

NGN NCLEX 2026 • MUSCULOSKELETAL SYSTEM

Spinal Deformities

Kyphosis · Lordosis · Scoliosis

A high-yield comparison of the three primary spinal curvature disorders — recognizing the curve, screening the adolescent, bracing the right way, and protecting the post-fusion spine.

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Definition & Overview

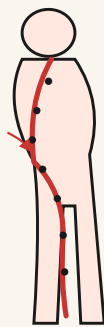
Three curves, three planes, three problems

The spine has natural curves — cervical lordosis, thoracic kyphosis, lumbar lordosis, sacral kyphosis. **Deformity = an exaggeration or abnormal direction of those curves.** All three conditions are diagnosed by visual inspection, the Adam's forward bend test, and confirmed by spinal X-ray with measurement of the curve angle (Cobb angle).



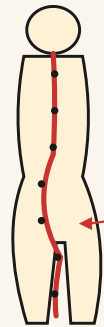
Normal

Gentle S-curve, balanced



Kyphosis

Thoracic outward — "hunchback"



Lordosis

Lumbar inward — "swayback"



Scoliosis

Lateral S or C — most common in adolescent girls

KYPHOSIS

Thoracic curve, outward

Rounded upper back ("hunchback" or "dowager's hump"). Anterior–posterior plane.

- **Top cause adults:** osteoporosis with vertebral compression fractures
- **Top cause teens:** Scheuermann's disease (idiopathic, postural)
- Also: congenital, ankylosing spondylitis, TB of spine (Pott's disease)

LORDOSIS

Lumbar curve, inward

Exaggerated inward curve of lower back ("swayback"). Belly pushes forward, buttocks back.

- **Common causes:** obesity, pregnancy, weak abdominal muscles
- Also: achondroplasia (dwarfism), spondylolisthesis, hip flexor tightness
- Often *compensatory* for kyphosis above it

SCOLIOSIS

Lateral S or C curve

Sideways curve of the spine $\geq 10^\circ$. The vertebrae also *rotate*, producing the rib hump.

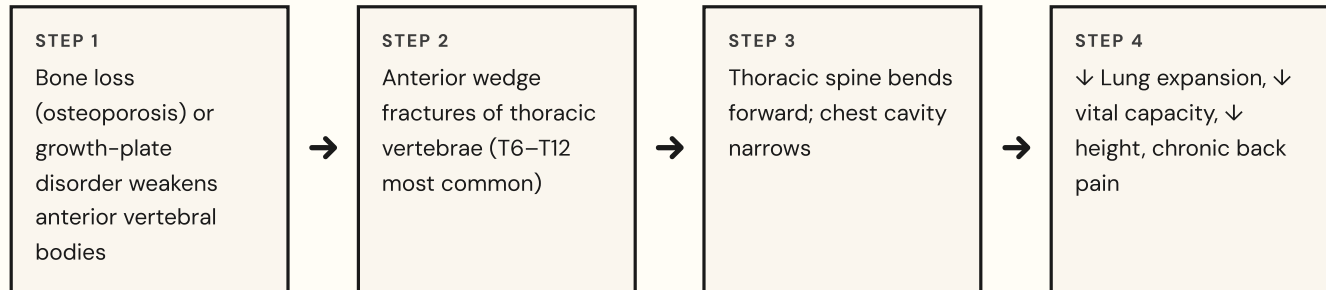
- **~80% idiopathic**, peak onset 10–15 yrs, **girls 8:1**
- Other types: congenital, neuromuscular (CP, muscular dystrophy)
- Progresses fastest during growth spurts

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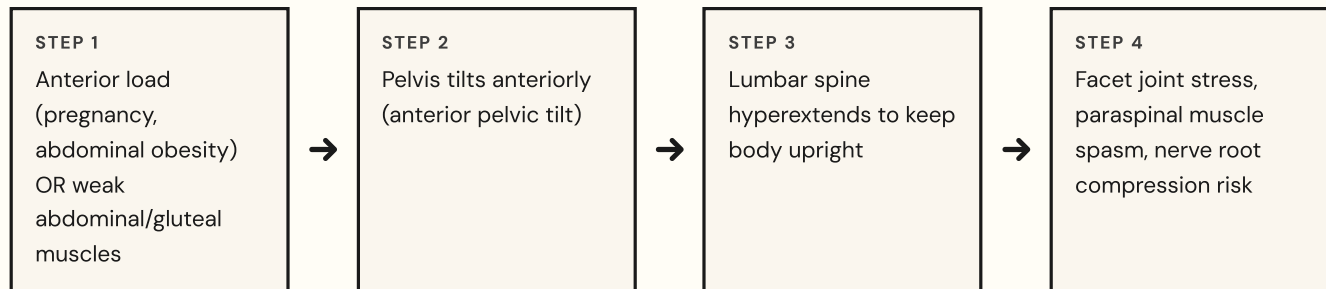
Pathophysiology

Why the curve becomes a problem

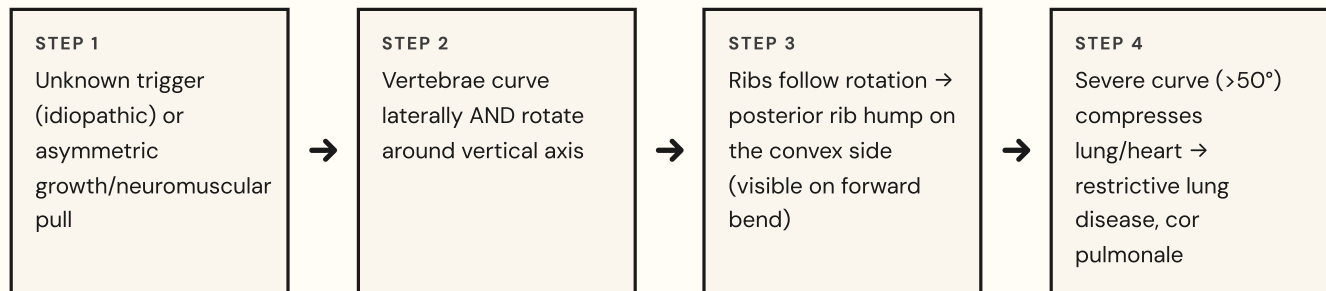
Kyphosis — vertebral wedging cascade:



Lordosis — center of gravity shift:



Scoliosis — curve + rotation:



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Signs & Symptoms

What you'll see on inspection — by condition

Kyphosis — visible findings

- Rounded thoracic back, "humpback" appearance
- Forward head, protracted shoulders
- Loss of height (esp. elderly with osteoporosis)
- Mid-back pain, stiffness, fatigue
- Decreased chest expansion → dyspnea on exertion
- GI symptoms if severe: early satiety, reflux

Lordosis — visible findings

- Prominent buttocks, abdomen protrudes
- Exaggerated curve of lower back
- Lower back pain, muscle spasms
- Numbness/tingling in legs if nerve root compressed
- Difficulty lying flat on back (gap under lumbar spine)
- Common in pregnancy & obesity (often reversible)

Scoliosis — Adam's bend test findings

- **Asymmetric shoulders** (one higher than other)
- **Asymmetric scapulae** — one prominent
- **Asymmetric hips/waistline** — uneven hemlines
- **Rib hump** on forward bend (hallmark sign)
- Visible lateral curve when standing
- Usually painless in adolescents (pain = red flag, think tumor/infection)

Severe / Late findings (any)

- Dyspnea, ↓ exercise tolerance (restrictive lung disease)
- Cardiac strain → cor pulmonale (right HF)
- Chronic, intractable back pain
- Neurologic deficits: weakness, paresthesia, bowel/bladder changes
- Loss of self-esteem, body image disturbance (esp. adolescent)

 **RED FLAGS — REPORT IMMEDIATELY: pain in pediatric scoliosis (not normal — consider tumor, infection, syrinx), new bowel/bladder dysfunction, rapidly progressing curve, neurologic deficit, dyspnea at rest, or post-op fusion patient with absent pedal pulses, numbness, or inability to move toes.**

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Priority Nursing Interventions

Screening, bracing, post-op fusion care

Screening & Assessment

- **1** Perform **Adam's forward bend test** — child bends at waist, arms hanging; nurse inspects from behind for rib hump or asymmetry
- **2** Assess shoulder, scapular, waist, and hip symmetry standing
- **3** Measure leg length (true vs apparent) — rule out compensatory curve
- **4** Standard school screenings: girls age 10 & 12, boys age 13–14
- **5** Assess respiratory effort, breath sounds, chest expansion

Brace Care (TLSO / Boston / Milwaukee)

- **1** **Wear 23 hrs/day** — off only for bathing & skin care
- **2** Wear a soft, snug cotton T-shirt **UNDER** the brace (no seams, no wrinkles)
- **3** Inspect skin under brace every time it is off — look for redness, breakdown
- **4** **NO lotions, powders, or oils** under brace — they soften skin and cause breakdown
- **5** Encourage exercise (swimming is ideal) when out of brace
- **6** Brace stops worsening — does NOT correct existing curve

Post-Spinal Fusion (Priority)

- **1** **Log roll** — keep spine in straight alignment; use draw sheet, 2–3 staff
- **2** **NO twisting** of trunk; HOB flat or low; pillow between knees when side-lying
- **3** Neurovascular checks q1–2h × 24 hrs: CMS (color, motion, sensation) all extremities
- **4** Monitor for paralytic ileus — auscultate bowel sounds, NG to suction if ordered, NPO until passing flatus
- **5** Pain control: PCA pump opioid (often morphine) → wean to PO
- **6** Strict I&O, monitor for urinary retention (Foley typically in place 24–48 hrs)
- **7** Incentive spirometer q1h while awake — prevent atelectasis
- **8** Monitor surgical drain output and incision (no bending to inspect)

Psychosocial & Long-Term

- **1** Address body image — especially adolescents wearing brace through school
- **2** Encourage peer support groups, online communities
- **3** Discuss clothing options that hide the brace
- **4** Reinforce that compliance with brace = avoiding surgery
- **5** Promote calcium/vit-D, weight-bearing exercise (esp. kyphosis with osteoporosis)
- **6** Fall prevention in elderly with kyphosis (altered balance)

Cobb Angle Treatment Roadmap (Scoliosis):

< 25° → **Observe** + serial X-rays every 4–6 months during growth

25° – 40° → **Brace** (Boston/TLSO 23 hrs/day) — only effective while skeletally immature
> 40°–50° → **Spinal fusion surgery** with rod instrumentation (Harrington, Luque, or modern segmental)

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Pharmacology

Pain, muscle spasm, bone health, post-op support

Drug / Class	Mechanism	Key Side Effects	Nursing Considerations
NSAIDs (ibuprofen, naproxen, ketorolac)	Inhibit COX-1/2 → ↓ prostaglandins → ↓ pain & inflammation	GI bleed, peptic ulcer, ↑ BP, renal injury, platelet inhibition	Give with food ; watch for melena/coffee-ground emesis; avoid in renal disease; ketorolac max 5 days
Opioids (morphine, hydromorphone, oxycodone)	Bind μ-receptors in CNS → ↓ pain perception	Respiratory depression, sedation, constipation, urinary retention, hypotension	Monitor RR — hold if <12 (adult) or <10 (peds) ; have naloxone available; bowel regimen with senna/docusate; PCA for post-fusion pain
Muscle Relaxants (cyclobenzaprine, methocarbamol, baclofen)	CNS depression → ↓ muscle spasm	Sedation, dizziness, dry mouth, anticholinergic effects	Fall precautions; avoid alcohol/CNS depressants; baclofen — never stop abruptly (rebound spasticity, seizures)
Bisphosphonates (alendronate, risedronate)	Inhibit osteoclasts → ↓ bone resorption → ↑ bone density	Esophagitis, esophageal ulcer, jaw osteonecrosis, atypical femur fracture	Take AM on empty stomach, full glass of water, remain upright 30 min , no other meds/food during that time
Calcium + Vitamin D	Substrate for bone formation; vit D ↑ Ca absorption	Constipation, kidney stones (excess Ca), hypercalcemia	Encourage dietary sources (dairy, leafy greens); separate from iron and bisphosphonates by 2 hrs
Calcitonin (nasal/SQ)	Inhibits osteoclasts; lowers serum Ca	Nasal irritation, rhinitis, hypocalcemia, flushing	Alternate nostrils daily; assess for tingling, muscle cramping (hypocalcemia)
Stool Softeners / Laxatives (docusate, senna)	Soften stool / stimulate peristalsis	Cramping, diarrhea, electrolyte loss	Essential prophylaxis with opioids post-fusion; ensure adequate fluids
Antibiotic Prophylaxis (cefazolin)	Bactericidal — prevents surgical site infection	Allergic reaction (cross-sensitivity with penicillin), GI upset	Give within 60 min of incision; assess for PCN allergy first; monitor temp post-op

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NCLEX Test Traps

Where students lose easy points

✗ WRONG THINKING

"The brace will correct the curve over time, so part-time wear is fine."

✓ RIGHT THINKING

The brace
ONLY HALTS PROGRESSION
— it does not reverse an existing curve. Must be worn
23 HOURS/DAY
to work.

✗ WRONG THINKING

"Apply baby powder under the brace to keep skin dry and prevent rash."

✓ RIGHT THINKING

NO POWDERS, LOTIONS, OR OILS
under the brace — they cake, soften skin, and cause breakdown. Cotton T-shirt only.

✗ WRONG THINKING

"After spinal fusion, the patient can sit up and self-reposition for comfort."

✓ RIGHT THINKING

LOG ROLL ONLY
— keep the spine in straight alignment. No twisting, no bending, draw sheet with 2–3 staff.

✗ WRONG THINKING

"A teenager with scoliosis complaining of back pain is normal — the curve is causing it."

✓ RIGHT THINKING

Idiopathic scoliosis is
USUALLY PAINLESS
in adolescents. Pain is a
RED FLAG
— investigate tumor, infection, syrinx, or disc problem.

✗ WRONG THINKING

"Post-op fusion patient is hypoactive bowel sounds — give a laxative and reassess in 8 hours."

✓ RIGHT THINKING

Suspect
PARALYTIC ILEUS
— keep NPO, notify HCP, monitor for distention/vomiting. NG suction may be needed.

✗ WRONG THINKING

"Adam's bend test is used to diagnose all three spinal deformities."

✓ RIGHT THINKING

Adam's forward bend is the
SCOLIOSIS
screening test (reveals rib hump). Kyphosis & lordosis are diagnosed by inspection & X-ray.

✗ WRONG THINKING

✓ RIGHT THINKING

"An elderly woman with new severe mid-back pain — give Tylenol and reassess."

Suspect
VERTEBRAL COMPRESSION FRACTURE
from osteoporosis (cause of senile kyphosis).
Notify HCP — needs imaging.

✗ WRONG THINKING

"Numbness in a post-fusion patient's leg is from positioning — reposition and observe."

✓ RIGHT THINKING

Numbness, weakness, or absent pulses =
POSSIBLE SPINAL CORD INJURY OR HEMATOMA
.
NOTIFY SURGEON STAT.

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Patient & Family Education

Teaching that wins compliance and prevents readmission

Bracing (scoliosis & kyphosis)

- Wear **23 hrs/day**; off only for bathing & skin checks
- Snug cotton T-shirt UNDER brace — change daily
- NO powders, lotions, oils under brace
- Inspect skin at every removal; report redness lasting >20 min
- Continue brace until skeletal maturity confirmed by X-ray
- Choose loose clothing to hide brace; sports allowed when out

Post-fusion home care

- NO bending, lifting (>5–10 lb), or twisting × 6 weeks
- Sleep flat on back or side with pillow between knees
- Use reacher tool for dropped objects; sock aid for dressing
- Walk daily — slowly increase distance
- NO driving × 4–6 weeks (or until off opioids & cleared)
- Inspect incision — report redness, drainage, fever >101°F
- Bowel regimen while on opioids — prevent constipation

Bone health (kyphosis adults)

- Calcium 1,200 mg/day; Vit D 800–1,000 IU/day
- Weight-bearing exercise: walking, dancing, light weights
- No smoking, limit alcohol & caffeine
- Bisphosphonates: AM, empty stomach, water, upright 30 min
- Fall-proof home: rugs, lighting, grab bars, no clutter
- DEXA scan as ordered to monitor bone density

Lordosis self-management

- Core/abdominal strengthening (planks, pelvic tilts)
- Stretch hip flexors and hamstrings daily
- Lose weight if overweight; supportive shoes (no high heels)
- Sleep on side with knee pillow or back with knees elevated
- Often resolves postpartum — be patient
- Apply heat for muscle spasm; ice if acute inflammation

Adolescent body image

- Validate feelings — bracing is hard socially
- Connect with peer support groups (in-person or online)
- Reinforce: compliance with brace = avoiding surgery
- Stay involved in activities, friends, sports when out of brace
- Watch for signs of depression — refer if persistent
- Parents: avoid nagging; build collaborative routine

When to call HCP

- New numbness, weakness, or tingling in legs
- Bowel or bladder changes (incontinence or retention)
- Severe or worsening pain not relieved by meds
- Fever >101°F, chills, incision drainage
- Shortness of breath, chest pain, calf swelling/redness (DVT)
- Skin breakdown under brace that won't heal

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Memory Boosters

Mnemonics & pattern recognition

K

Kurved & Klumped

Kyphosis = Kurved back, klumped forward at the top (thoracic).

Think "K-Y-pho-sis = bent like a Y on its side."

L

Lower & Loungy

Lordosis = Lower back, Lounging swayback. Belly out, butt out.

Common in pregnancy & obesity.

S

Sideways S-curve

Scoliosis = Shaped like an S, Screen with bend test, found in School-age girls.

📌 ABCDEF — Scoliosis screening on Adam's bend test:

Asymmetric shoulders · Bulging scapula · Curved spine · Different hip height · Even leg lengths? (rule out) · Forward bend reveals rib hump

📌 Post-fusion priority — "LOG":

Log roll only · Opioid PCA + bowel regimen · Gauge neuro status (CMS) every 1–2 hr

📌 Brace rules — "23 / TT / NO":

23 hours per day · TT = Thin cotton T-shirt under · NO lotion, powder, oil

📌 Cobb angle "25 / 40":

Under 25° → observe · 25–40° → brace · over 40° → fuse it

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NCJMM Clinical Judgment

The six-step model applied to a real scenario

Scenario: Emma, a 13-year-old female, presents to the school nurse's office for her annual scoliosis screening. Mother reports Emma has had a recent growth spurt of 3 inches over the past 6 months. On inspection, the nurse notes that Emma's right shoulder appears higher than her left, and her right scapula is more prominent. When Emma performs the Adam's forward bend test, a visible right-sided thoracic rib hump is apparent. Emma denies back pain. Vital signs are within normal limits. Mother asks, "Does she need surgery?"

1

Recognize Cues

Adolescent female, peak scoliosis screening age. Recent rapid growth spurt = risk factor for curve progression. Asymmetric shoulders & scapulae. **Positive rib hump on forward bend** — hallmark of scoliosis. No pain (consistent with idiopathic scoliosis).

2

Analyze Cues

Findings strongly suggest **idiopathic adolescent scoliosis**. The rib hump indicates vertebral rotation (not just lateral curve). Growth spurt is concerning because curves progress most rapidly during skeletal growth. Absence of pain rules out red-flag diagnoses (tumor, infection). She has NOT yet been confirmed by imaging — Cobb angle is unknown.

3

Prioritize Hypotheses

Highest priority: Suspected idiopathic scoliosis requiring physician referral and spinal X-ray to determine Cobb angle.

Secondary: Risk for impaired body image related to brace wear if indicated.

Tertiary: Risk for non-compliance with brace therapy (adolescent population).

4

Generate Solutions

(1) Document findings & refer to PCP / orthopedist for spinal X-ray and Cobb angle measurement. (2) Educate mother that screening result is *not* a diagnosis — needs confirmation. (3) Reassure that most cases are mild and surgery is reserved for $>40^{\circ}$ – 50° . (4) Anticipate possible bracing if 25° – 40° . (5) Provide written referral & school documentation.

5

Take Actions

The nurse documents asymmetric shoulders, right scapular prominence, and right thoracic rib hump on Adam's bend test. She refers Emma to her PCP for an orthopedic consultation and standing spinal X-ray. She educates Emma and her mother on the screening findings, explains the diagnostic pathway, and emphasizes that **most cases do NOT require surgery**. She provides resources for adolescent scoliosis education.

Evaluate Outcomes

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Expected outcomes: (1) Family follows through with PCP referral within 1–2 weeks. (2) Emma receives appropriate imaging and Cobb angle measurement. (3) If treatment indicated, family demonstrates understanding of brace care or observation plan. (4) Emma verbalizes understanding and expresses feelings. (5) Serial monitoring continues throughout remaining skeletal growth. (6) No progression to severe curve requiring surgery.

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