is a surgical emergency — notify the HCP **immediately**. Do not elevate the limb above the heart (reduces arterial flow).

05 — Priority Nursing Interventions

ABCS + SAFETY

BEFORE — PRE-PROCEDURE

Preparation & Screening

1. **Verify informed consent** for all invasive procedures (arthroscopy, biopsy, myelogram, arthrocentesis).
2. **Allergy screen:** iodine, shellfish, latex, contrast dye.
3. **Labs:** BUN/creatinine before contrast; PT/INR, platelets before biopsy.
4. **Hold metformin 48 hr** before IV iodinated contrast.
5. **NPO 6–8 hr** for sedated / invasive procedures.
6. **MRI screening:** metal implants, pacemaker, pregnancy, claustrophobia.
7. Establish **baseline neurovascular check** — CMS (circulation, motion, sensation).
8. Empty bladder; remove metal objects, jewelry, hearing aids.

AFTER — POST-PROCEDURE

Monitoring & Safety

1. **Neurovascular checks q1–2 hr** on affected extremity after arthroscopy / biopsy / arthrocentesis.
2. **Push PO fluids** to flush contrast & radioisotopes (unless contraindicated).
3. Monitor **vital signs** & **O_2 saturation** per sedation protocol.
4. Assess site for **bleeding, hematoma, infection**. Apply pressure dressing & ice.
5. **Myelogram positioning:** HOB ↑ 30–45° × 8 hr (water-based); flat 12–24 hr (oil-based).
6. **Rest joint** 8–24 hr after arthrocentesis / arthroscopy.
7. Monitor for **anaphylaxis** (hives, wheezing, hypotension) × 30 min post-contrast.

8 Teach signs of **compartment syndrome** to report immediately.

06 — Clinical Judgment Scenario

NCJMM FRAMEWORK

Applying the NCJMM Model

> *A 62-year-old client returns to the unit 2 hours post right-knee arthroscopy. The nurse notes the right calf is tense, pale, and the client reports "severe pain that won't stop." Dorsalis pedis pulse is weak compared to the left. Capillary refill is 4 seconds.*

Step 1

Recognize

Pain disproportionate to procedure, pallor, weak pulse, prolonged cap refill, tense extremity — classic early **compartment syndrome**.

Step 2

Analyze

Swelling from arthroscopy fluid & bleeding ↑ intracompartmental pressure → compressed vessels & nerves → ischemia within **4–6 hours**.

Step 3

Prioritize & Act

Notify HCP STAT. Keep limb at heart level (not elevated). Loosen dressing. Prepare for **fasciotomy**. Do not apply ice.

Step 4

Evaluate

Reassess pulses, color, pain q15 min. Goal: restored perfusion, pain relief, intact motor/sensory function, no tissue necrosis.

07 — NCLEX Test Traps

COMMONLY MISSED

TRAP 01 · MRI	~~"Remove metal jewelry — pacemaker is fine"~~	→ Pacemaker = ABSOLUTE contraindication (older models); screen ALL implants
TRAP 02 · CONTRAST	~~"Hold metformin the morning of the scan"~~	→ Hold metformin 48 hours before AND after IV iodinated contrast (lactic acidosis risk)
TRAP 03 · MYELOGRAM	~~"Position flat for all dye types"~~	→ Water-based = HOB ↑ 30–45° × 8 hr; oil-based = flat × 12–24 hr
TRAP 04 · COMPARTMENT SYNDROME	~~"Elevate the limb above the heart"~~	→ Keep limb at heart level — elevation ↓ arterial flow & worsens ischemia
TRAP 05 · EMG	~~"Full cup of coffee before the test is fine"~~	→ NO caffeine or smoking × 3 hr — alters muscle electrical activity
TRAP 06 · BONE SCAN	~~"Strict isolation because of radiation"~~	→ Isotope dose is low — standard precautions; push fluids to excrete
TRAP 07 · RA LABS	~~"RF is the most specific test for RA"~~	→ Anti-CCP is more specific and appears earlier than RF
TRAP 08 · ARTHROCENTESIS	~~"Resume normal activity right away"~~	→ Rest joint 8–24 hr, ice, compression; watch for bleeding/infection

TRAP 09 · DEXA ~~"Take calcium supplement the morning of DEXA"~~ → Hold calcium × 24 hr before — can falsely elevate density

TRAP 10 · PRIORITY ~~"Give pain medication first for post-op pain"~~ → Assess first — unusual pain may be compartment syndrome, not routine pain

08 — Patient & Family Education

TEACHING

i. Before the Test

- **Allergies** — tell staff about iodine, shellfish, latex, previous dye reactions
- Bring a list of **all medications** including metformin & anticoagulants
- Follow **NPO** instructions exactly for sedated or invasive tests
- Remove **metal, jewelry, hearing aids** — especially for MRI
- Arrange a **ride home** if sedation is used

ii. After Contrast / Isotope

- **Drink plenty of water** for 24–48 hours to flush dye/isotope
- Report **itching, rash, wheezing, hives** immediately (late allergy)
- Watch for **decreased urine**, flank pain — kidney warning
- Flush toilet twice after bone scan to excrete isotope safely

iii. After Invasive Procedures

- **Rest, ice, elevate** (except in compartment syndrome — keep level)
- Keep the dressing **clean and dry**
- Call HCP for **fever > 101°F**, bleeding, ↑ pain, numbness, coldness
- Do not drive or sign legal documents for 24 hr after sedation
- Use prescribed **assistive devices** (crutches, sling) as instructed

09 — Memory Boosters & Mnemonics

RETENTION

6 P's

COMPARTMENT SYNDROME

- **P** **Pain** — severe, out of proportion, unrelieved by opioids
- **P** **Pallor** — pale, cool, shiny skin
- **P** **Pulselessness** — diminished or absent distal pulse
- **P** **Paresthesia** — tingling, numbness
- **P** **Paralysis** — late sign, may be permanent
- **P** **Poikilothermia** — limb matches room temperature

MRI

METAL RULES IN DANGER

- **M** **Metal implants** — pacemaker, aneurysm clips, cochlear, shrapnel
- **R** **Remove** all jewelry, watches, hairpins, hearing aids
- **I** **Inform** about claustrophobia & pregnancy

DEXA

DENSITY THRESHOLDS

- **+** T-score **≥ -1.0** → Normal
- **~** T-score **-1.0 to -2.5** → Osteopenia
- **–** T-score **≤ -2.5** → **Osteoporosis**
- **!** T-score ≤ -2.5 **+ fragility fracture** → Severe

CAT

PRE-CONTRAST CHECKLIST

- **C** **Creatinine** & BUN — check kidney function
- **A** **Allergies** — iodine, shellfish, previous dye reactions
- **T** **Tell them to hold metformin** 48 hr before & after

GOUT

ARTHROCENTESIS CLUES

- **G** — **Great toe** — classic first joint affected (podagra)
- **O** — **Overproduction** of uric acid; labs ↑
- **U** — **Urate crystals** in synovial fluid = diagnostic
- **T** — **Tophi** — chalky deposits in chronic disease

OIL ↔ H_2O

MYELOGRAM POSITIONING

- **O** — **Oil-based** dye → position **flat** 12–24 hr (heavier than CSF)
- **H** — **Water-based** dye → **HOB 30–45°** × 8 hr (prevents seizures)
- **F** — **Fluids** afterward — flush dye from system
- **S** — **Seizure** precautions — hold phenothiazines & TCAs