

## 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.

### 2. The Cardinal (Orthogonal) Planes & Axes

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

### 3. Directional Terms (with PT-Specific Context)

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

#### 4. Fundamental Body Positions in Physiotherapy

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

#### 5. Putting It All Together - Charting Example

**Subjective:** Patient c/o right shoulder pain.

**Objective:**

- AROM: Glenohumeral **abduction in coronal plane** limited to  $90^\circ$ .
- 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.

#### 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.

#### 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?



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.

#### 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.

#### 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.