Chapter 2. Anatomical Terminology: planes, directions, and positions

1. Learning Objectives

By the end of this chapter you will be able to …

1. **Define** the three cardinal anatomical planes and the axes that pass through them.
2. **Describe** the standard directional terms used to locate body structures in text, palpation, and medical imaging.
3. **Identify** and correctly use common patient positions employed in physiotherapy assessment, exercise, and electro-physical modalities.
4. **Apply** these terms to real-life clinical scenarios and chart notes, ensuring clear interdisciplinary communication.

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2. The Cardinal (Orthogonal) Planes & Axes

Plane	Axis Perpendicular to Plane	Description	Physiotherapy Examples
Sagittal (Median when mid-sagittal)	**Mediolateral** (frontal–horizontal)	Divides body into **right & left** parts	Hip flexion–extension during gait analysis; forward reach test
Coronal / Frontal	**Anteroposterior** (sagittal–horizontal)	Divides body into **anterior (ventral) & posterior (dorsal)** parts	Shoulder ab-/adduction in joint play; scapular wall slides
Transverse / Horizontal / Axial	**Longitudinal / Vertical**	Divides body into **superior & inferior** parts	Cervical rotation range; trunk rotation in PNF patterns

Clinical Pearl — Plane ≠ Movement
• A motion **occurs *parallel* to a plane** and **around** its perpendicular axis.
• A resistance exercise cue such as “move in the frontal plane” guides both therapist and patient to maintain correct movement trajectory, reducing compensations.

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3. Directional Terms (with PT-Specific Context)

Pair	Meaning	Practical PT Application
Anterior / Posterior	Toward the front / back of body	Recording thoracic kyphosis as “posterior convexity”
Superior / Inferior	Above / below a reference point	Cueing “superior glide of patella” in mobilisations
Medial / Lateral	Toward / away from the midline	Describing meniscus tears on MRI report
Proximal / Distal	Nearer / farther from limb root	Splint reaches “distal third of forearm”
Superficial / Deep	Closer to surface / further inside	Ultrasound head used for deep transverse friction
Cranial (Rostral) / Caudal	Toward head / tail end; often embryology, spine	Documenting “caudal traction” in lumbar traction note
Ipsilateral / Contralateral	Same side / opposite side of body	Cross-extension reflex training in stroke rehab
Palmar / Dorsal (hand)	Anterior hand / posterior hand	Electrode over palmar motor point of abductor pollicis brevis
Plantar / Dorsal (foot)	Inferior foot / superior foot	Stretch applied to plantar fascia

Documentation Tip: Combine terms for accuracy—e.g., “distal-lateral fibula tenderness” pinpoints the anatomy better than “outer ankle pain.”

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4. Fundamental Body Positions in Physiotherapy

Position	Anatomical Features	Typical Uses in PT
Anatomical Position	Standing, eyes forward, arms at sides, **supinated** palms	Universal reference for directions & planes
Supine	Lying face up	Bridging, SLR strength testing, E-stim for paraspinals
Prone	Lying face down	Prone press-ups for McKenzie, scapular re-training
Sidelying (Left / Right)	Lying on one side	Hip abductor MMT, modified thoracic rotation mobilisations
Hook-lying	Supine, hips & knees flexed, feet flat	Core stabilisation, transversus abdominis activation
Crook-lying	Synonym of hook-lying (UK usage)	—
Long-sitting	Sitting with knees extended	Hamstring stretch, neurodynamic testing
High-sitting	Sitting with hips flexed ≈ 90°, knees dangling	Lower-limb MMT, dynamic balance
Fowler's (Semi-recumbent)	Supine with head elevated 45–60 °	Pulmonary drainage, semi-upright IMT
Trendelenburg	Supine, head lower than feet 15–30 °	Postural drainage (contraindicated in ↑ICP)
Quadruped (All-fours)	Hands & knees on table	Bird-dog exercise, rocking for lumbar mobility
Kneeling / Half-kneel	Weight on both knees / single knee	Proprioceptive/balance drills, gait pre-training
Standing	Weight-bearing on feet	Gait, posture assessment, CKC strengthening

Safety Note: Always document any **contra-indications** to positions (e.g., hypotension in upright, pregnancy in prone) before treatment.

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5. Putting It All Together – Charting Example

Subjective: Patient c/o right shoulder pain.
Objective:
– AROM: Glenohumeral **abduction in coronal plane** limited to 90°.
– Accessory motion: **Posterior glide** (anteroposterior axis) hypomobile.
– Palpation: Tender at **anterosuperior acromion**.
Assessment: Sub-acromial impingement.
Plan: Mobilise in **sidelying**, apply **inferior glide** (longitudinal axis) grade III, then prescribe closed-chain wall slides maintaining **scapular plane** alignment.

Correct use of planes, axes, and directions minimizes ambiguity for any clinician reading this note.

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6. Quick Visualisation Hacks

1. **Laser Pointer Method:** Imagine a laser fixed perpendicular to each plane—where the beam points is the axis.
2. **Door & Hinge Analogy:** Door moves in a plane; hinge pin is the axis.
3. **"Salami Slice" MRI Thinking:** Each axial MRI slice is a transverse plane; mentally stack slices to reconstruct 3-D relationships.

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7. Self-Assessment Quiz

1. Which axis corresponds to flexion–extension at the elbow?
2. In a right-handed baseball swing, trunk rotation occurs in which plane?

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3. Name two patient positions unsuitable immediately after total hip replacement (posterior approach) and explain why using directional terminology.
4. Define “contralateral” and provide an example from neuro-rehabilitation.
5. True/False: The median nerve lies lateral to the brachial artery in the cubital fossa in anatomical position.

Answers of Self-Assessment Quiz

1. Mediolateral axis (perpendicular to sagittal plane).
2. Transverse (horizontal) plane.
3. (i) Low-sitting (hip > 90 ° flexion – risk of posterior dislocation) and (ii) Cross-leg sitting (combined hip flexion, adduction, internal rotation).
4. Pertaining to the opposite side; e.g., **contralateral hemispheric stroke** causing weakness in the left limb if the right cerebral hemisphere is affected.
5. False – it lies **medial** to the brachial artery.

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8. Suggested Lab Activities

1. **Plane Tape Drill:** Tape sagittal, coronal, and transverse lines on the floor. Have students perform movement patterns staying within each lane.
2. **Directional Bingo:** Instructor calls a term (“distal-posterior femur”); first student to palpate correctly scores.
3. **Position Swap Stations:** Rotate through treatment plinths set in prone, sidelying, quadruped—document three potential interventions per station.

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9. Key Take-Home Points

- Planes and axes form the **coordinate system** for describing movement.
- Directional terms eliminate vagueness; pair them when necessary.
- Mastery of patient positions underpins safe, effective treatment and accurate documentation.
- Consistency in terminology facilitates teamwork across disciplines and improves patient understanding.