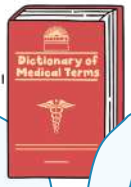
NURSING FUNDAMENTALS

MEDICAL TERMINOLOGY

COMMON TERMS



ABDUCTION: movement of a limb away from the midline of the body
ADDUCTION: movement of a limb toward the midline of the body
ABLATION: destruction of tissue using electricity, heat, or cold
ABSCESS: a localized collection of pus in or on the body
ACUTE: a condition with sudden onset, often severe
ADHESION: band of scar tissue that connects separate surfaces within the body
ALLERGEN: a substance that triggers an allergic reaction (e.g., pollen, dust, peanuts)
ALVEOLI: tiny air sacs in the lungs where oxygen & carbon dioxide are exchanged
AMENORRHEA: absence of menstruation
AMBULATORY: able to walk
ANALGESIA: pain relief through medication or other means
ANAPHYLAXIS: a life-threatening allergic reaction (e.g., hypotension, airway swelling, weak pulse, unconsciousness)
ANEMIA: a condition in which the red blood cell count is low
ANOREXIA: loss of appetite
APHASIA: difficulty speaking or understanding speech, often due to a left-sided stroke
APNEA: absence of breathing
ARRHYTHMIA: abnormal heart rhythm
ASEPTIC: free from harmful microorganisms
ASCITES: fluid buildup in the abdominal cavity
ASPIRATION: inhalation of food, fluid, or a foreign object into the airway
ASYMPTOMATIC: showing no signs or symptoms of disease
ASYSTOLE: absence of a heartbeat
ATROPHY: wasting or thinning of muscle due to lack of use
AUSCULTATION: listening to internal body sounds, typically with a stethoscope
BENIGN: non-cancerous tumor, growth, or condition
BIOPSY: removal of tissue or fluid for microscopic examination
BOLUS: a large dose of fluid or medication given over a short time
BRADYCARDIA: heart rate below 60 beats per minute
BRADYPNEA: respiratory rate below 10 breaths per minute
CACHEXIA: severe weight & muscle loss due to chronic illness
CEREBRAL: relating to the brain
CHRONIC: a long-term, recurring condition
CONGENITAL: present at birth
CONTUSION: bruise caused by ruptured capillaries under the skin
CREPITUS: grating or crackling sound from bones or joints
CYANOSIS: bluish skin discoloration due to low oxygen levels
DEHISCENCE: separation of previously joined wound edges
DELIRIUM: sudden confusion & disorientation, often temporary
DEMENTIA: progressive cognitive decline affecting memory & behavior
DIASTOLE: phase of the heartbeat when the heart relaxes & fills with blood
DYSPEPSIA: indigestion or upset stomach
DYSPHAGIA: difficulty swallowing
DYSPNEA: difficulty or labored breathing
ECCHYMOSIS: discoloration from bleeding under the skin (bruise)

EDEMA: swelling from fluid accumulation in tissues
EFFUSION: fluid buildup in a joint or body cavity
EMBOLISM: blockage of a blood vessel by a circulating clot or substance
EMESIS: vomiting
EPISTAXIS: nosebleed
ETIOLOGY: cause or origin of a disease or condition
EUPNEA: normal breathing rate & pattern
FEBRILE: having a fever (≥ 100.3°F / ≥ 38°C)
FLATUS: intestinal gas
GAIT: pattern or manner of walking
GRAFT: transplanted tissue from one part of the body to another
HEMATEMESIS: vomiting blood
HEMATOMA: blood collection under the skin due to a larger vessel rupture
HEMATURIA: blood in the urine
HEMIANOPIA: loss of vision in half of the visual field
HEMIPARESIS: weakness on one side of the body
HEMIPLEGIA: paralysis on one side of the body
HEMOPTYSIS: coughing up blood from the lungs
HEMORRHAGE: excessive or uncontrolled bleeding
HYPERGLYCEMIA: high blood sugar (> 160 mg/dL)
HYPERPNEA: deep, rapid breathing
HYPERTENSION: high blood pressure (> 140/90 mmHg)
HYPOTENSION: low blood pressure (< 90/60 mmHg or MAP < 65 mmHg)
HYPOTHERMIA: body temperature below 95°F (35°C)
HYPOXIA: low oxygen levels in tissues
IATROGENIC: caused unintentionally by medical treatment or procedures
IDIOPATHIC: of unknown cause
INCONTINENCE: involuntary loss of urine or stool
ISCHEMIA: reduced blood & oxygen supply to tissues
INFARCT: area of dead tissue from lack of blood supply
JAUNDICE: yellowing of skin or eyes due to high bilirubin levels
LESION: abnormal tissue change, often from injury or disease
LATERAL: away from the midline of the body
MALAISE: general feeling of discomfort or illness
MEDIAL: toward the midline of the body
NECROSIS: tissue death
NEUROPATHY: nerve damage causing pain, tingling, or weakness
NOCTURIA: waking up at night to urinate
ORTHOPNEA: difficulty breathing while lying flat
PALLIATIVE: care focused on comfort, not cure, during serious illness
PALPITATION: irregular, pounding, or fluttering heartbeat
PARESTHESIA: tingling, numbness, or "pins & needles" sensation
PERFUSION: delivery of blood to tissues & organs
PERISTALSIS: wave-like muscle contractions that move food through the gut
PETECHIAE: tiny pinpoint spots of bleeding under the skin
PHOTOPHOBIA: sensitivity to light
POLYDIPSIA: excessive thirst
POLYURIA: excessive urination
PRURITUS: itching
PURULENT: thick, pus-like discharge, often yellow or green
QUADRIPLEGIA: paralysis of all four limbs, often due to spinal cord injury
RALES: crackling lung sounds heard on auscultation (crackles)
RHINORRHEA: runny nose
SEPSIS: life-threatening systemic infection response
SEPTICEMIA: bloodstream infection
STENOSIS: narrowing of a body passage (e.g., blood vessel or valve)
STRIDOR: high-pitched, harsh respiratory sound indicating airway obstruction
SYSTOLE: heart contraction phase where blood is pumped out
TACHYCARDIA: heart rate above 100 beats per minute
THROMBUS: stationary blood clot in a vessel or heart
TINNITUS: ringing or buzzing in the ears
URGENCY: sudden, intense need to urinate or defecate
URTICARIA: raised, itchy rash (hives)
VIRULENT: highly infectious or severe disease-causing organism
WELL-APPROXIMATED: surgical wounds with clean, closely aligned edges

PREFIXES & SUFFIXES

PREFIXES	
ADENO-	gland
ANTE-	before
ARTHRO-	joint
BRADY-	slow
BRONCH-	airway
CARDIO-	heart
CEPHAL-	head
COSTO-	rib
CYST-	bladder
DERM-	skin
DYS-	abnormal
ENTERO-	intestines
FIBRO-	fibers
GASTRO-	stomach
GLUCO- OR GLYCO-	sugar
HEMI-	half
HEMO- OR HEMA-	blood
HEPAT-	liver
HISTO-	tissue
HYPER-	high
HYPO-	low
HYSTERO-	uterus
INTRA-	within
MACRO-	large
MICRO-	small
LAPRO-	abdominal wall
MYEL-	spinal cord
MYO-	muscle
NEPHRO-	kidney
OCULO-	eye
ORCHI-	testicle
OSTEO-	bone
OTO-	ear
PAN-	all
PED-	foot
PERI-	around
PHLEB-	vein
PNEUMO-	lung
POLY-	many
POST-	after
PRE-	before
PSEUDO-	not real
QUAD-	four
REN-	kidney
RHINO-	nose
SCLERO-	hard
SERO-	serum
SOMAT-	body
SUB-	below
SUPRA-	above
TACHY-	fast
THORA-	chest
THROMB-	blood clot
UTERO-	uterus
VASO-	blood vessel

SUFFIXES	
-ABLE	capable
-ASE	enzyme
-CENTESIS	surgical puncture
-CIDE	causes death
-ECTOMY	surgical excision
-EMESIS	vomit
-EMIA	blood
-ESTHESIA	sensation
-GENIC	formation
-ITIS	inflammation
-LITH	stone/calculi
-LOGY	study of
-LYSIS	destruction
-MEGALY	enlargement
-METRY	measurement
-OMA	tumor/growth
-OPIA	sight
-OSTOMY	surgical opening
-OTOMY	surgical incision
-PATHY	disease
-PENIA	deficiency
-PHAGIA	swallowing/eating
-PHOBIA	fear
-PHYLAXIS	protection
-PLASIA	growth
-PLASTY	reconstructive repair
-PLEGIA	paralysis
-PNEA	breathing
-POIESIS	formation/production
-RHAGE	copious bleeding
-SCLEROSIS	hardening
-URIA	urine

ABBREVIATIONS

Only **approved medical abbreviations** should be used. Always consult your school or hospital's policy to ensure compliance and avoid miscommunication.

GENERAL

A&O: alert & oriented
ABC: airway, breathing, circulation
ADH: antidiuretic hormone
AKA: above the knee amputation
ALS: advanced life support
AMA: against medical advice
BIBA: brought in by ambulance
BLS: basic life support
BM: bowel movement
Bx: biopsy
CC: chief complaint
C/O: complaining of
CP: chest pain
CSF: cerebrospinal fluid
CV: cardiovascular
D/C: discharge
DOB: date of birth
DOE: dyspnea on exertion
DNR: do not resuscitate
Dx: diagnosis
EBL: estimated blood loss
EENT: eyes, ears, nose, & throat
EMR: electronic medical record
FB: foreign body
Fx: fracture
GI: gastrointestinal
GSW: gunshot wound
GU: genitourinary
H&P: history & physical
H/O: history of
HOB: head of bed
HPI: history of present illness
I&O: intake & output
ICU: intensive care unit
IUD: intrauterine device
IVP: IV Push
IVPB: IV piggyback
ICD: implantable cardioverter defibrillator
ID: infectious disease
JVD: jugular venous distention
KVO: keep vein open
L&D: labor & delivery

FYI

Lac: laceration
LTAC: long-term acute care
LVAD: left ventricular assist device
MAP: mean arterial pressure
MAR: medication administration record
MDI: metered dose inhaler
MMR: measles, mumps, rubella (vaccine)
MVC: motor vehicle collision
N/V: nausea/vomiting
NGT: nasogastric tube
NICU: neonatal intensive care unit
NKA: no known allergies
NKDA: no known drug allergies
NSR: normal sinus rhythm
OB: obstetrics
OOB: out of bed
ORIF: open reduction internal fixation
OT: occupational therapy
OR: operating room
PACU: post-anesthesia care unit
PCA: patient-controlled analgesia
PCP: primary care physician
PEG: percutaneous endoscopic gastrostomy
PERRLA: pupils equal, round, reactive to light & accommodation
PICC: peripherally inserted central catheter
PMH: past medical history
Post-op: postoperative
POC: point of care
Pre-op: preoperative
PPE: personal protective equipment
PPM: permanent pacemaker
PT: physical therapy
RF: risk factors
RSI: rapid sequence intubation
S/P: status post
SNF: skilled nursing facility
SOB: shortness of breath
STAT: immediately
Sx: symptoms
TPN: total parenteral nutrition
Tx: treatment
UOP: urine output

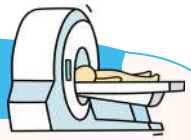
VITALS/MEASUREMENTS

ABI: ankle brachial index
BMI: body mass index
BP: blood pressure
BSA: body surface area
CI: cardiac index
CO: cardiac output
CPP: central perfusion pressure
CVP: central venous pressure
EF: ejection fraction
GCS: Glasgow Coma Scale
Gyn: gynecology
HR: heart rate
Ht: height
PAOP: pulmonary artery occlusion pressure
PAP: pulmonary artery pressure
PVR: pulmonary vascular resistance
RR: respiratory rate
SI: stroke index
SVR: systemic vascular resistance
Temp: temperature
VS: vital signs
VSS: vital signs stable
Wt: weight

TIMING

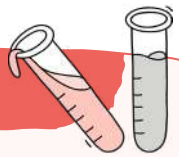
AC: before meals (Latin: ante cibum)
BID: twice a day (Latin: bis in die)
IM: intramuscular
IV: intravenous
NPO: nothing by mouth (Latin: nil per os)
OTC: over the counter
PC: after meals (Latin: post cibum)
PO: by mouth (Latin: per os)
PRN: as needed (Latin: pro re nata)
Q2H : every 2 hours
Q3H: every 3 hours
QAM: every morning (Latin: quaque die ante meridiem)
QH: every hour (Latin: quaque hora)
QHS: at bedtime (Latin: quaque hora somni)
QID: 4 times a day (Latin: quater in die)
QPM: every evening (Latin: quaque post meridiem)
Subcut: subcutaneous
TID: 3 times a day (Latin: ter in die)

LABORATORY



ABG: arterial blood gas
BAC: blood alcohol concentration
BG: blood glucose
BMP: basic metabolic panel
BUN: blood urea nitrogen
C&S: culture & sensitivity
Ca: calcium
CBC: complete blood count
CMP: comprehensive metabolic panel
CrCl: creatinine clearance
FFP: fresh frozen plasma
GFR: glomerular filtration rate
H&H: hemoglobin & hematocrit
HCT: hematocrit
HDL: high density lipoprotein
Hgb: hemoglobin
INR: international normalized ratio
K: potassium
LDL: low density lipoprotein
LFT: liver function test
Mg: magnesium
Na: sodium
Plt: platelet
PRBCs: packed red blood cells
PT: prothrombin time
PTT: partial thromboplastin time
RBCs: red blood cells
T&C: type & cross
T&S: type & screen
UA: urinalysis
WBC: white blood cells

DIAGNOSTICS



CT: computed tomography
CXR: chest X-ray
ECG/EKG: electrocardiogram
EEG: electroencephalogram
KUB: X-ray of kidneys, ureters, & bladder
MRI: magnetic resonance imaging
PET: positron emission tomography
PFT: pulmonary function test
US: ultrasound

DIAGNOSES

AAA: abdominal aortic aneurysm
ACS: acute coronary syndrome
Afib: atrial fibrillation
AKI: acute kidney injury
ARDS: acute respiratory distress syndrome
ARF: acute renal failure
AVM: arteriovenous malformation
BPH: benign prostatic hyperplasia
CAD: coronary artery disease
CF: cystic fibrosis
CHF: congestive heart failure
CKD: chronic kidney disease
COPD: chronic obstructive pulmonary disease
CP: cerebral palsy
CSW: cerebral salt wasting
CVA: cerebrovascular accident
CVD: cardiovascular disease
DAI: diffuse axonal injury
DIC: disseminated intravascular coagulation
DKA: diabetic ketoacidosis
DM1: type 1 diabetes mellitus
DM2: type 2 diabetes mellitus
DTs: delirium tremens
DVT: deep venous thrombosis
EDH: epidural hematoma
ESRD: end stage renal disease
GERD: gastroesophageal reflux disease
GVHD: graft versus host disease
HF: heart failure
HPV: human papilloma virus
HSV: herpes simplex virus
HTN: hypertension
IBD: inflammatory bowel disease
IBS: irritable bowel syndrome
ICH: intracerebral hemorrhage
ICP: intracranial pressure
IVH: intraventricular hemorrhage
LVH: left ventricular hypertrophy
MI: myocardial infarction
MS: multiple sclerosis
NSTEMI: non-ST elevated myocardial infarction
OSA: obstructive sleep apnea
PD: Parkinson's disease
PE: pulmonary embolism
PNA: pneumonia
PVC: premature ventricular contraction
PVD: peripheral vascular disease
RA: rheumatoid arthritis
RSV: respiratory syncytial virus
SAH: subarachnoid hemorrhage
SBO: small bowel obstruction
SDH: subdural hematoma
STEMI: ST elevated myocardial infarction
TBI: traumatic brain injury
TIA: transient ischemic attack
UC: ulcerative colitis
URI: upper respiratory infection
UTI: urinary tract infection
VF: ventricular fibrillation
VT: ventricular tachycardia

ANATOMICAL LOCATION

ABD: abdomen
LA: left atrium
LLE: left lower extremity
LLL: left lower lobe
LLQ: left lower quadrant
LUE: left upper extremity
LUL: left upper lobe
LUQ: left upper quadrant
LV: left ventricle
RA: right atrium
RLE: right lower extremity
RLL: right lower lobe
RLQ: right lower quadrant
RML: right middle lobe
RUE: right upper extremity
RUL: right upper lobe
RUQ: right upper quadrant
RV: right ventricle

PROCEDURES/INTERVENTIONS

AKA: above the knee amputation
BKA: below the knee amputation
CABG: coronary artery bypass graft surgery
CRRT: continuous renal replacement therapy
ECMO: extracorporeal membrane oxygenation
I&D: incision & debridement
IABP: intra-aortic balloon pump
PCI: percutaneous intervention
TAVR: transcatheter aortic valve replacement

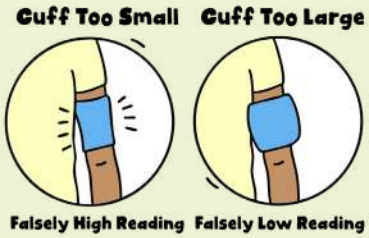
MEDICATIONS/FLUIDS

ABX: **a**nti**b**iotics
ACEi: **ace** **i**nhibitor
APAP: acetaminophen
ARB: **a**ngiotensin II **r**eceptor **b**locker
ASA: **a**cetyl**s**alicylic **a**cid
BB: **b**eta **b**locker
CCB: **c**alcium **c**hannel **b**locker
D5W: **5**% **d**extrose in **w**ater
IVIG: **i**ntra**v**enous **i**mmune **g**lobulin
LR: **l**actated **r**inger's
NS: **n**ormal **s**aline
NSAID: **n**on-**s**teroidal **a**nti-**i**nflammatory **d**rug
NTG: **n**i**t**ro**g**lycerine
PCN: **p**eni**c**illi**n**
PPI: **p**roton **p**ump **i**nhibitor
TPA: **t**issue **p**lasminogen **a**ctivator

PROHIBITED ABBREVIATIONS

		
UNIT	U	Write out "**unit**"
DAILY	Q.D., QD, q.d., qd	Write out "**daily**"
EVERY OTHER DAY	Q.O.D., QOD, q.o.d.	Write out "**every other day**"
TRAILING ZERO	X.0	Omit trailing zero – "**X**"
NO LEADING ZERO	.X	Add leading zero – "**0.X**"
MORPHINE SULFATE	MS	Write out "**morphine sulfate**"
MAGNESIUM SULFATE	MS04 MgS04	Write out "**magnesium sulfate**"
GREATER THAN OR LESS THAN	> or <	Write out "**greater than**" or "**less than**"
AT	@	Write out "at"
MILILITER	cc	Use "**mL**" or write out "**mililiters**"
SUBLINGUAL	SL	Write out "**sublingual**"
SUBCUTANEOUS	SC, SQ, sub q	Use "**subcut**" or write out "**subcutaneous**"

VITAL SIGNS

VITAL SIGN	NORMAL	ABNORMAL
HEART RATE	60-100 beats/min Resting heart rates in the 50s - even the 40s - can be normal in well-conditioned individuals. Always use your clinical judgment to assess the entire patient, not just the numbers.	< 60 beats/min ➔ **"Bradycardia"** > 100 beats/min ➔ **"Tachycardia"** Your critical thinking skills should always prompt you to ask "why?"
BLOOD PRESSURE	120 /80 mmHg (MAP ≥ 65 mmHg) "Systolic" "Diastolic" 	< 90/60 or MAP < 65 ➔ **"Hypotension"** > 130/90 ➔ **"Hypertension"** Always ensure you're using the correct cuff size - an improperly sized cuff can lead to inaccurate readings
RESPIRATORY RATE	 10-20 breaths/min	< 10 breaths/min ➔ **"Bradypnea"** > 20 breaths/min ➔ **"Tachypnea"**
SPO$_2$	 92-100% SpO_2 readings are only reliable with a strong, consistent waveform. Always verify the waveform before trusting the value.	< 92% ➔ **"Hypoxemia"** In healthy individuals, breathing is triggered by rising CO_2 levels. In COPD, chronic hypercapnia shifts the respiratory drive to low oxygen levels (hypoxic drive). As a result, SpO_2 levels of 88-92% are considered normal.
TEMPERATURE	 97.8-100.4° **TEMPERATURE MEASUREMENT ACCURACY (MOST TO LEAST ACCURATE):** Rectal - most accurate; closest to core body temperature Temporal (forehead) - generally reliable, especially in children Oral - affected by eating, drinking, & breathing patterns Axillary (armpit) - least accurate; often reads 0.5-1°F (0.3-0.6°C) lower than the core	95-97.7° ➔ **"Low body temp"** ≤ 95° ➔ **"Hypothermia"** ≥ 100.3 – 103.9° ➔ **"Febrile"** ≥ 104° ➔ **"Hyperthermia"**

VITAL SIGN	NORMAL	ABNORMAL
PAIN 	Patient provides a subjective report of pain that is **consistent with their condition** & clinical presentation	Patient reports a pain level that is **unusually high** given the nature of their condition, injury, or exam findings

HEAD TO TOE ASSESSMENT

INTRODUCTION

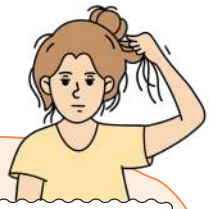
- Foam in (hand sanitizer)
- Knock before entering the room
- Wash your hands
- Greet the patient & introduce yourself by name & role
- Verify patient's identity using full name & DOB
- Explain your purpose clearly:
  - ✔ e.g. "I'm here to complete your assessment"
- Provide privacy (shut the door, close the curtain, etc.)
- Address immediate needs
  - ✔ Pain
  - ✔ Water
  - ✔ Bed position
  - ✔ Sensory aids (glasses, hearing aids, etc.)
- Explain what you are going to do (assessment details)

At this moment, perform a quick primary survey to ensure the patient is conscious, breathing, & not in immediate medical danger. Then, introduce yourself as their nurse for the next 12 hours.

If others are present, politely ask the patient whether they would like them to step out for privacy during the assessment

At the start, give the patient a clear overview of the assessment, including what you'll do and how long it will take. As you proceed, keep explaining each step in simple, jargon-free language - like saying "checking your legs for swelling" instead of "assessing for edema." This helps build trust, ease anxiety, & keeps the patient informed and comfortable throughout.

HEAD & NECK



HEAD

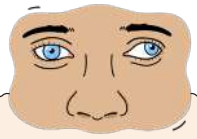
- Inspect for lice, debris, dandruff, or bald patches
- Palpate for deformities or masses

Bald patches may indicate "**alopecia areata**" (an autoimmune condition) or "**trichotillomania**" (a mental health disorder characterized by compulsive hair pulling)

EYES

- Check for strabismus
- Inspect sclera for jaundice or redness
- Note any drainage
- Look for cloudy pupils

A condition where the eyes point in different directions

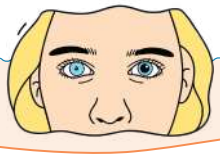


Commonly seen with cataracts or glaucoma

or anisocoria (unequal pupil size)

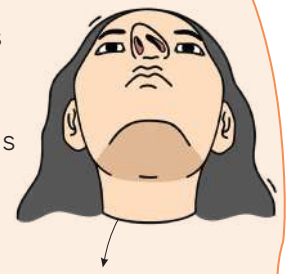
Anisocoria may be a normal variant for some patients -congenital, medication-induced, or benign. However, if new or unexplained, it requires urgent evaluation, as it can signal serious conditions like stroke or traumatic brain injury. In these cases, promptly perform a neurological exam.

Jaundiced sclera may indicate liver failure, while erythema can suggest conjunctivitis



HEAD & NECK

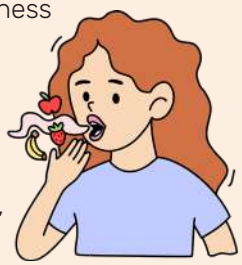
EARS



- Check for drainage or lesions
- Assess symmetry
- Note presence of hearing aids or signs of hearing difficulty

NOSE

- Look for deformities or deviated septum
- Assess for sinus pain or tenderness
- Observe nasal drainage - note color & consistency



MOUTH

- Check oral mucosa for dryness, pallor, cracking, or bleeding
- Note breath odor such as a fruity or alcohol smell
- Inspect lips for pallor, cyanosis, or lesions
- Look for sores or lesions inside the mouth

TEETH

- Check for broken teeth or dental caries (cavities)

TONGUE

- Check if midline, dry/cracked, or beefy red

This may be a sign of **pernicious anemia**

TONSILS

- Assess for swelling or presence of exudate

UVULA

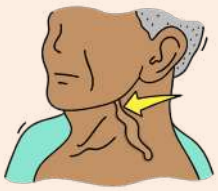
- Check if midline or deviated

NECK

- Confirm trachea is midline
- Palpate for swollen lymph nodes or masses

A deviated trachea may indicate a tension pneumothorax, a medical emergency - call a rapid response immediately!

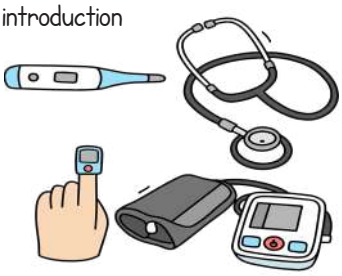
- Look for jugular venous distention



JVD may indicate heart failure

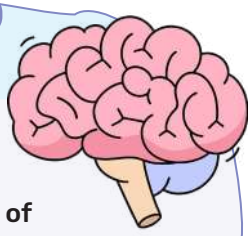
Obtain a full set of vital signs immediately following the introduction

- Temperature
- Heart rate
- Blood pressure
- Respiratory rate
- SpO_2
- Pain



NEUROLOGICAL

BASIC ASSESSMENT



GLASGOW COMA SCALE

- A standard tool to assess **level of consciousness & severity of head injury** by evaluating eye opening, verbal, & motor responses
- Scoring range: 3-15

CLASSIFICATION	GCS SCORE
NONE TO MILD INJURY	13-15 — FEELING SERENE, WHEN THAT GCS IS 15! MEMORY TRICK
MODERATE INJURY	4-12
SEVERE INJURY	3-8 — GCS LESS THAN 8? TIME TO INTUBATE! MEMORY TRICK

STRENGTH GRADING

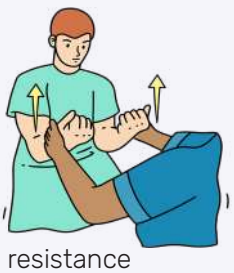
- **Evaluate muscle strength in all four limbs**

0/5: flaccid (no muscle contraction)

1/5: muscle contraction present, but no movement

2/5: movement possible without overcoming gravity

3/5: movement against gravity only



4/5: movement against some resistance

5/5: full muscle strength

NEUROLOGICAL

BASIC ASSESSMENT

Some patients may respond slowly - use clinical judgment to determine if this is typical for them (e.g., elderly or children)

ORIENTATION

▶ Assess the patient's **orientation** with four simple questions:

What is your first & last name?
➡ **A&O x 1** = oriented to self

Where are you right now?
➡ **A&O x 2** = oriented to self & place

What month is it? Who is the President of the United States?
➡ **A&O x 3** = oriented to self, place, & time

Confirm patient identity by checking their armband. A bedside family member can also help verify details.

Avoid asking for the exact date or day of the week, as many healthy individuals may not recall them

Why are you here today?
➡ **A&O x 4** = oriented to self, place, time, & situation

MENTATION

▶ Using the Glasgow Coma Scale & orientation status, we describe the patient's **mentation** as follows:

- ➡ **Alert, conscious, & oriented:** A&O x 4; easily arousable when sleeping
- ➡ **Confused:** disoriented, difficulty following instructions, slow thinking, memory loss
- ➡ **Delirious:** confused, restless, agitated, delusional, &/or hallucinating
- ➡ **Somnolent:** excessively drowsy & sleepy
- ➡ **Obtunded:** difficult to arouse; requires repeated stimulation to stay awake
- ➡ **Stuporous:** only arousable with vigorous stimulation; will not stay awake without constant stimulation
- ➡ **Comatose:** unarousable regardless of stimulation level

PUPILLARY EXAM

▶ A quick assessment of pupillary response to detect signs of stroke or traumatic brain injury

➡ **Normal finding:**
PERRLA ➔ **p**upils are **e**qual, **r**ound, and **r**eactive to **l**ight & **a**ccommodation

NEUROLOGICAL

ADVANCED ASSESSMENT

SENSORY EXAM

▶ Test the somatic (conscious) senses, including:

- ✔ Pain
- ✔ Temperature
- ✔ Light vs. sharp touch
- ✔ Vibration
- ✔ Position awareness ("**proprioception**")
- ✔ Discriminative sensation ("**stereognosis**")

These help assess sensory nerve function and detect neurological deficits

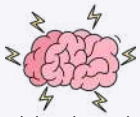
DEEP TENDON REFLEX ASSESSMENT

▶ Assess the integrity of the "reflex arc", which includes: *sensory* receptor ➔ *sensory* neuron ➔ spinal cord/brain ➔ *motor* neuron ➔ muscle (effector) ➔ contraction

➡ **Common reflexes tested:**

- ✔ Biceps
- ✔ Triceps
- ✔ Brachioradialis
- ✔ Patellar
- ✔ Achilles
- ✔ Plantar

CRITICAL CONSIDERATIONS



▶ **NIH stroke scale**

A standardized assessment tool evaluating 15 criteria, including eye movement, facial movement, limb strength, sensation, speech, & attention

➡ **Scoring**

1-4: Minor stroke
5-15: Moderate stroke
16-20: Moderate to severe stroke
21-42: Severe stroke

NEUROLOGICAL

ADVANCED ASSESSMENT

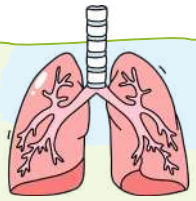
CRANIAL NERVE EXAM

▶ The 12 cranial nerves originate in the brain and extend to the face, head, & neck. Deficits in any of these nerves may indicate a head injury or neurological impairment.

"ONE OF OUR TALL TRIATHLETES ASKED FOR VERY GOOD VEGETABLES AND HUMMUS"

I. **O**lfactory: smell
II. **O**ptic: sight
III. **O**culomotor: eye movement & blinking
IV. **T**rochlear: vertical & horizontal eye movement
V. **T**rigeminal: facial sensation, jaw movement, & taste
VI. **A**bducens: eye movement
VII. **F**acial: taste & facial expression
VIII. **V**estibulocochlear: balance & hearing
IX. **G**lossopharyngeal: swallow & taste
X. **V**agus: heart rate & digestion
XI. **A**ccessory: neck & shoulder movement
XII **H**ypoglossal: tongue movement

RESPIRATORY

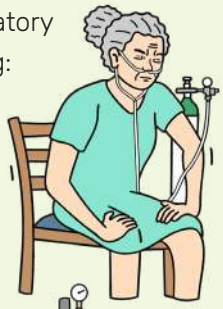


BASIC ASSESSMENT

WORK OF BREATHING

▶ Observe for signs of respiratory distress or dyspnea, including:

- ✔ Labored breathing
- ✔ Nasal flaring
- ✔ Grunting
- ✔ Intercostal retractions
- ✔ Cyanosis or pallor



O_2 DELIVERY SYSTEMS

▶ Document any oxygen support the patient is using:

- ✔ Nasal cannula
- ✔ Simple face mask
- ✔ Venturi mask
- ✔ Partial rebreather
- ✔ Non-rebreather
- ✔ High-flow nasal cannula
- ✔ Endotracheal tube

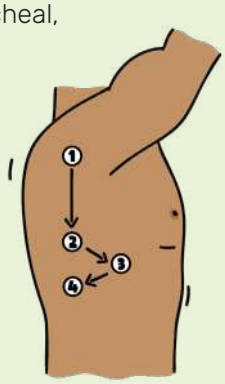
If a patient is on oxygen therapy, it's essential to collaborate closely with the **respiratory therapist** to ensure safe & effective care

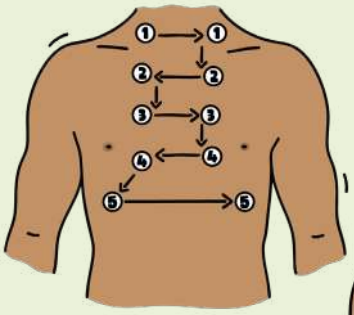
LUNG SOUNDS

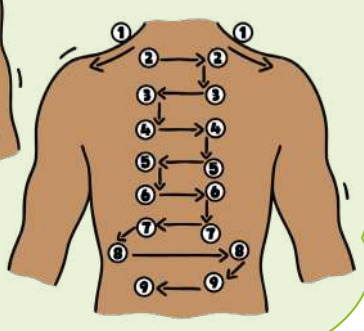
▶ Auscultate lung fields anteriorly & posteriorly

✔ **Normal sounds:** bronchial, tracheal, bronchovesicular, vesicular

✔ **Abnormal ("adventitious") sounds:** coarse crackles (rales), fine crackles, pleural friction rub, wheezes, rhonchi, stridor







RESPIRATORY

ADVANCED ASSESSMENT

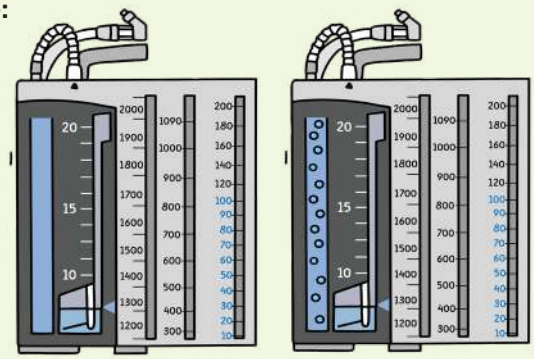
TRACHEOSTOMIES

- **Key questions when caring for a patient with a tracheostomy:**
  - ✓ Is it an open system or closed system?
  - ✓ Cuffed or uncuffed?
  - ✓ What is the Shiley size (typically 6-10 mm)?

It's important to know when the tracheostomy inner cannula was last changed, as buildup of debris can increase the risk of a mucous plug, leading to airway obstruction

CHEST TUBES

- **Important considerations when managing a chest tube:**
  - ✓ Is it a dry suction or wet suction system?
  - ✓ Is it set to suction or water seal?
- **Assess for:**
  - ✓ Crepitus (subcutaneous air)
  - ✓ Dislodgement or poor seal (e.g. constant bubbling in the water seal chamber)
  - ✓ High output (> 100 mL/hr for 2 consecutive hours)



CARDIOVASCULAR

BASIC ASSESSMENT

HEART RATE

- **Assess rate:** normal = 60-100 BPM

The most accurate way to assess heart rate is by auscultating for **one full minute** at the point of maximal impulse (PMI)

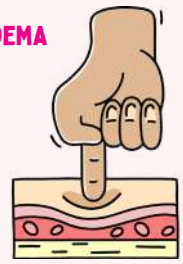
PULSE STRENGTH GRADING

0: absent
1+: weak, thready; easily obliterated
2+: normal
3+: strong; moderate pressure to obliterate
4+: bounding; unable to obliterate

If you are unable to palpate a pulse and the patient is stable, use a doppler device to assess the pulse

ASSESS FOR EDEMA

1+: 2mm
2+: 4mm
3+: 6mm
4+: 8mm



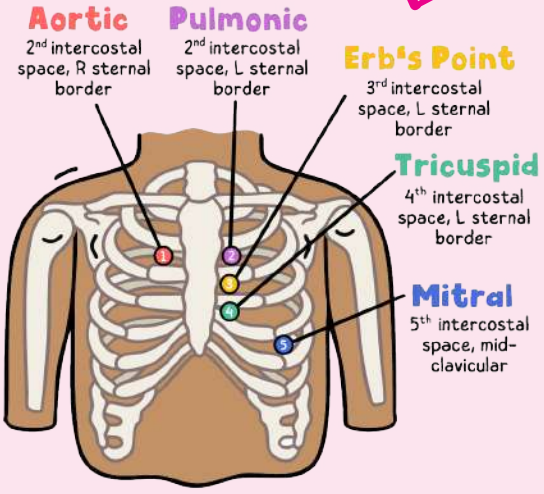
HEART SOUNDS

- **Normal:** S_1 + S_2 ("lub-dub")
- **Abnormal:**
  - → S_3 ("KEN-tucky") - ventricular gallup
  - → S_4 ("ten -NES-see") - atrial gallop
  - → Murmurs – turbulent blood flow

Produces a whooshing or swishing sound

MEMORY TRICK

REMEMBER APE TO MAN FOR YOUR AUSCULTATION SITES



CARDIOVASCULAR

BASIC ASSESSMENT

CAPILLARY REFILL

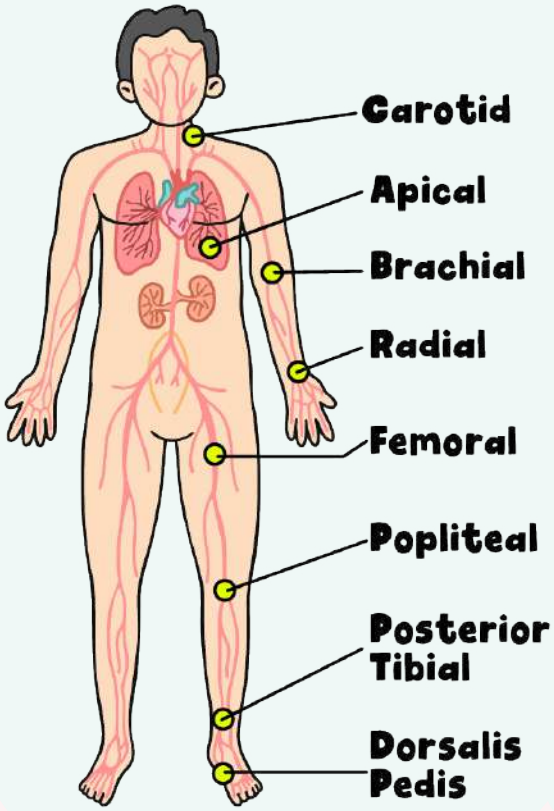
- Press nailbed for 5 seconds, then release
  - ➡ **Normal refill:** ≤ 3 seconds

STEPS FOR ASSESSING PULSES:

1. Assess the **apical pulse** with your stethoscope for one full minute
2. Assess the **carotid pulse**
3. Assess pulses in the upper extremities: **brachial**, then **radial**
4. Assess pulses in the lower extremities: **femoral, popliteal, posterior tibial,** then **dorsalis pedis**

Never assess both carotids simultaneously to avoid occluding blood flow to the brain!

Always assess pulses moving from proximal to distal. This approach helps identify any central pulse compromises first, which pose a greater risk to the patient than issues with distal pulses. Starting proximally ensures you catch major circulation problems early before evaluating peripheral circulation.



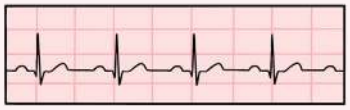
CARDIOVASCULAR

ADVANCED ASSESSMENT

HEART RHYTHM/ECG

Normal findings:

- **Sinus rhythm**



Abnormal findings:

- **Blocks** (1st, 2nd and 3rd degree)
- **Atrial rhythms**
  - ✓ **A**trial **fib**rillation (“**a fib**”)
  - ✓ **A**trial **flutter** (“**a flutter**”)
  - ✓ **S**upra**v**entricular **t**achycardia (“**SVT**”)

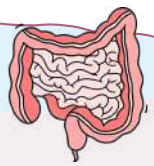
CRITICAL CONSIDERATIONS

Critical rhythms:

- **Ventricular rhythms**
  - ✓ **V**entricular **fib**rillation (“**v fib**”)
  - ✓ **V**entricular **tach**ycardia (“**v tach**”)
  - ✓ Torsades de Pointes
- **Cardiac arrest rhythms**
  - ✓ Asystole
  - ✓ **P**ulseless **e**lectrical **a**ctivity (**PEA**)

GASTROINTESTINAL

BASIC ASSESSMENT



- Assess patient’s ability to swallow
  - ➡ If appropriate, perform a swallow screen
- Perform a comprehensive abdominal exam

1 INSPECT

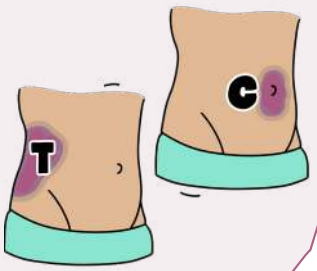
➡ **Abnormal findings:**

✓ **Caput medusae:** cluster of swollen & distended veins in the abdomen

✓ **Cullen’s sign:** irregular hemorrhagic patches around the umbilicus

✓ **Ascites:** build-up of fluid in the abdominal cavity

✓ **Grey Turner’s sign:** bruising to the flanks



GASTROINTESTINAL

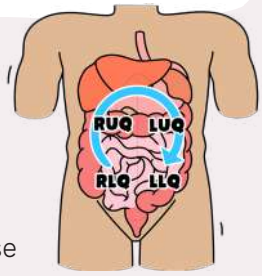
BASIC ASSESSMENT

MEMORY TRICK

The order of abdominal exam steps matters - percussion & palpation can alter bowel sounds. Always perform in this sequence:

1. I - Inspect
2. Am - Auscultate
3. Personally - Percuss
4. Pale - Palpate

❷ AUSCULTATE



➡ Use the bell of the stethoscope

➡ Auscultate all four abdominal quadrants, starting in the **r**ight **l**ower **q**uadrant (**RLQ**) and moving clockwise

- ✓ Normoactive bowel sounds: 5-30 sounds/**minute**
- ✓ Hyperactive bowel sounds ➔ > 30 sounds/**minute**
- ✓ Hypoactive bowel sounds ➔ < 5 sounds/**minute**
- ✓ Absent bowel sounds ➔ no sound for **5 minutes**

Listen for **5 full minutes** before concluding there are none

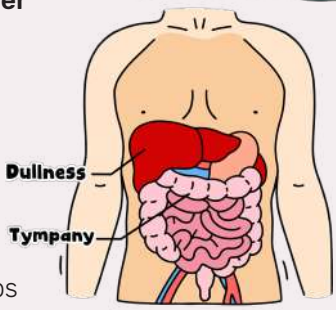
❸ PERCUSS

➡ Place non-dominant hand on abdomen

➡ Strike middle finger of same hand 2–3 times with tip of dominant hand's middle finger (all 4 quadrants)

Findings:

- ✓ **Tympany:** long, high-pitched, hollow drum sound (**normal over air-filled intestines**)
- ✓ **Dullness:** short, soft, thud-like sound (**normal over solid organs like liver & spleen**)

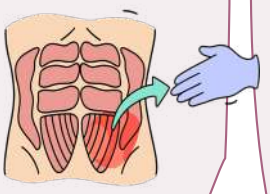


❹ PALPATE

➡ Use palm & base of fingertips to gently palpate all four quadrants

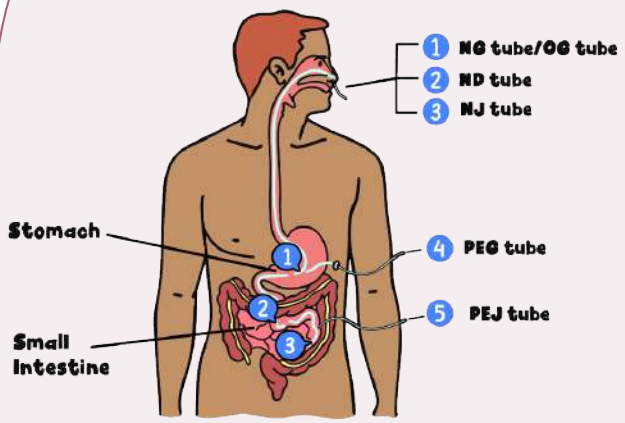
Abnormal findings:

- ✓ Pain
- ✓ Guarding/rigidity
- ✓ **McBurney's point:** acute pain between umbilicus & superior iliac spine
- ✓ **Blumberg's sign:** rebound tenderness
- ✓ **Rovsing's sign:** referred pain in the RLQ when palpating the LLQ
- ✓ **Kehr's sign:** acute left shoulder pain when legs are elevated



GASTROINTESTINAL

ADVANCED ASSESSMENT



NUTRITION

▶ Assess how the patient is receiving nutrition

Enteral ← Enteral: delivered **into the GI tract**

- ✓ Oral (PO)
- ✓ **O**rog**a**stric (**OG**)/**n**aso**g**astric (**NG**) tube
- ✓ **N**aso**d**uodenal (**ND**) tube
- ✓ **N**aso**j**ejunal (**NJ**) tube
- ✓ **P**ercutaneous **e**ndoscopic **g**astrostomy (**PEG**) tube

Parenteral

- ✓ **T**otal **p**arenteral **n**utrition (**TPN**)
- ✓ **P**artial **p**arenteral **n**utrition (**PPN**)

Parenteral: delivered **outside of the GI tract (IV)**

CRITICAL CONSIDERATIONS

▶ **Closed abdominal surgery**

➡ Assess the incision site:

- ✓ Staples
- ✓ Sutures

Assess site for signs of infection - erythema, warmth, induration, &/or purulent drainage

➡ Check for presence of drains:

- ✓ **J**ackson-**P**ratt (**JP**)
- ✓ Hemovac
- ✓ Penrose
- ✓ Pigtail

These drains are used in many other types of surgeries as well!

▶ **Open abdominal surgery**

➡ Assess dressings for drainage (color, amount, odor)

➡ If vacuum-sealed (e.g. wound VAC):

- ✓ Monitor output
- ✓ Ensure system integrity

GASTROINTESTINAL

ADVANCED ASSESSMENT

ELIMINATION

- Assess how the patient evacuates stool:

➡ **DEFECATION**

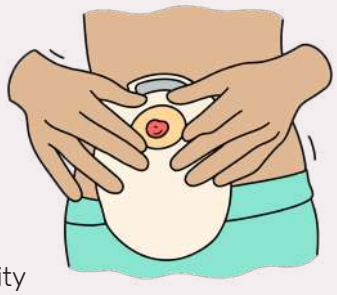
Method

- ✔ Bedpan
- ✔ Bedside commode
- ✔ Ambulates to the bathroom

Assess stool type using the Bristol stool chart

Type 1: separate hard lumps, like nuts (difficult to pass)
Type 2: sausage-shaped but lumpy
Type 3: like a sausage with cracks on the surface
Type 4: like a smooth, soft sausage or snake
Type 5: soft blobs with clear-cut edges (passed easily)
Type 6: fluffy pieces with ragged edges; mushy
Type 7: watery, no solid pieces (entirely liquid)

➡ **OSTOMY**



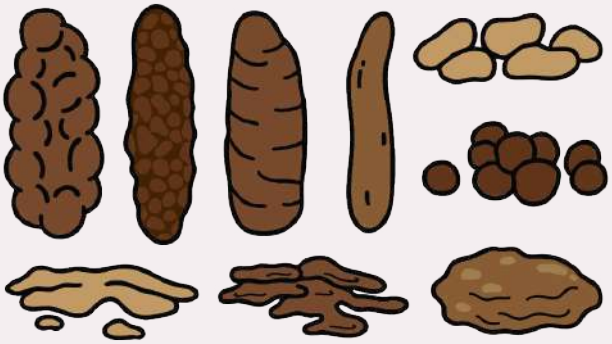
Types

- ✔ Colostomy
- ✔ Ileostomy

Assess

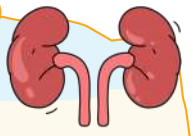
- ✔ Stool color & quality
- ✔ Peristomal skin (check for irritation or breakdown)
- ✔ Type of collection system
- ✔ Fullness of the ostomy bag

Change the bag if it is 1/3-1/2 full



GENITOURINARY

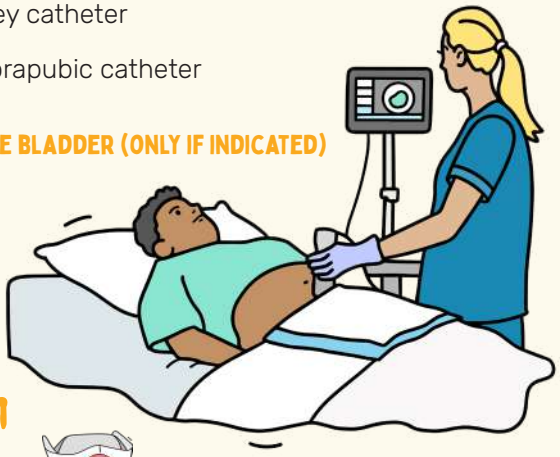
BASIC ASSESSMENT



ASSESS HOW THE PATIENT VOIDS

- Ambulates to the bathroom or uses bedside commode
- Uses bedpan or urinal
- Condom catheter (male) or female external catheter (e.g. PureWick)
- Foley catheter
- Suprapubic catheter

PALPATE BLADDER (ONLY IF INDICATED)



If the patient is unable to void and the bladder is firm or distended, perform a bladder scan to estimate urinary retention. Catheterization (either straight or Foley) may be necessary based on the results.

ASSESS URINE OUTPUT

- **Amount**

MINIMUM:	0.5-1.5 mL/kg/hour (≈ ≥ 30 ml/hour)
FREQUENCY:	at least every 6 hours
EXCESSIVE:	> 250 - 300 ml/hr for 2 consecutive hours

Ask the patient if they're having any pain or discomfort with urination, as this may signal a urinary tract infection or another issue

- **Quality**

Clarity: clear, cloudy, or with sediment
Odor: normal, sweet (diabetes), or foul (infection)

GENITOURINARY

BASIC ASSESSMENT

COLOR		MOST COMMON CAUSE
LIGHT YELLOW		Normal
DARK YELLOW /AMBER		Dehydration
CLEAR/ NO COLOR		Overhydration/ diabetes insipidus
CLOUDY		UTIs
DARK BROWN		Rhabdomyolysis/ kidney or liver disease
REDDISH -PINK		Hematuria (presence of blood)
BLUE		Medications (propofol or indomethacin)

GENITOURINARY

ADVANCED ASSESSMENT

DIALYSIS

- Identify vascular access type
- **A**rteriov**e**nous (**AV**) fistula
- AV graft
- Central venous catheter

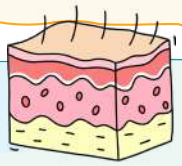
When assessing the dialysis access site, you should **feel a thrill** (a palpable vibration) and **hear a bruit** (a whooshing sound on auscultation). These findings indicate adequate blood flow and confirm that the fistula or graft is functioning properly.

Since the central venous catheter is a central line, collaborate with the dialysis nurse to minimize infection risk by ensuring antimicrobial caps are in place, dressings are changed per protocol, & sterile technique is maintained

ASSESS FOR SIGNS OF INFECTION

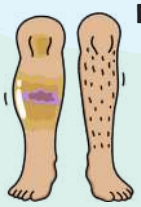
- Pain or tenderness at the site
- Redness (erythema)
- Warmth
- Swelling or induration
- Foul odor
- Discharge

INTEGUMENTARY



BASIC ASSESSMENT

COMPREHENSIVE SKIN EVALUATION

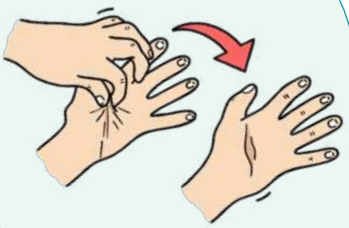


➡ **Areas to assess:** torso, back, buttocks, & upper/lower extremities

➡ **Inspect for:**

- Discoloration (erythema, cyanosis, etc.)
- Unusual hair distribution or hair loss
- Lacerations
- Rashes
- Bruises
- Swelling
- Scars

This information is critically important for nursing care. For example, if you observe a mastectomy scar, avoid taking blood pressure on the same side to reduce the risk of lymphedema.



➡ **Skin turgor assessment:**

Locations: inner arm, back of the hand, or abdomen

Method: pinch skin between your pointer finger & thumb to form a "tent"

Findings:

- **Normal:** skin returns to its original position within 3 seconds
- **Abnormal:** skin remains "tented" > 3 seconds, indicating possible dehydration

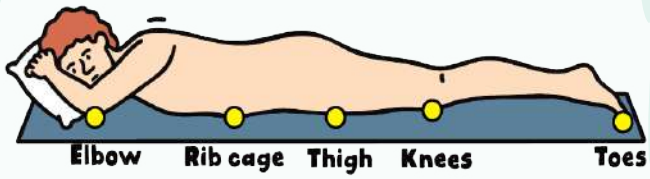
Skin turgor is not a reliable test for dehydration in individuals over 65 years old due to decreased elastin & skin elasticity

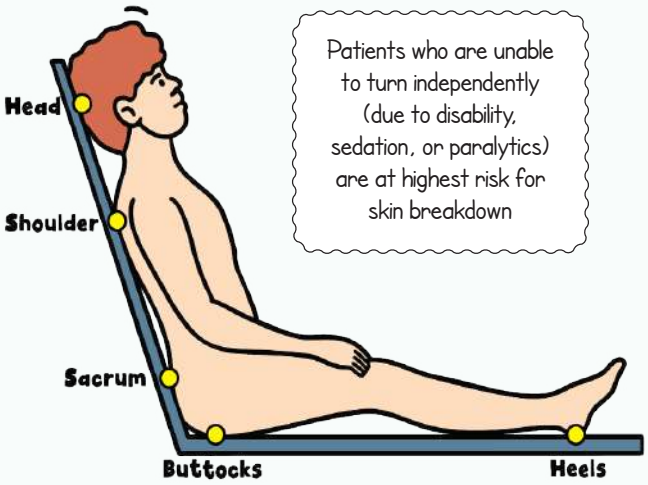
INTEGUMENTARY

BASIC ASSESSMENT

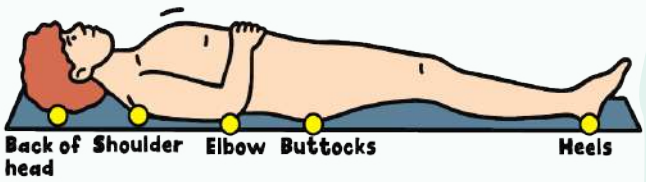
➡ **Assess for skin breakdown at:**

- Points of contact
- Bony prominences
- Areas under devices (e.g., cervical collars, immobilizers, nasal cannulas)

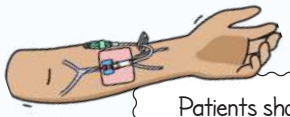




Patients who are unable to turn independently (due to disability, sedation, or paralytics) are at highest risk for skin breakdown



VENOUS ACCESS



IDENTIFY TYPE:

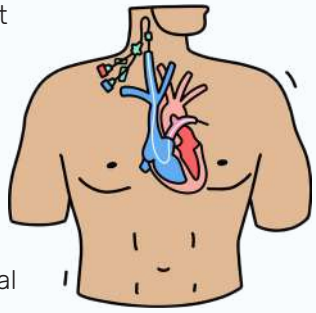
▶ **Peripheral**

➡ **P**eripheral **IV** (**PIV**)

- ✔ Note the gauge size
- ✔ Flush the IV to ensure patency
- ✔ Assess for leakage, erythema, induduration, bleeding, or dislodgement

Patients should not experience any pain at the IV site. If pain is present, it likely indicates infiltration, and the IV should be removed immediately.

▶ **Central**



➡ **Acute line**

■ **Central venous catheter (CVC)**

- ✔ Flush ports per hospital policy
- ✔ Assess for dislodgement, pain, erythema, leakage, induration, or bleeding

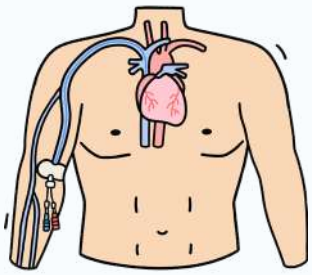
PICC lines may also be placed in the acute setting if unable to place a PIV due to vascular challenges

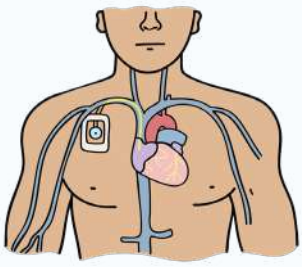
➡ **Long-term line**

■ **P**eripherally **i**nserted **c**entral **c**atheter (**PICC**)

■ Implanted port (portacath)

- ✔ Typically used for long-term treatments like antibiotics or chemotherapy
- ✔ Should be used only for their intended purpose and otherwise accessed only in emergencies
- ✔ Assess for dislodgement, pain, erythema, leakage, induration, or bleeding





Follow your hospital policy for flushing and medication administration when managing ports

CONCLUSION

- Assist the patient back to a comfortable position
- Place the call light within the patient's reach
- Move the bedside table and the patient's belongings (phone, incentive spirometer, etc.) within arm's reach
- Return the bed to its lowest position
- Ensure the side rails are raised
- Remove any necessary PPE and perform hand hygiene before leaving the room

BEDSIDE TRIAGE

ABCs

AIRWAY

IS THE AIRWAY PATENT (OPEN)?

➡ **YES:** Proceed to **Breathing**

➡ **NO:** Look for signs (stridor, cyanosis, violent coughing, nasal flaring, tense neck muscles, universal choking sign, apnea)

INTERVENTIONS

➡ Encourage coughing if patient can still move air

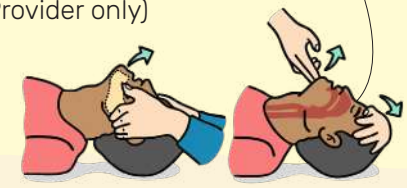
➡ Administer epinephrine/steroids for allergic reactions

➡ Perform jaw thrust or head-tilt-chin lift if unconscious

➡ Use Magill forceps to retrieve object if unconscious and obstruction present (Provider only)

➡ Suction as needed

➡ Intubate if appropriate



POSSIBLE CAUSES OF A COMPROMISED AIRWAY

- Anaphylaxis
- Tongue obstruction (e.g. in unconscious patients)
- Foreign object aspiration
- Trauma to the throat or neck
- Upper airway infections (e.g. epiglottitis, croup)
- Smoke inhalation injury
- Ruptured esophageal varices

BREATHING

IS THE PATIENT BREATHING EFFECTIVELY?

➡ **YES:** Proceed to **Circulation**

➡ **NO:** Look for signs (shallow breathing, no detectable breath sounds, altered level of consciousness)

INTERVENTIONS:

➡ Provide supplemental oxygen (BIPAP, non-rebreather, etc.)

➡ Sit patient upright if possible

➡ Chest tube placement if indicated

➡ Use bag-valve mask ventilation

➡ Intubate if necessary

POSSIBLE CAUSES OF INEFFECTIVE BREATHING

- Head injury
- Hemothorax/pneumothorax
- Pulmonary embolism
- Pulmonary edema
- Sepsis/trauma

ABCs

CIRCULATON

DOES THE PATIENT HAVE A STRONG PULSE?

- **YES:** Proceed to your assessment
- **NO:** Look for signs (weak/thready pulse, pallor, hemorrhage, poor capillary refill)

INTERVENTIONS

- Administer IV fluids
- Transfuse blood products as needed
- Give inotropic medications to support heart function
- Cardiac pacing or cardioversion if indicated
- Control any bleeding

POSSIBLE CAUSES OF INSUFFICIENT CIRCULATION

- Arrythmias
- Myocardial infarction (MI)
- Hemorrhage

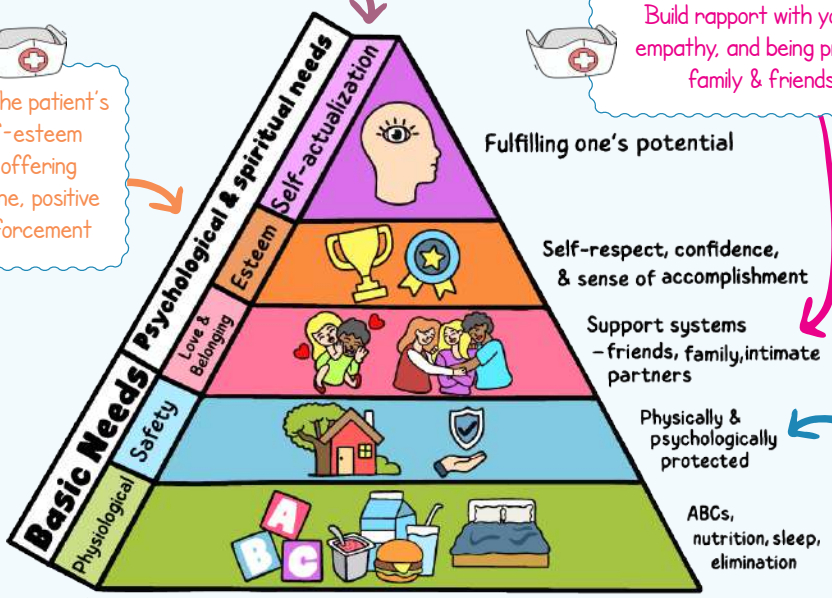
MASLOW'S HIERARCHY OF NEEDS

Encourage the patient to focus on achieving their optimal medical & psychological outcomes based on their personal goals. Support them in setting realistic short-term and long-term objectives aligned with their values & desires.

Notice how the pyramid is constructed in order of importance. Each level depends on the one below it (same as a pyramid!). We can't focus on building our patient's psychological well-being (level 2) until we ensure that they are hemodynamically stable (level 1). Further, we can't build our patient's self-confidence (level 4) until we ensure they feel physically safe (level 2).

Build the patient's self-esteem by offering genuine, positive reinforcement

Build rapport with your patient by actively listening, showing empathy, and being present. Encourage them to lean on close family & friends for emotional & practical support.



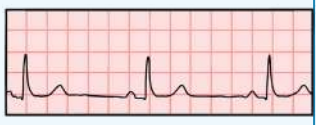
Ensure a safe environment for your patient by keeping the call light within reach, lowering the bed to its lowest position, & using two identifiers when administering medications. Provide emotional & psychological support, and if the patient has complex needs, coordinate both pharmacological and non-pharmacological interventions to help them cope effectively.

Think ABCs (Airway, Breathing, Circulation) & ADLs (Activities of Daily Living)

PATIENT PRIORITIZATION

STABLE VS. UNSTABLE

CASE STUDY: BRADYCARDIA



Who should I see first?

- **Patient 1:** John, 29-year-old male, A&O x 4, HR 45
- **Patient 2:** Mark, 32-year-old male, HR 50, progressively more confused

✓ **Priority: patient #2 (Mark)**

➡ ***LESSON:*** *Numbers alone can be deceiving. Always prioritize the patient whose clinical condition is acutely worsening.*

EXPECTED VS. UNEXPECTED

CASE STUDY: CONFUSION

Who should I see first?

- **Patient 1:** Martha, 86-year-old with history of sundowning, calling you by her daughter's name at 11:30 pm while you draw labs
- **Patient 2:** Lupe, 29-year-old admitted for fractured leg, now struggling to find words and disoriented at lunchtime

✓ **Priority: patient #2 (Lupe)**

➡ ***LESSON:*** *Use critical thinking to differentiate expected from unexpected presentations. If confusion aligns with known conditions (like sundowning), it's expected. If not, it's unexpected and requires immediate attention.*

ACUTE VS. CHRONIC

CASE STUDY: HYPOXEMIA

Who should I see first?

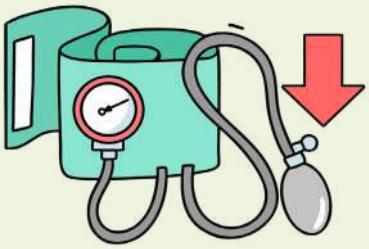
- **Patient 1:** Maria, 39-year-old admitted for anaphylaxis from a bee sting, SpO_2 87% on 4L nasal cannula
- **Patient 2:** Jerry, 52-year-old COPD patient on 4L nasal cannula, SpO_2 87%

✓ **Priority: patient #1 (Maria)**

➡ ***LESSON:*** *Patients with chronic conditions may have baseline findings that would be alarming in others. When a clinical issue is unrelated to a known chronic condition (i.e., acute), it requires immediate attention.*

POTENTIAL PROBLEM VS. ACTUAL PROBLEM

CASE STUDY: HYPOTENSION



Who should I see first?

- **Patient 1:** Monique, sepsis signs, confirmed UTI, elevated lactate, WBC 15,000, BP 130/70
- **Patient 2:** John, sepsis signs, confirmed bacteremia, BP 70/35

✓ **Priority: patient #2 (John)**

➡ ***LESSON:*** *Prioritize patients with actual problems over those with potential or developing issues. Preparation is important, but immediate intervention is needed for active, critical conditions.*

PATIENT PRIORITIZATION

SAFE VS. UNSAFE

CASE STUDY: FALL RISK

Who should I see first?

▶ **Patient 1:** Sam, 82 years old, history of falls, tries to get out of bed unassisted, insists on walking independently

▶ **Patient 2:** Victoria, 77 years old, alert & oriented, stable on feet, uses call light & cane appropriately

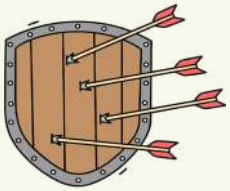
✓ **Priority: patient #1 (Sam)**

➡ ***LESSON:*** *Always prioritize patients who may knowingly or unknowingly put their own safety at risk*

INTEGUMENTARY OVERVIEW

FUNCTIONS OF THE SKIN

PROTECTION



- ✓ Acts as a barrier to the external environment, preventing bacteria & viruses from entering
- ✓ Protects against injury by serving as a physical barrier & shock absorber
- ✓ Filters harmful UV radiation via melanin

THERMOREGULATION

- ✓ Sweating cools the body
- ✓ Blood vessels dilate when hot (increasing blood flow to the skin) and constrict when cold (preserving core warmth)

SENSATION

- ✓ Contains nerve endings (mechanoreceptors & cutaneous receptors) that detect touch, pressure, pain, vibration, wetness, roughness, smoothness, heat, & cold

VITAMIN D SYNTHESIS

- ✓ UV-B light stimulates conversion of 7-dehydrocholesterol in the epidermis to vitamin D3, which then enters the bloodstream

WASTE CLEARANCE

- ✓ Removes small amounts of waste (lactic acid, ammonia, urea) through sweating

HEALING

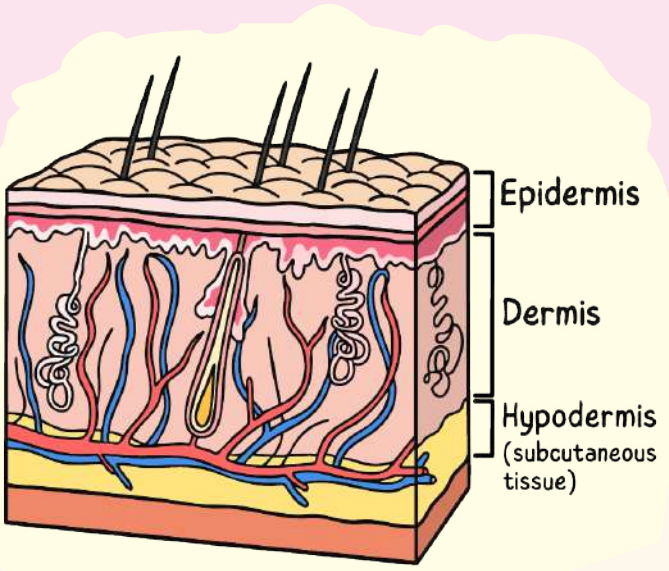
- ✓ Controls bleeding via clot formation & hemostasis
- ✓ Fights infection through inflammation
- ✓ Repairs & strengthens tissue via epithelialization, angiogenesis, & collagen deposition

SKIN LAYERS

EPIDERMIS
- ✔ Outermost layer made of epithelial cells
- ✔ Primary protective barrier of the body
- ✔ Continuously sheds & regenerates skin cells
- ✔ Contains melanin, which determines skin pigmentation

DERMIS
- ✔ Thickest, middle layer
- ✔ Contains connective tissue, blood vessels, hair follicles, nerves, & glands
- ✔ Provides structural support & flexibility
- ✔ Aids thermoregulation through blood vessels & sweat glands
- ✔ Involved in sensation via nerve endings

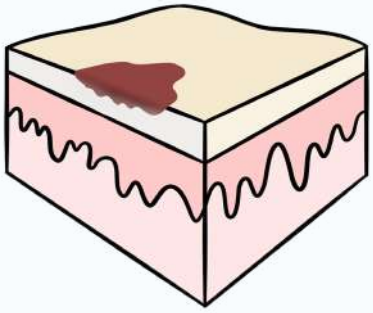
HYPODERMIS
- ✔ Deepest layer composed of areolar connective tissue & adipose (fat) tissue
- ✔ Stores energy in fat cells
- ✔ Provides protection through shock absorption
- ✔ Helps regulate temperature by insulating the body



PRESSURE INJURIES

SAY WHAT?

Localized damage to the skin &/or underlying tissue resulting from **prolonged pressure**, often in combination with **shear**



Unrelieved pressure impairs blood flow, reducing the delivery of oxygen & nutrients to tissues. This leads to tissue ischemia and, if prolonged, can result in cell death and skin breakdown.

WHERE DO THEY OCCUR?

Most commonly develop over **bony prominences**, but can also develop **under medical devices** or **any area where constant pressure is applied** (e.g. nasal bridge from a CPAP mask, under a cast or brace)

MAJOR RISK FACTORS

Nutrition poor
Oxygen/nutrient delivery reduced (vascular disease)
Brittle, swollen skin
Elderly
Diabetes,
Dehydration
Sensation reduced (spinal cord injuries, comatose patients)
Obesity
Reduced mobility
Excretion (urine & stool incontinence)
Shearing forces

RISK ASSESSMENT TOOLS

THE TWO MOST COMMONLY USED TOOLS FOR ASSESSING RISK OF SKIN BREAKDOWN ARE THE BRADEN SCALE & THE NORTON SCALE

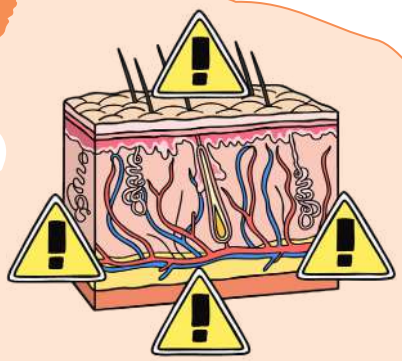
BRADEN SCALE

Assesses a patient's risk of developing pressure injuries based on six categories:

- **SENSORY PERCEPTION** (ability to respond meaningfully to pressure-related discomfort)
  Score: 1-4
- **MOISTURE** (degree to which skin is exposed to moisture)
  Score: 1-4
- **ACTIVITY** (degree of physical activity)
  Score: 1-4
- **MOBILITY** (ability to change & control body position)
  Score: 1-4
- **NUTRITION** (usual food intake pattern)
  Score: 1-4
- **FRICTION/SHEAR** (impact of sliding & rubbing)
  Score: 1-3

OVERALL SCORES

19-23:	NO RISK
14-18:	LOW RISK
10-13:	HIGH RISK
≤ 9:	VERY HIGH RISK



NORTON SCALE

Risk score is based on 5 risk-related categories:

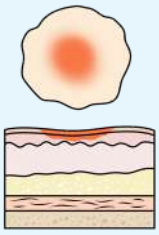
- **PHYSICAL CONDITION**
  Score: 1-4
- **MENTAL CONDITION**
  Score: 1-4
- **ACTIVITY**
  Score: 1-4
- **MOBILITY**
  Score: 1-4
- **INCONTINENCE**
  Score: 1-4

OVERALL SCORES

LOW RISK:	> 18
MEDIUM RISK:	14-18
HIGH RISK:	10-14
VERY HIGH RISK:	< 10

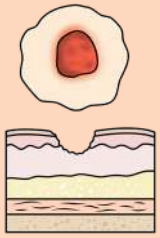
PRESSURE ULCER STAGES

STAGE 1



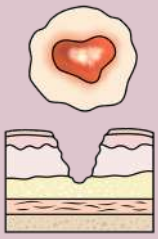
- ✔ Non-blanchable erythema of intact skin
- ✔ Skin is red, but not broken

STAGE 2



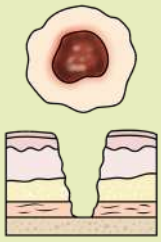
- ✔ Partial-thickness skin loss
- ✔ Ulcer involves the epidermis &/or dermis
- ✔ May appear as a shallow open ulcer or intact/ruptured blister

STAGE 3



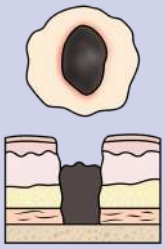
- ✔ Full-thickness skin loss
- ✔ Damage extends into subcutaneous tissue and may reach the fascia
- ✔ Bone, tendon, & muscle are **not** exposed

STAGE 4



- ✔ Full-thickness skin and tissue loss with **extensive destruction**
- ✔ Exposure of bone, tendon, muscle, or joint capsule possible

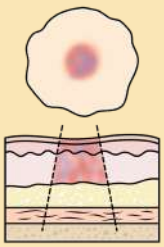
UNSTAGEABLE



In order to stage this pressure ulcer, the slough &/or eschar must first be removed through "**debridement**"

- ✔ Full-thickness tissue loss, but **depth is obscured** by slough or eschar
- ✔ True depth & stage **cannot** be determined until necrotic tissue is removed

DEEP TISSUE INJURY (DTI)



Because the extent of tissue damage in a deep tissue injury (DTI) is often not fully visible, once the skin opens, it can rapidly progress to a stage 3 or stage 4 pressure injury

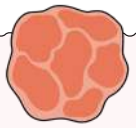
- ✔ Persistent, non-blanchable **deep red, purple, or maroon** discoloration
- ✔ Skin is intact or may appear blood-filled; indicates damage to underlying soft tissue due to pressure or shear

PRESSURE ULCER TISSUE

GRANULATION TISSUE (RED/PINK)

- Healthy connective tissue with tiny blood vessels
- Serves as the foundation for new epithelial growth

The presence of granulation tissue is a positive sign that the wound is progressing toward healing



EPITHELIAL TISSUE (SHINY, LIGHT PINK)

- New layer of epidermal skin
- Indicates the wound is in the final stages of healing

SLOUGH (MOIST, YELLOW)

- Composed of dead cells, fibrin, white blood cells, micro-organisms, & proteins
- Often requires debridement for healing to progress

ESCHAR (HARDENED, BLACK)

- Dead tissue that is dry
- Indicates full-thickness tissue damage and must be debrided for healing to take place

PRESSURE ULCER TISSUE

SEROUS

- Clear, thin, & watery fluid
- Normal finding; indicates healthy healing

SEROSANGUINEOUS

- Pink, watery fluid (a mix of blood & serous fluid)
- Common during early wound healing

SANGUINEOUS

- Bright red, bloody drainage
- May indicate active bleeding; monitor closely

PURULENT

- Thick, yellow, white, green, or brown drainage with a foul odor
- Sign of infection; requires prompt evaluation

THE HOSPITALIZED PATIENT

ASSESSMENT

▶ **Frequency:** perform a comprehensive skin assessment **at least once per shift**

▶ **Risk evaluation:** use a validated tool (e.g. Braden Scale or Norton Scale) to assess pressure injury risk

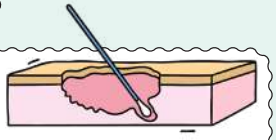
Be sure to carefully assess the skin surrounding medical devices - such as endotracheal tubes, tracheostomy tubes, nasal cannulas, cervical collars, & Foley catheter tubing - as these areas are common sites for pressure-related skin breakdown. Apply appropriate padding or protective dressings as needed.

IF A WOUND IS IDENTIFIED:

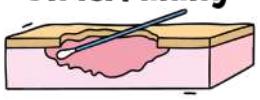
1. Take a photo of the wound
2. Upload it to the patient's chart
3. Include measurements, initials, date, time, & patient label
   - Wound dimensions:
     - ✔ Length
     - ✔ Width
     - ✔ Depth (include tunneling & undermining)

Wound care is inherently collaborative - maintain open communication with the Provider, wound care nurse, & pharmacist

Tunneling



Undermining



Tunneling occurs when a narrow channel extends vertically downward from the wound bed. Undermining, in contrast, involves horizontal erosion beneath the wound edges. It is important to measure the depth & extent of these areas using a cotton-tipped applicator and document your findings accurately.

4. Assess the surrounding skin ("peri wound")

Healthy & intact ➔ normal color, no signs of infection
Denuded ➔ epidermis lost, raw skin exposed
Excoriated ➔ linear erosion from friction/shearing
Desiccated ➔ dry, cracked
Inflamed ➔ red, warm, swollen
Hyperkeratotic ➔ thickened, rough stratum corneum
Indurated ➔ hardened due to inflammation/edema
Macerated ➔ white, soggy, softened

Outermost layer of the skin

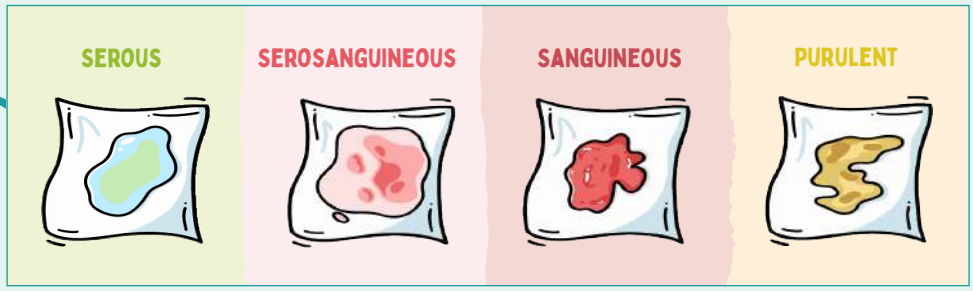
Indicates an infection is present

Macerated skin significantly increases the risk of infection

New measurements and a photo should be taken weekly, unless otherwise directed by the Provider

5. Assess wound bed tissue
   - Granulation tissue
   - Epithelial tissue
   - Slough
   - Eschar

6. Assess drainage
   - Serous
   - Serosanguineous
   - Sanguineous
   - Purulent



7. Provide analgesia as needed

NURSING CARE

ASSESSMENT

Assessing wounds is a continuous process requiring around-the-clock vigilance. Re-assess the wound:

- ✔ At the start of your shift during the initial assessment
- ✔ Whenever dressing changes are performed
- ✔ If the patient's condition acutely deteriorates (e.g. signs of sepsis)
- ✔ During transitions of care between units (both nurses should assess together)
- ✔ Before discharge (include a photo for documentation)

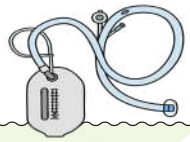
SKIN CARE

- Promptly clean after urinary or fecal incontinence
- Use collection devices (e.g. catheters, fecal management systems) if appropriate
- Apply moisturizer, especially after bathing
- Avoid:
  - ✔ Talcum powder
  - ✔ Harsh soaps
  - ✔ Alcohol-based products
- Use barrier creams as needed
- Manage excessive sweating

Avoid creating excessive friction when cleaning the patient

Patients with urinary incontinence may benefit from a condom catheter (for males) or a PureWick device (for females)

For patients experiencing watery diarrhea, the use of a fecal management system (such as a rectal tube) may be considered

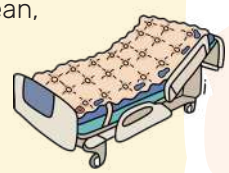


PREVENTION

PRESSURE RELIEF

Use foam wedges or pillows to off-set the patient's weight

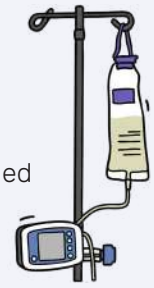
- Reposition every 2 hours (if patient is immobile)
- Encourage ambulation or chair mobility
- Ensure linens are clean, dry, & wrinkle-free
- Use low air loss or waffle mattresses



- Use pillows to offload pressure from bony prominences
- Encourage weight shifting every 15 minutes for wheelchair users
- Elevate heels or use heel protectors

OPTIMIZE NUTRITION

- Provide a high protein, balanced diet
- Encourage fluid intake
- Administer tube feeds, TPN, or PPN as needed
- Ensure adequate vitamin & mineral intake, especially vitamins A, C, E, & zinc



EXISTING ULCERS

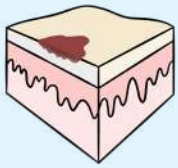
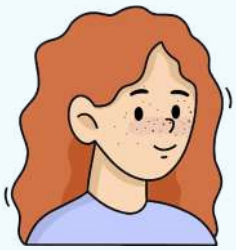
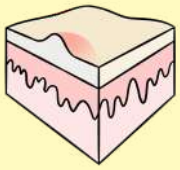
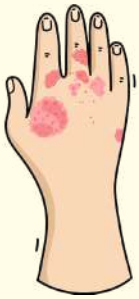
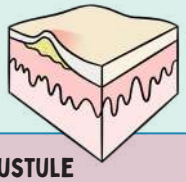
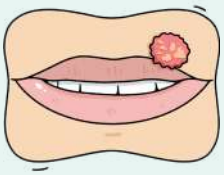
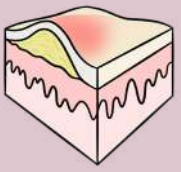
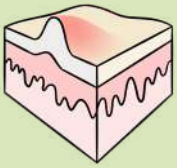
- Offload all pressure from the site
- Apply foam dressings to affected or high-risk areas

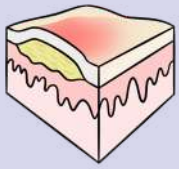
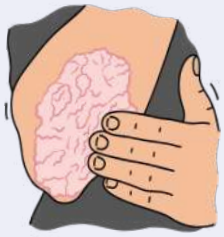
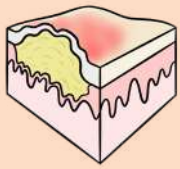
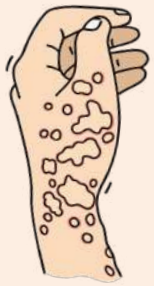
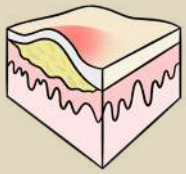
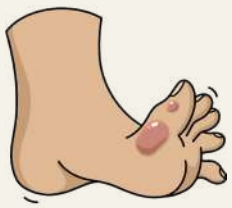
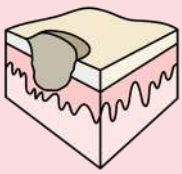
ADDITIONAL STRATEGIES

- Reduce risk factors:
  - ✔ Control diabetes
  - ✔ Encourage weight loss
  - ✔ Promote a healthy diet
- Request wound care consults as needed
- Educate family & caregivers:
  - ✔ How to prevent pressure injuries
  - ✔ How to treat existing wounds

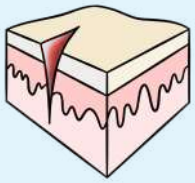
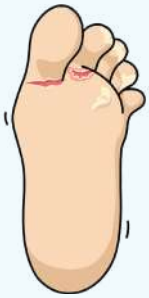
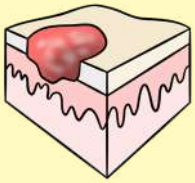
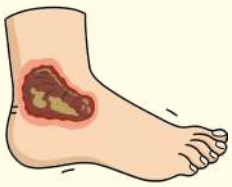
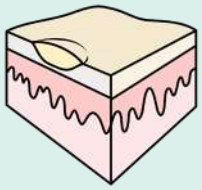
SKIN LESIONS

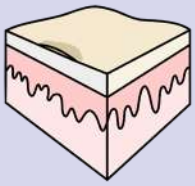
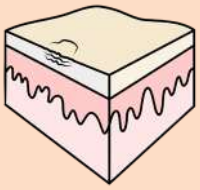
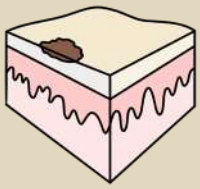
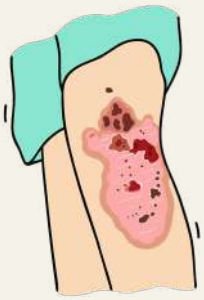
PRIMARY SKIN LESIONS

MACULE (E.G. FRECKLE) 	• Flat, well-demarcated area of discoloration • Diameter < 1 cm	
PAPULE (E.G. SMALL PIMPLE) 	• Raised, solid area of localized inflammation (non-purulent) • Diameter < 1 cm	
VESICLE (E.G. HERPES SIMPLEX) 	• Small, fluid-filled blister or sac	
PUSTULE (E.G. ACNE) 	• Small, pus-filled blister or sac	
NODULE (E.G. LARGE CYST) 	• Raised, solid mass • Diameter > 1 cm	

PLAQUE (E.G. PSORIASIS) 	• Raised, thickened area with rough, often scaly surface • Diameter > 1 cm	
WHEAL (E.G. WELT OR HIVE) 	• Raised, itchy area of skin, often pale or red • Transient and typically allergic in origin	
BULLA (E.G. BURN BLISTER) 	• Large, fluid-filled blister • Diameter > 1 cm	
TUMOR (E.G. LIPOMA) 	• Abnormal mass of tissue • Can be benign (non-cancerous) or malignant (cancerous)	

SECONDARY SKIN LESIONS

FISSURE (E.G. ATHLETE'S FOOT) 	• Linear crack or break in the skin, often painful	
ULCER (E.G. PRESSURE ULCER) 	• Crater-like erosion of one or more skin layers • Typically slow to heal or non-healing	
CICATRIX (E.G. C-SECTION SCAR) 	• Scar formed by fibrous tissue replacing normal skin after injury	

SCALES (E.G. DANDRUFF) 	• Flakes of dry, dead epidermal cells	
ANETODERMA (E.G. FLACCID SKIN IN THE ELDERLY) 	• Thinned, sagging skin due to loss of collagen & elastin	
CRUST (E.G. SCAB FROM A HEALING BLISTER) 	• Dried exudate (serum, blood, or pus) on the skin's surface	

- Inspect size, color, shape, distribution, drainage, & borders
- Monitor for changes (growth, spreading, new lesions)
- Document location and patient-reported symptoms (itching, pain, burning)
- Keep lesion area clean and dry unless otherwise prescribed
- Use mild, fragrance-free soaps and lukewarm water for cleaning
- Apply protective dressings for fragile or blistered areas
- Identify & avoid potential triggers (allergens, irritants, sun exposure)
- Encourage use of sunscreen for sun-sensitive lesions
- Educate patient on not picking or squeezing lesions

LABORATORY

DRAWING BLOOD

TUBE COLOR	LABS/TESTS	INVERSION TIMES
1. YELLOW (pediatric) GREEN (adult aerobic) ORANGE (adult anaerobic)	 **Blood cultures** — Bacteria may be aerobic (oxygen-dependent) or anaerobic (able to survive without oxygen)	7-10X
2. LIGHT BLUE 	**Coagulation studies** ✔ PT ✔ aPTT ✔ INR ✔ Fibrinogen ✔ D-dimer ✔ Anti- Xa	3-4X
3. RED 	**Therapeutic drug levels**	5X
4. GOLD 	**Chemistry panel** ✔ Electrolytes (Na, Ca, PO, Mg, K) ✔ Kidney function (BUN & creatinine) ✔ Liver function (bilirubin, AST, ALT) ✔ Thyroid function (TSH, T3, & T4) ✔ Lipid panel (HDL, LDL, total cholesterol, triglycerides) ✔ Albumin ✔ CRP	5-8X
5. GREEN 	✔ Arterial blood gases ✔ Troponin ✔ Ammonia CBC: Complete blood count	8-10X
6. LAVENDER 	✔ CBC (RBCs, Hgb, Hct, platelets, WBCs, differential) ✔ Hemoglobin A1c ✔ ESR ✔ Type & screen The WBC differential includes neutrophils, lymphocytes, monocytes, eosinophils, & basophils	8-10X
7. PINK 	**Crossmatch** ESR: Erythrocyte sedimentation rate	8-10X
8. GRAY 	✔ Lactate ✔ Blood glucose	8-10X
9. YELLOW TOP 	✔ ABO group ✔ Rh type	8-10X

COMPREHENSIVE LAB VALUES

ERYTHROCYTES & RELATED

RED BLOOD CELLS (RBC)	4.5 – 6 million/mm^3
HEMOGLOBIN (HGB)	**Average:** 12 - 18 g/dL **Male:** 14 - 16 g/dL **Female:** 12 - 15 g/dL
HEMATOCRIT (HCT)	**Average:** 37 - 50% **Male:** 42 - 52 % **Female:** 35 - 47%
MEAN CORPUSCULAR VOLUME (MCV)	80 - 100 fL
ERYTHROCYTE SEDIMENTATION RATE (ESR)	0-30 mm/hour
IRON	60-170 mcg/dL

MEMORY TRICK

THE HUMAN BODY HAS **4.5 - 6** LITERS OF BLOOD IN IT!

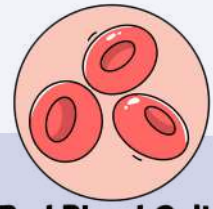
HEMOGLOBIN CARRIES OXYGEN - WE TAKE ABOUT 12-18 BREATHS/MINUTE!

MEMORY TRICK

A MIDLIFE HEMATOCRISIS OCCURS BETWEEN 37 & 50!

MEMORY TRICK

These numbers represent the percentage of total blood volume composed of red blood cells (RBCs)



Red Blood Cells

WHITE BLOOD CELLS & DIFFERENTIAL

WHITE BLOOD CELLS (WBC)	4,500 - 11,000 cells/mm^3
NEUTROPHILS	55 - 70% / 1,800 - 7,800 cells/mm^3
LYMPHOCYTES	20 - 40% / 1,000 - 4,800 cells/mm^3
MONOCYTES	2 - 8% / 0 - 800 cells/mm^3
EOSINOPHILS	1 - 4% / 0 - 450 cells/mm^3
BASOPHILS	0 - 2% / 0 - 200 cells/mm^3
BANDS	0 - 2% / 0 - 700 cells/mm^3

I'M A POOR NURSING STUDENT, BUT I WOULD BUY A CAR BETWEEN $4,500 & $11,000!

MEMORY TRICK

These numbers indicate the percentage of total white blood cells (WBCs) represented by each cell type

White Blood Cells

COAGULATION STUDIES

PLATELETS (PLT)	150,000 - 400,000 cells/mm³
APTT (ACTIVATED PARTIAL THROMBOPLASTIN TIME)	**Normal:** 20 - 60 seconds **Target range (for heparin therapy):** 1.5-2.5x
PT (PROTHROMBIN TIME)	11 – 13 seconds
PTT (PARTIAL THROMBOPLASTIN TIME)	25 – 35 seconds
(INR) INTERNATIONAL NORMALIZED RATIO	< 1.1 **Target range (for warfarin therapy):** 2 - 3
FIBRINOGEN	203 – 377 mg/dL
D-DIMER	< 0.5 mg/mL

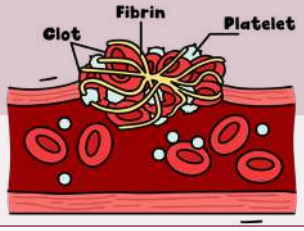
MEMORY TRICK: A PLATE OF FOOD AT VERY FANCY RESTAURANT COSTS BETWEEN 150 & 400 DOLLARS!

The exact target depends on the patient's underlying bleeding risk!

MEMORY TRICK: PRETEENS ARE 11-13 YEARS OLD!

MEMORY TRICK: YOUR PERSONAL TRAINING TIME SHOULD BE 25-35 MINUTES PER DAY!

MEMORY TRICK: INR SHOULD BE < 1!

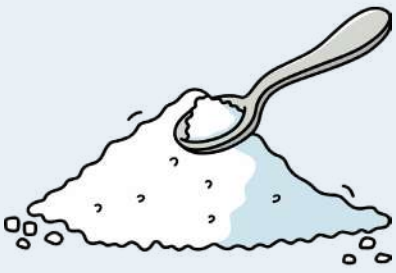


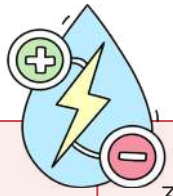
GLUCOSE STUDIES

GLUCOSE, FASTING	70 – 100 mg/dL
GLUCOSE, 2 HOUR POSTPRANDIAL	< 140 mg/dL
HBA1C	
➡ **NORMAL**	< 5.7%
➡ **PREDIABETES**	5.7 - 6.4%
➡ **DIABETES**	> 6.5%

MEMORY TRICK: GLUCOSE PROVIDES ENERGY & ENERGY IS LOW WHEN YOU ARE 70-100 YEARS OLD!

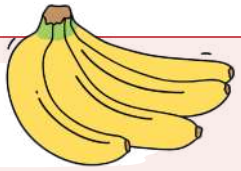
"Postprandial": after a meal





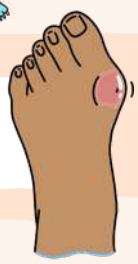
SERUM ELECTROLYTES

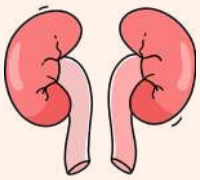
POTASSIUM (K)	3.5 - 5.0 mEq/L	MEMORY TRICK: BANANAS ARE HIGH IN **POTASSIUM** & THERE ARE USUALLY **3-5** BANANAS IN A BUNCH!
SODIUM (NA)	135 - 145 mEq/L	MEMORY TRICK: REMEMBER YOUR **ODD** NUMBERS FOR SODIUM **1**,**3**, & **5**!
CHLORIDE (CL)	95 - 105 mEq/L	MEMORY TRICK: **CHLORI**NATED POOLS ARE GREAT WHEN IT'S SUPER HOT (**95-105**° F)!
CALCIUM (CA)	9 - 11 mg/dL	**CA**LL **9-11** IN AN EMERGENCY! MEMORY TRICK
PHOSPHOROUS (P)	2.5 - 4.5 mEq/L	MEMORY TRICK: THE OLDEST **PHOS**SILS EVER DISCOVERED ARE BETWEEN **2.5** & **4.5** BILLION YEARS OLD!
MAGNESIUM (MG)	1.5 - 2.5 mg/dL	A **MAGNI**FYING GLASS CAN MAGNIFY **1.5-2.5** X MEMORY TRICK
SERUM BICARBONATE	22 - 29 mEq/L	MEMORY TRICK: REMEMBER YOU HAVE (3) **2**S AND (1) **9** IN BICARBONATE!



RENAL STUDIES

CREATININE (CR)	0.6 - 1.3 mg/dL	MEMORY TRICK: SCARY **CREA**TURES COME OUT BETWEEN **6** PM & **1:30** AM!
BLOOD UREA NITROGEN (BUN)	5 - 20 mg/dL	MEMORY TRICK: **BUN**IONS ARE ON A FOOT WITH **5** DIGITS & THERE ARE **20** DIGITS ON ALL FOUR EXTREMITIES!
GLOMERULAR FILTRATION RATE (GFR)	90 - 120 ml/min/1.73 m^2	





LIVER STUDIES

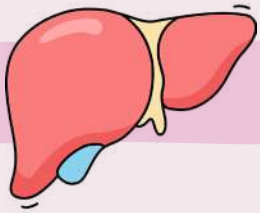
ALANINE AMINOTRANSFERASE (ALT)	9 - 56 U/L
ASPARTATE AMINOTRANSFERASE (AST)	8 - 33 U/L
ALKALINE PHOSPHATASE (ALP)	44 - 147 U/L
TOTAL BILIRUBIN	0.2 - 1.3 mg/dL
DIRECT (CONJUGATED) BILIRUBIN	0 - 0.2 mg/dL
INDIRECT (UNCONJUGATED) BILIRUBIN	0.1 - 1 mg/dL
ALBUMIN	3.4 - 5 g/dL
AMMONIA	35 - 65 mcg/dL
TOTAL PROTEIN	6 - 8 g/dL

MEMORY TRICK

THINK OF THE "L" IN ALT FOR LABOR - THE TYPICAL WORKDAY IS 9-5 OR 6!

MEMORY TRICK

THINK OF THE "S" IN AST FOR SCHOOL - THE TYPICAL SCHOOL DAY IS FROM 8-3:30!

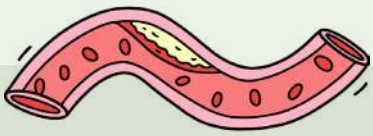


ALBUMIN IS A PROTEIN & PROTEIN SHAKES TYPICALLY USE 3-5 SCOOPS OF POWDER!

MEMORY TRICK

LIPOPROTEIN PROFILE

CHOLESTEROL (TOTAL)	< 200 mg/dL
TRIGLYCERIDES	< 150 mg/dL
HIGH-DENSITY LIPOPROTEIN (HDL)	30 - 70 mg/dL
LOW DENSITY LIPOPROTEIN (LDL)	< 130 mg/dL

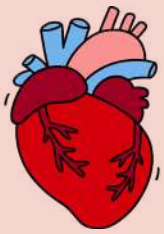


MEMORY TRICK

LOW-DENSITY LIPOPROTEIN CHOLESTEROL (LDL) - "BAD CHOLESTEROL IS LAME"

HIGH-DENSITY LIPOPROTEIN CHOLESTEROL (HDL) - "GOOD CHOLESTEROL IS HIP"

CARDIAC MARKERS & SERUM ENZYMES

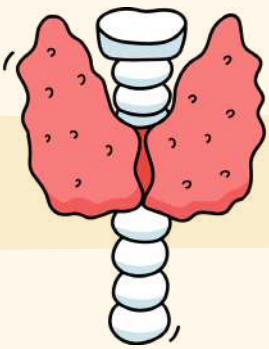
CREATINE KINASE (CK)	22 - 198 U/L
CREATINE KINASE ISOENZYMES	**CK-MM (skeletal muscle):** 22 - 198 U/L **CK-MB (cardiac muscle):** 0 - 5 ng/mL **CK-BB (brain):** < 5 U/L
MYOGLOBIN	5 - 70 ng/mL
TROPONIN	**Troponin:** < 0.04 ng/mL **Troponin T:** < 0.1 ng/mL **Troponin I:** < 0.03 ng/mL
ATRIAL NATRIURETIC PEPTIDE (ANP)	22 - 27 pg/mL
BRAIN NATRIURETIC PEPTIDE (BNP)	< 100 pg/mL 

URINALYSIS STUDIES

COLOR	Clear to pale yellow
ODOR	Mild
TURBIDITY	Clear
SPECIFIC GRAVITY	1.005 - 1.030
PH	4.5 - 7.8
PROTEIN 	Negative
KETONES	Negative
BILIRUBIN	Negative
GLUCOSE	0 - 0.8 mmol/L
RED BLOOD CELLS (RBC)	< 4 cells/HPF
WHITE BLOOD CELLS (WBC)	0 - 5 cells/HPF
BACTERIA	≤ 10,000 colonies/ml
CASTS	None to few
CRYSTALS	None

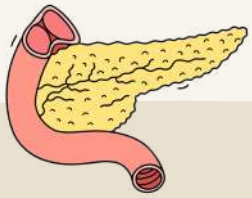
THYROID FUNCTION STUDIES

TRIIODOTHYRONINE (T_3)	80 - 230 ng/dL
THYROXINE (T_4)	5 - 12 mcg/dL
THYROID-STIMULATING HORMONE (TSH)	0.2 - 5.4 microunits/mL



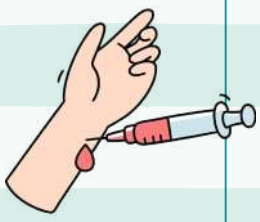
PANCREAS STUDIES

AMYLASE	25 - 151 U/L
LIPASE	10 - 140 U/L



ARTERIAL BLOOD GAS

PH	7.35 - 7.45
PCO_2	35 – 45 mmHg
HCO_3	22 - 26 mEq/L
PAO_2	80 – 100 mmHg



HIV & AIDS STUDIES

	CD4 CELL COUNT
➡ **NORMAL**	500-16,000 cells/mm³
➡ **AIDS**	< 200 cells/mm³

COMMONLY ORDERED LAB PANELS

COMPLETE BLOOD COUNT (CBC)

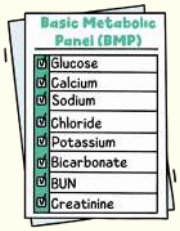
- ✔ WBCs
- ✔ RBCs
- ✔ Hgb
- ✔ Hct
- ✔ Plts

COAGS

- ✔ PT
- ✔ PTT
- ✔ aPTT
- ✔ INR
- ✔ Fibrinogen
- ✔ D. dimer

BASIC METABOLIC PANEL (BMP)

- ✔ Glucose
- ✔ Calcium
- ✔ Sodium
- ✔ Chloride
- ✔ Potassium
- ✔ Bicarbonate
- ✔ BUN
- ✔ Creatinine

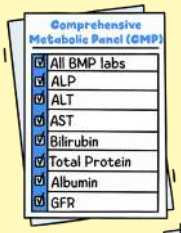


Magnesium & phosphorus tests must be ordered separately, as they are not included in the basic metabolic panel (BMP) or comprehensive metabolic panel (CMP)

COMPREHENSIVE METABOLIC PANEL (CMP)

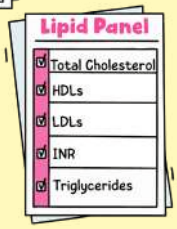
Includes all labs from the BMP plus the following:

- ✔ ALP
- ✔ ALT
- ✔ AST
- ✔ Bilirubin
- ✔ Total protein
- ✔ Albumin
- ✔ GFR



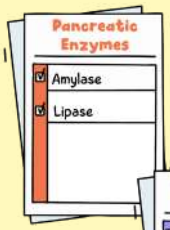
LIPID PANEL

- ✔ Total cholesterol
- ✔ HDLs
- ✔ LDLs
- ✔ Triglycerides



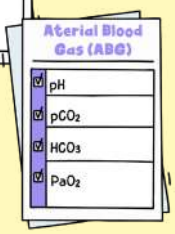
PANCREATIC ENZYMES

- ✔ Amylase
- ✔ Lipase



ARTERIAL BLOOD GAS (ABG)

- ✔ pH
- ✔ pCO_2
- ✔ HCO_3
- ✔ PaO_2



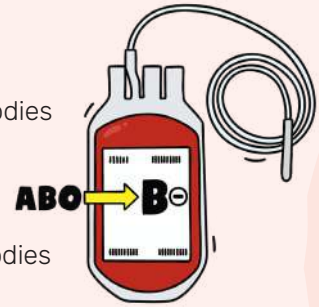
BLOOD PRODUCTS

TYPE & SCREEN

TYPE

A person's overall blood type consists of two components:

1 ABO SYSTEM: DETERMINES THE BLOOD GROUP - A, B, AB, OR O



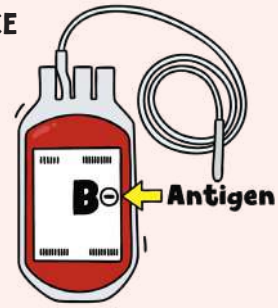
▶ **Type A**
- ✓ RBCs have A antigens
- ✓ Plasma contains anti-B antibodies

▶ **Type B**
- ✓ RBCs have B antigens
- ✓ Plasma contains anti-A antibodies

▶ **Type AB**
- ✓ RBCs have both A & B antigens
- ✓ Plasma has no anti-A or anti-B antibodies

▶ **Type O**
- ✓ RBCs have no A or B antigens
- ✓ Plasma contains both anti-A & anti-B antibodies

2 RH ANTIGEN: PRESENCE OR ABSENCE OF RH ANTIGEN ON RBCS



▶ **Rh positive:**
Have the Rh antigen on their RBCs

▶ **Rh negative:**
Do not have the Rh antigen on their RBCs

It is important to understand that the Rh antigen is distinct from the A and B antigens found on red blood cells - they are separate components of blood typing!

SCREEN

The screen tests for **atypical antibodies** that may attack red blood cell antigens beyond the ABO or Rh antibodies

➡ Most common atypical antibodies:

▶ Anti-D
▶ Anti-C
▶ Anti-K
▶ Anti-E

COMPATIBILITY

RECIPIENT \ DONOR	O-	O+	B-	B+	A-	A+	AB-	AB+
AB+	✚	✚	✚	✚	✚	✚	✚	✚
AB-	✚		✚		✚		✚	
A+	✚	✚			✚	✚		
A-	✚				✚			
B+	✚	✚	✚	✚				
B-	✚		✚					
O+	✚	✚						
O-	✚							

O-negative (O-) blood is considered the universal donor type because it lacks A, B, and Rh antigens on the red blood cells. This means it can be safely transfused to individuals of any blood type without causing an immune reaction.

Conversely, AB-positive (AB+) blood is the universal recipient type because individuals with this blood type do not produce anti-A, anti-B, or anti-Rh antibodies. Therefore, they can receive blood from any donor without risk of antibody-mediated rejection.

WHEN IS A TYPE & SCREEN DONE?

- ✓ If a patient needs a transfusion (for stable patients)
- ✓ Before scheduled surgery
- ✓ During prenatal testing (to check for Rh incompatibility with fetus)

IMPORTANT NOTES:

Antibodies can develop after that!

- A type & screen is valid for 72 hours
- Draw the type & screen sample in a lavender top tube
- After the type & screen is completed, patients receive a blood band - **do not remove it!**
- In emergencies where a type & screen cannot be performed beforehand, patients receive **O-negative (O-) blood** as a universal donor

TYPES OF BLOOD PRODUCTS

WHOLE BLOOD

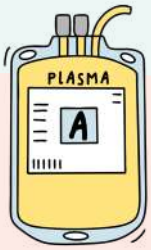
- **Composition**
  - Plasma, red blood cells (RBCs), and buffy coat (white blood cells & platelets)
- **Indications**
  - Given for life-threatening hemorrhage (e.g. trauma, surgery, childbirth)
- **Time parameters**
  - Must be transfused within **4 hours** of removal from the refrigerator

PACKED RED BLOOD CELLS (PRBC)

If the patient has a scheduled procedure or surgery, notify the Provider if the Hgb is less than 11

- **Composition**
  - Isolated red blood cells
- **Indications**
  - To raise hemoglobin in anemic patients (Hgb < 7)
- **Time parameters**
  - Must be transfused within **4 hours** of being removed from the refrigerator

One unit of PRBCs typically increases Hgb by approximately 1 g/dL



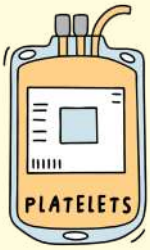
FRESH FROZEN PLASMA (FFP)

- **Composition**
  - All clotting factors
- **Indications**
  - Bleeding with clotting deficiencies, **d**isseminated **i**ntravascular **c**oagulation (**DIC**), & warfarin reversal
- **Time parameters**
  - Must be transfused within **4 hours** of removal from the refrigerator

CRYOPRECIPITATE

- **Composition**
  - Concentrated portion of FFP rich in factor VIII, von Willebrand factor, & fibrinogen
- **Indications**
  - Bleeding with low fibrinogen (e.g. DIC, von Willebrand disease, massive hemorrhage)
- **Time parameters**
  - Must be transfused within **6 hours** of removal from the refrigerator

PLATELETS



- **Composition**
  - Isolated from the buffy coat
- **Indications**
  - Thrombocytopenia (platelets < 50,000)
- **Time parameters**
  - Must be transfused within **1 hour** of removal from the refrigerator

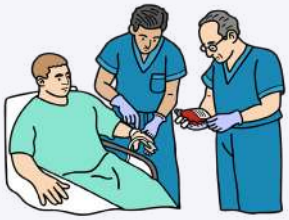
BLOOD PRODUCT ADMINISTRATION

STEPS

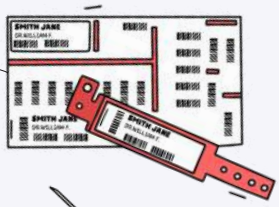
CHECKING BLOOD

Blood should be checked by two licensed RNs for:

- Order
- Blood type & Rh
- Patient name & DOB (verify with patient if able)
- Medical record number
- Blood product details:
  - ✓ Product number
  - ✓ Blood type
  - ✓ Expiration date
  - ✓ Compatibility tag

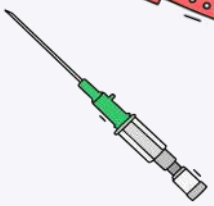


Must match exactly with the name & MRN printed on the blood component tag



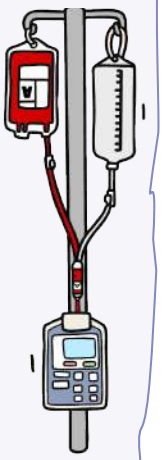
BLOOD ADMINISTRATION

- Use a 20 gauge IV or larger (≥ 18 gauge preferred)



Using a smaller gauge needle can destroy the RBCs ("hemolysis")

- Take baseline vital signs before starting the transfusion
- Use Y-tubing or a straight-tubing blood administration set with appropriate filter
- Start infusion slowly for the first 15 minutes and stay with the patient
- Take vital signs again after 15 minutes
- If no transfusion reaction occurs, increase infusion to prescribed rate



Transfusion reactions typically occur in the first 15 minutes!

- Run transfusion over 2-4 hours, reassessing vital signs at least every hour

STEPS

AFTER TRANSFUSION COMPLETES

- Run normal saline through tubing to deliver remaining blood
- Take a final set of vital signs after transfusion
- Document:
  - ✓ Time of transfusion completion
  - ✓ Patient's vital signs
  - ✓ Any reactions (if present)
- Recheck relevant labs (e.g. Hgb & Hct) post-transfusion
- Dispose of blood product bag in biohazard waste bin

QUICK FACTS

- Informed consent must be obtained prior to administration (except in emergencies)
- Blood products can only be transfused by an RN
- Transfuse blood products one at a time
- Transfuse within 30 minutes of receiving from the blood bank
- Only normal saline can be infused with blood products
- Note patient's religious preferences - Jehovah's Witnesses typically refuse blood transfusions

- Blood products usually do not need warming unless rapid transfusion is needed (e.g. trauma)

TRANSFUSION REACTIONS

HEMOLYTIC

WHAT IS IT?

Recipient's IgM and IgG antibodies bind to antigens on the transfused RBCs, activating the **m**embrane **a**ttack **c**omplex (**MAC**), which lyses the red blood cells

S&S

- Lower back pain
- Fever/chills
- Anxiety
- Pain at the IV site
- Hyperkalemia
- Dark urine (**hemoglobinuria**)

Left untreated, hemolytic transfusion reactions can lead to serious complications, including shock, **d**isseminated **i**ntravascular **c**oagulation (**DIC**), liver failure, & kidney failure

When RBCs lyse, they release intracellular potassium into the bloodstream, which can lead to hyperkalemia (K > 5.0 mEq/L). Elevated potassium levels may result in dangerous cardiac arrhythmias.

ALLERGIC

WHAT IS IT?

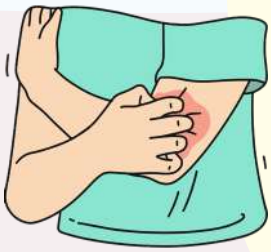
The recipient's IgE antibodies recognize allergens (e.g. medications, food proteins, plasma proteins) in the donor blood, triggering mast cell & basophil degranulation. This leads to histamine release and an allergic response.

If a patient has a known history of a **mild allergic reaction** to transfusion, the Provider may premedicate with an antihistamine (e.g. diphenhydramine) &/or an antipyretic (e.g. acetaminophen) to help prevent or reduce symptoms.

If the patient develops a **severe allergic reaction** (anaphylaxis), it is a medical emergency.

S&S

- Anxiety
- Facial flushing
- Hives ("**urticaria**")/ itching ("**pruritus**")
- Shortness of breath



Signs and symptoms include:

- Dyspnea
- Wheezing
- Tachycardia
- Hypotension (anaphylactic shock)

Immediate management includes:

- Supplemental O_2
- Epinephrine
- Corticosteroids & antihistamines
- Preparing for endotracheal intubation &/or vasopressor support if needed

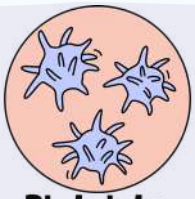
FEBRILE

WHAT IS IT? Occurs when cytokines from donor WBCs stimulate the hypothalamus, resulting in fever

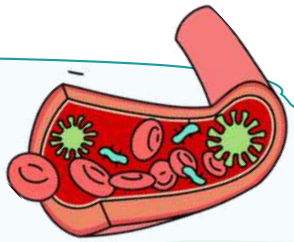
S&S

- Temperature ≥ 100.3° F (38° C)
- Chills
- Rigors

This is a relatively common transfusion reaction and is **not considered a medical emergency**. Fevers most frequently occur during platelet transfusions, particularly when residual donor leukocytes (WBCs) are present and have not been adequately removed. These leukocytes release cytokines, which can trigger a febrile response in the recipient.



SEPTIC



WHAT IS IT?

Caused by transfusion of bacteria-contaminated blood, which triggers a systemic inflammatory response via cytokine release

S&S

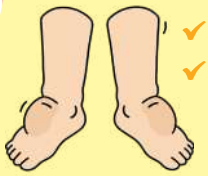
- Sudden high fever
- Chills & rigors
- Hives & pruritus (possible)
- Gastrointestinal symptoms: nausea, vomiting, &/or diarrhea

This transfusion reaction can quickly progress to life-threatening septic shock. Monitor for confusion, tachycardia, hypotension, dyspnea/SOB, & nausea/vomiting

TRANSFUSION-ASSOCIATED CIRCULATORY OVERLOAD (TACO) & TRANSFUSION-RELATED ACUTE LUNG INJURY (TRALI)

TACO

Results from fluid overload during transfusion, which increases pulmonary capillary pressure and leads to fluid leakage into the alveoli, causing **pulmonary edema**



- ✔ Afebrile
- ✔ Signs of fluid overload
  - JVD
  - Pedal edema
- ✔ Leukocyte count normal
- ✔ **Improves with diuretics**

Patients with heart failure are at increased risk, as their heart is unable to effectively compensate for the additional fluid volume introduced during transfusion

COMMON SYMPTOMS

PULMONARY EDEMA

RALES/CRACKLES

DYSPNEA/SHORTNESS OF BREATH

RESTLESSNESS

BILATERAL INFILTRATES (AS SEEN ON CHEST X-RAY)

TRALI

A non-cardiogenic reaction in which recipient neutrophils respond to donor antibodies, causing inflammatory damage to the lung capillary endothelium and resulting in **pulmonary edema**

- ✔ Acute onset
- ✔ Febrile
- ✔ No signs of fluid overload
  - No JVD
  - No pedal edema
- ✔ Transient leukopenia
- ✔ **Does not improve with diuretics**

To reduce the risk of TACO, administer the transfusion slowly over **4 hours** and space out multiple transfusions by at least **2 hours**.
If the patient begins to show signs of fluid overload, take the following steps ➡

- ✔ Stop the transfusion immediately
- ✔ Elevate the head of the bed
- ✔ Administer supplemental O_2
- ✔ Notify the Provider
- ✔ Be prepared to administer a diuretic as ordered

GENERAL INTERVENTIONS FOR TRANSFUSION REACTIONS

- Call for assistance and remain with the patient at all times
- Notify the Provider & pharmacy immediately
- Stop the transfusion immediately
- Administer prescribed treatments as appropriate, which may include:
  - ✔ Corticosteroids
  - ✔ Acetaminophen
  - ✔ Diphenhydramine
  - ✔ Diuretics
  - ✔ Epinephrine
  - ✔ Vasopressors
- Replace the tubing and begin running normal saline

- Send the following to the blood bank:
  - ✔ Remaining blood product
  - ✔ Blood tubing
  - ✔ Pertinent documentation

- Obtain ordered laboratory tests, which may include:
  - ✔ **C**omplete **b**lood **c**ount (**CBC**)
  - ✔ Direct Coombs test
  - ✔ Liver & kidney function tests
  - ✔ Serum lactate
  - ✔ Urine specimen for hemoglobinuria
- Continue to monitor & document vital signs every 15 minutes

Used to detect the presence of antibodies that are bound to red blood cells, which may indicate an immune-mediated hemolytic reaction

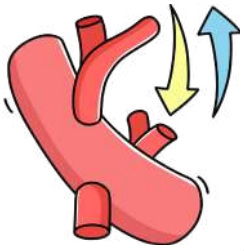
ELECTROLYTE IMBALANCES

AS YOU GO THROUGH THIS SECTION, KEEP IN MIND THE FOLLOWING IMPORTANT RELATIONSHIPS:

INVERSE RELATIONSHIP

SODIUM/POTASSIUM	↑ Na → ↓ K	↓ Na → ↑ K
CALCIUM/PHOSPHORUS	↑ Ca → ↓ P	↓ Ca → ↑ P
MAGNESIUM/PHOSPHORUS	↑ Mg → ↓ P	↓ Mg → ↑ P

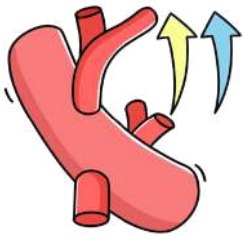
These electrolytes have a **reciprocal (inverse) relationship** -as one increases, the other decreases, & vice versa



DIRECT RELATIONSHIP

CALCIUM/MAGNESIUM	↓ Mg → ↓ Ca
POTASSIUM/MAGNESIUM	↓ K → ↓ Mg

These electrolytes have a **parallel relationship** - as one decreases, the other also decreases. **However, this is not reciprocally true**; if one increases, the other does not necessarily increase as well.



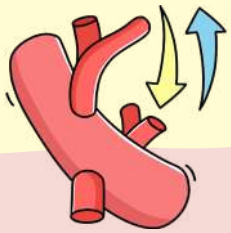
SODIUM (135 - 145 MEQ/L)

11
Na
Sodium
22.990

WHAT DOES SODIUM DO IN THE BODY?

SODIUM & POTASSIUM HAVE AN INVERSE RELATIONSHIP

↑ Na → ↓ K ↓ Na → ↑ K



MAINTAINS FLUID BALANCE

- Controls intracellular & extracellular fluid shifts through osmosis and is a key component of the sodium-potassium pump

The **sodium-potassium pump** is a cellular mechanism that regulates the concentration of sodium & potassium ions inside and outside the cell

REGULATES BLOOD PRESSURE

- By drawing water into blood vessels, sodium increases blood volume, which raises blood pressure

Using osmotic pressure, sodium draws fluid via a pressure gradient from an area of *higher concentration* to an area of *lower concentration*

INITIATES NERVE IMPULSES

- Through the sodium-potassium pump, sodium & potassium ions are exchanged to maintain the resting membrane potential necessary for nerve impulse transmission

Resting membrane potential is the polarized state of a cell membrane, where the inside of the cell is negatively charged relative to the outside

PLAYS A KEY ROLE IN MUSCLE CONTRACTION

- Sodium triggers calcium release, which enables actin & myosin proteins to interact and generate muscle contraction

HYPERNATREMIA VS HYPONATREMIA

HYPERNATREMIA (NA > 145 MEQ/L)

CAUSES

Medications

- Corticosteroids (enhance free water diuresis)
- Lithium (causes nephrogenic diabetes insipidus)

Conditions

- Cushing's syndrome
- Hyperaldosteronism
- **D**iabetes **i**nsipidus (**DI**)
- Kidney disease/failure

Occurs when the kidneys lose the ability to concentrate urine, leading to increased free water loss and resulting in a higher concentration of sodium in the blood

Fluid loss — MOST COMMON!

- **D**ehydration
- **D**iaphoresis
- **D**iarrhea

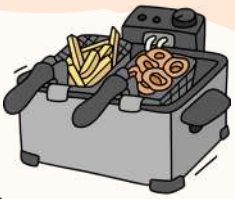
REMEMBER THE **D**S! — MEMORY TRICK

Increased sodium intake

- Excessive salty foods (oral)
- Hypertonic IV fluids

S&S

MEMORY TIP



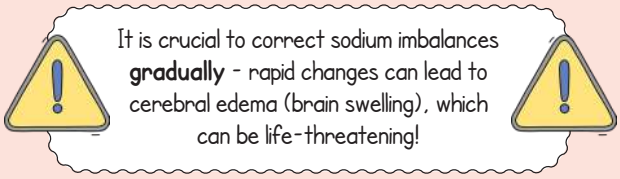
- **F**lushed
- **R**estless
- **I**ncreased BP/fluid retention,
- **I**ncreased muscle tone
- **E**dema
- **D**ecreased urine output,
- **D**ry, swollen tongue, **D**ry skin
- **F**ever
- **A**gitated, **A**ltered (confused)
- **T**hirst — MOST COMMON!
- **S**tomach upset (nausea/vomiting)

HYPERNATREMIA (NA > 145 MEQ/L)

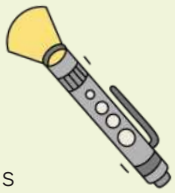
TREATMENT

Treatment is based on the underlying cause:

- **Dietary:** sodium restriction
- **IV fluids:** stop hypertonic fluids or switch to isotonic/hypotonic



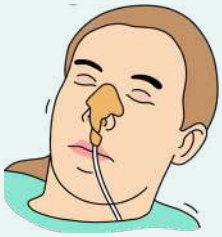
- **Diabetes insipidus:** desmopressin
- **Fluid loss (dehydration, diarrhea, diaphoresis):** IV fluids
- **Kidney dysfunction:** dialysis



- Perform regular neuro checks
- Monitor sodium & potassium levels
- Monitor kidney function (BUN & creatinine)
- Implement safety precautions if the patient is confused
- Provide dietary education to avoid high-sodium foods (e.g. fried foods, lunch meats, canned foods, salad dressings, frozen dinners)

HYPONATREMIA (NA < 135 MEQ/L)

CAUSES



Drains to suction (OG or NG tubes)

Diaphoresis

Drainage (wound)

Deficiency

- NPO status
- Low sodium diets

Diuretics

- Loop & thiazide diuretics

Loop diuretics inhibit the reabsorption of sodium & water in the ascending loop of Henle, while thiazide diuretics act on the distal tubule to prevent sodium & water reabsorption. Although these diuretics can sometimes cause hypernatremia, they more commonly lead to hyponatremia by increasing the excretion of sodium-rich urine.

Dilutional

- **Water intoxication (excessive water intake) ➔ causes hemodilution**

MOST COMMON!

- Hypotonic IV fluids ➔ dilute extracellular fluid
- **S**yndrome of **i**nappropriate **a**nti**d**iuretic **h**ormone (**SIADH**) ➔ causes fluid retention by excessive ADH action

This can result from physical illnesses or mental health conditions such as anorexia nervosa

Diarrhea or vomiting

Disease

- Kidney disease/failure ➔ impaired urine concentration, leading to sodium loss exceeding water loss
- Heart failure ➔ reduced kidney perfusion and increased ADH secretion
- Addison's disease ➔ aldosterone deficiency and increased ADH

This hormone causes the reabsorption of sodium in the kidneys

HYPONATREMIA (NA < 135 MEQ/L)

S&S

- **L**imp muscles
- **O**rthostatic hypotension
- **W**eak, thready pulses
- **S**tupor/coma, **S**eizure,

- **S**tomach cramping (hyperactive bowels)
- **A**norexia, **A**ltered mental status, **A**ching head
- **L**ethargy
- **T**achycardia, **T**endon reflex (deep) decreased

TREATMENT

- **Dilutional hyponatremia**
  - ✓ Fluid restriction as ordered
  - ✓ Loop diuretics
- **Deficiency hyponatremia**
  - ✓ High sodium diet
  - ✓ Salt tablets

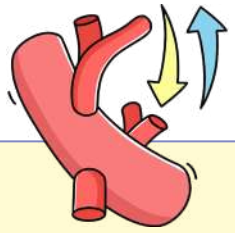
Mild hyponatremia: normal saline

Moderate to severe hyponatremia: hypertonic saline

- Perform regular neuro checks
- Monitor sodium & potassium levels
- Monitor kidney function (BUN & creatinine)
- Educate patients on the risks of extreme dieting if diet-related
- Implement fall precautions as needed

HYPERNATREMIA VS HYPONATREMIA

"HYPER-" INDICATES THAT A LEVEL IS ABOVE THE NORMAL RANGE, WHILE "HYPO-" INDICATES THAT A LEVEL IS BELOW THE NORMAL RANGE: SOMEONE WHO IS HYPER HAS HIGH ENERGY, WHILE HYPO SOUNDS LIKE "LOW"!



POTASSIUM (3.5 - 5 MEQ/L)

WHAT DOES POTASSIUM DO IN THE BODY?

SODIUM & POTASSIUM HAVE AN INVERSE RELATIONSHIP ↑ Na → ↓ K ↓ Na → ↑ K

MAINTAINS FLUID BALANCE

▶ Works through the sodium-potassium pump to regulate intracellular & extracellular fluid distribution

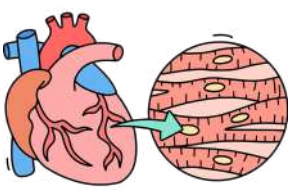
REGULATES BLOOD PRESSURE

▶ Acts in opposition to sodium by promoting its excretion, which reduces fluid volume and directly lowers vascular tone

INITIATES NERVE IMPULSES & SUPPORTS MUSCLE CONTRACTION/RELAXATION

▶ Maintains resting membrane potential via the sodium-potassium pump, ensuring normal nerve conduction & muscle function

Especially in cardiac muscle! Cardiac myocytes are uniquely sensitive to even small changes in potassium levels. Potassium plays a critical role in **repolarization** - the process that restores the heart's electrical state to baseline after each contraction, allowing the next heartbeat to occur.



HYPERKALEMIA VS. HYPOKALEMIA

HYPERKALEMIA (K > 5 MEQ/L)

CAUSES

Medications

- Potassium-sparing diuretics
- ACE inhibitors & ARBs (inhibit aldosterone release)

While aldosterone promotes sodium reabsorption in the kidneys, it simultaneously enhances the excretion of potassium & magnesium. Therefore, medications that reduce aldosterone levels (such as ACE inhibitors & ARBs) can contribute to hyperkalemia.

- NSAIDS (reduce aldosterone production)
- IV solutions containing potassium

Diet

- High-potassium diet
- Excessive use of salt substitutes

Salt substitutes contain potassium!

Conditions/diseases

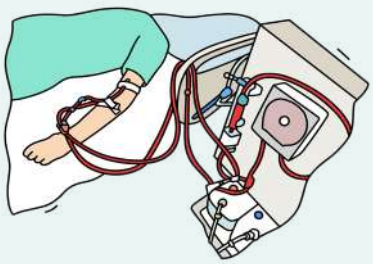
- Rhabdomyolysis & tumor lysis syndrome ➔ release intracellular K into bloodstream
- Trauma, burns, hemolytic disease ➔ cell lysis releases K
- Addison's disease ➔ reduced aldosterone

Patients with Addison's disease are unable to produce aldosterone

MOST COMMON!

- Kidney disease/ failure ➔ impaired potassium excretion

Dialysis patients!



HYPERKALEMIA (K > 5 MEQ/L)

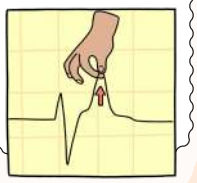
S&S

MEMORY TIP

Muscle
Early: irritability - twitches/cramps, paresthesia, & circumoral numbness
Late: weakness progressing to complete paralysis

Urine output decreased
Respiratory failure
Decreased cardiac contractility,
Diarrhea
ECG changes
Reflexes depressed (deep tendon)
Excessive fatigue
Retching (nausea/vomiting)

Arrythmias, **tall/peaked T-waves**, wide QRS complexes, & prolonged PR and QT intervals



TREATMENT

Mild hyperkalemia

- Discontinue potassium-containing infusions
- Loop diuretics (e.g. furosemide)

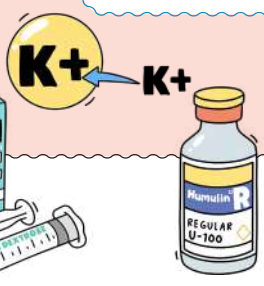
Moderate to severe hyperkalemia

- Dialysis
- Calcium gluconate

Stabilizes cardiac membrane

- Medications to shift potassium into the cells
  - ✓ Sodium bicarbonate
  - ✓ Albuterol
  - ✓ Insulin

Administer **slowly** (50-100 mg/min)



Administered with glucose to prevent hypoglycemia!

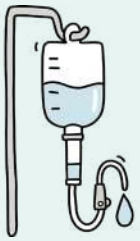
HYPERKALEMIA (K > 5 MEQ/L)

- Continuous cardiac monitoring
- Monitor sodium & potassium levels
- Monitor kidney function (BUN & creatinine)
- Educate patient to avoid high-potassium foods, such as:
  - ✔ Salt substitutes, leafy greens, & potassium-rich fruits
  - ✔ **Avoid:** avocados, sweet potatoes, squash, spinach, apricots, coconut water, yogurt, white beans, mushrooms, bananas

HYPOKALEMIA (K < 3.5 MEQ/L)

CAUSES

Inadequate intake
- NPO, fasting, malnutrition, starvation



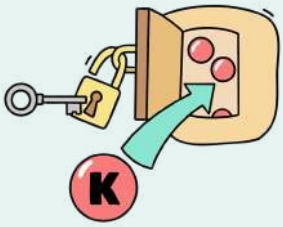
Dilutional
- Water intoxication
- Excessive IV fluids without potassium supplementation

Medications
- Loop or thiazide diuretics (increase potassium excretion)
- Albuterol (shifts potassium into cells)

"Potassium-wasting"

Conditions
- Cushing's disease (increased aldosterone)
- Hyperinsulinism & alkalosis (shift K into cell)

Losses
- Diarrhea, vomiting
- Excessive diaphoresis
- Gastric suctioning (OG/NG)
- Wound drainage



TREATMENT

- **Supplemental potassium**
  - ✔ Oral or IV (as ordered)
- **Potassium-sparing diuretics only**

Oral potassium should be taken with food to reduce the risk of gastrointestinal upset

Avoid loop or thiazide diuretics

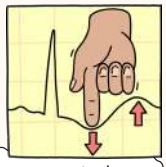
HYPOKALEMIA (K < 3.5 MEQ/L)

S&S

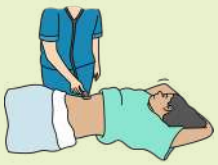
- **S**evere hypotension
- **L**ethargy
- **O**ut of it (confusion)
- **W**eakness (muscles) & ↓ DTR
- **M**otility ↓ (nausea, vomiting, ileus)
- **U**rinary frequency (large outputs)
- **S**hallow respirations
- **C**ramps (legs), **C**alcium excretion ↑
- **L**ethal arrhythmias (dysrhythmias & profound bradycardia)
- **E**CG changes

These patients are at increased risk for a bowel obstruction

This can cause kidney stones!

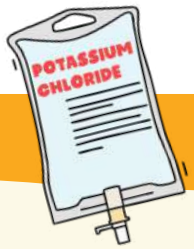


ST depression, inverted T-waves, & prominent U-waves



- Monitor ECG for acute changes
- Assess bowel sounds regularly
- Monitor respiratory status (rate & effort)
- Implement safety precautions as needed for muscle weakness
- Monitor sodium, potassium, & blood glucose levels
- Teach the patient to eat potassium-rich foods

Foods high in potassium: bananas, avocado, sweet potato, squash, spinach, mushrooms, coconut water, yogurt, apricots, white beans



Spotlight Medication

SAFE ADMINISTRATION GUIDELINES

➡ **Never** administer potassium via:

- ✓ **IV push**
- ✓ **Intramuscular (IM)**
- ✓ **Subcutaneous (SubQ)**

➡ These routes can cause **immediate cardiac arrest**

➡ **Always** administer potassium:

- ✓ As a **diluted infusion**
- ✓ **Via an infusion pump** to control the rate precisely

➡ Recommended infusion rates

- ✓ **Peripheral IV: ≤ 10 mEq/hour**
- ✓ **Central line: ≤ 20 mEq/hour**

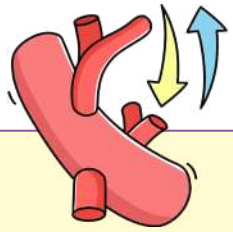
NURSING INTERVENTIONS

➡ Potassium is **highly irritating** to veins

➔ monitor the IV site closely for:

- ✓ **Redness**
- ✓ **Pain**
- ✓ **Infiltration**

➡ **Never exceed the recommended infusion rate** unless under direct Provider supervision in a critical care setting



CALCIUM (9 - 11 MG/DL)

WHAT DOES CALCIUM DO IN THE BODY?

CALCIUM & PHOSPHATE HAVE AN INVERSE RELATIONSHIP ↑ Ca → ↓ PO ↓ Ca → ↑ PO

SUPPORTS THE CLOTTING CASCADE

▶ Activates coagulation factors II, VII, IX, X, & XIII

STABILIZES THE CELLULAR PLASMA MEMBRANE

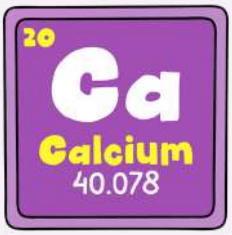
▶ Binds to phospholipids, increasing membrane rigidity and reducing permeability

TRIGGERS NEUROTRANSMITTER RELEASE

▶ Occurs at the presynaptic terminal

INITIATES MUSCLE CONTRACTIONS

▶ Facilitates the interaction between actin & myosin, allowing them to slide past one another - an action that generates muscle contraction



Calcium is found almost exclusively in the bones & teeth

HYPERCALCEMIA VS. HYPOCALCEMIA

HYPERCALCEMIA (CA > 11 MG/DL)

CAUSES

High calcium or vitamin D consumption

A common cause is antacid overdose - such as taking too many TUMS (calcium carbonate supplements)

Bone resorption (release of calcium from the bones)

- ▶ **Hyperparathyroidism** MOST COMMON!
  - ✓ **Para**thyroid **h**ormone (**PTH**) stimulates osteoclast activity

Osteoclasts are cells that break down bone

- ▶ **Hyperthyroidism**
  - ✓ Increases bone turnover rate

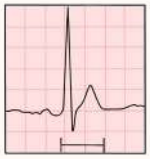
Thyroid hormone plays a key role in bone growth & development

Malignancy

- ▶ Tumor-mediated bone destruction

HYPERCALCEMIA (CA > 11 MG/DL)

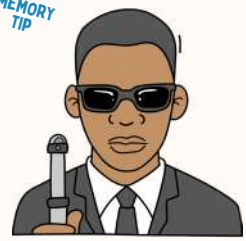
S&S



Shortened QT interval, wide T-wave, & heart block

- **M**uscle weakness
- **E**CG changes
- **N**o appetite (anorexia)
- **I**ncreased BP, urine output, & thirst
- **N**ausea/vomiting
- **B**one pain ← MOST COMMON!
- **L**ethargy
- **A**rrhythmias
- **C**ardiac arrest, **C**onfusion,
- **C**onstipation
- **K**idney stones

MEMORY TIP



TREATMENT

- Medications that inhibit bone resorption
  - ✓ **Bisphosphonates** (inhibit osteoclast activity)
  - ✓ **Calcitonin** (promotes calcium excretion)

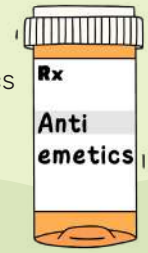
- Dialysis for severe hypercalcemia
- Avoid thiazide diuretics; use loop diuretics if needed

Thiazide diuretics can cause calcium retention

HYPERCALCEMIA (CA > 11 MG/DL)

- Monitor ECG
- Monitor calcium & magnesium levels
- Encourage oral or IV fluids (prevent stones & constipation)
- Avoid calcium-rich diets, calcium supplements, & aluminum hydroxide antacids

- Implement fall precautions (muscle weakness & bone fragility)
- Administer antiemetics for nausea/vomiting



FALL PREVENTION STRATEGIES

- ✓ Ensure bed is in the lowest position with wheels locked
- ✓ Keep the call light within reach - respond promptly
- ✓ Maintain clear, uncluttered pathways
- ✓ Verify the patient is wearing non-slip socks or footwear
- ✓ Place a urinal or bedside commode within easy access if appropriate
- ✓ Keep the side table with personal items (e.g. glasses, hearing aids, phone, charger) within reach
- ✓ Activate a bed alarm if indicated
- ✓ Consider placing the patient in a room near the nurse's station for closer monitoring

HYPOCALCEMIA (CA < 9 MG/DL)

MOST COMMON!

CAUSES

Hypoparathyroidism

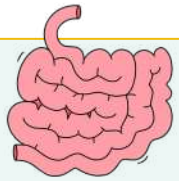
- Often follows thyroidectomy due to accidental removal or damage to the parathyroid glands, leading to decreased **p**ara**t**hyroid **h**ormone (**PTH**) production

Pancreatitis

- Causes the release of free fatty acids, which bind to calcium and form insoluble deposits that are excreted

Crohn's disease

- Inflammation impairs the absorption of both calcium & vitamin D in the gastrointestinal tract



Vitamin D deficiency

- Decreases calcium absorption in the small intestine

Chronic kidney disease/failure

- Reduces the kidney's ability to convert vitamin D into its active form (calcitriol), impairing calcium absorption & regulation

Medications

- Includes **phosphate enemas** & **calcium chelators**, which can lower serum calcium levels

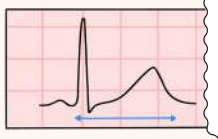
HYPOCALCEMIA (CA < 9 MG/DL)

S&S

Heart failure, **H**eart rate low (bradycardia)
Yawn (lethargy/sluggishness)
Positive Chvostek's sign & Trousseau's sign
Overly dry skin (dermatitis)
Circumoral numbness
ALOC/seizures
Laryngospasm
Confusion
ECG changes

MEMORY TIP

Numbness most commonly occurs around the mouth, but it may also affect the nose, ears, & extremities



- **Prolonged QT interval**
- ST elevation (may look like a heart attack!)
- Inverted T-waves
- Prominent U-waves

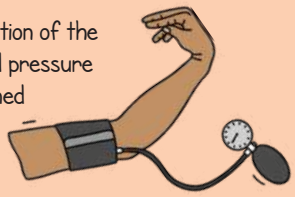
Muscle irritability — MOST COMMON!
(tetany, twitches, cramps, hyperactive bowels)
Increased bleeding
Audible stridor

Remember, calcium activates coagulation factors during the clotting process!

Stridor is a high-pitched, musical sound that typically indicates upper airway obstruction, such as laryngospasm, which can occur as a complication of hypocalcemia

CHVOSTEK'S SIGN
Involuntary contraction of facial muscles when the facial nerve is tapped just in front of the ear

TROUSSEAU'S SIGN
Involuntary carpopedal spasm (contraction of the hand & wrist) that occurs when a blood pressure cuff is inflated on the arm and maintained for several minutes



HYPOCALCEMIA (CA < 9 MG/DL)

TREATMENT

▶ **Calcium**

✔ Oral calcium supplements for **asymptomatic hypocalcemia**

Take with food & a full glass of water

✔ IV calcium gluconate for **symptomatic hypercalcemia**

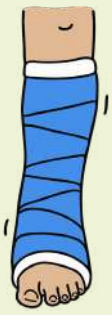
▶ **Aluminum hydroxide**

Decreases phosphate levels by binding dietary phosphate in the gut, which in turn helps increase serum calcium levels

▶ **Vitamin D**

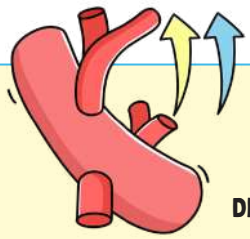
Listen for stridor!

- Continuous ECG monitoring
- Monitor for signs of laryngospasm or respiratory compromise
- Regularly assess magnesium & calcium levels
- Encourage consumption of calcium-rich foods
- Monitor kidney function (BUN & creatinine)
- Implement seizure precautions
- Implement fall risk precautions due to increased fracture risk



Both **hyper**calcemia & **hypo**calcemia increase the risk for fractures!

MAGNESIUM (1.5 - 2.5 MG/DL)



MAGNESIUM & CALCIUM HAVE A PARALLEL RELATIONSHIP WHERE DECREASED MAGNESIUM LEVELS CAN CAUSE DECREASED CALCIUM LEVELS. DECREASED MAGNESIUM LEVELS CAN ALSO CAUSE DECREASED POTASSIUM LEVELS.

↓ Mg → ↓ Ca
↓ Mg → ↓ K

WHAT DOES MAGNESIUM DO IN THE BODY?

HELPS MUSCLES RELAX AFTER A CONTRACTION

- Competitively bind to the same plasma protein sites as calcium. This competitive binding effectively blocks calcium's action, thereby regulating muscle excitability and preventing excessive contraction.

PREVENTS NERVE OVERSTIMULATION

- Inhibits the release of the excitatory neurotransmitter glutamate and enhances the inhibitory neurotransmitter GABA

LOWERS BLOOD PRESSURE

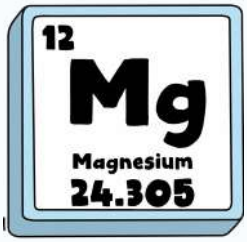
- Blocks calcium's action which causes vasodilation

PRODUCES ENERGY

- Participates in the enzymatic reaction that produces ATP

SYNTHESIZES PROTEINS

- Participates in the enzymatic reactions that produce DNA & RNA



HYPERMAGNESEMIA VS. HYPOMAGNESEMIA

HYPERMAGNESEMIA (> 2.5 MG/DL)

CAUSES

- Kidney disease/failure
- Overuse of magnesium-containing antacids, laxatives or enemas
- Magnesium infusions

Typically associated with patients who have underlying renal failure

Magnesium infusions are commonly administered to **pregnant women with preeclampsia** (high risk)

- **D**iabetic **k**eto**a**cidosis **(DKA)** MOST COMMON!
  - ✔ Insulin deficiency causes extracellular magnesium buildup due to impaired cellular uptake

Insulin is responsible for shifting magnesium into the cells

- Addison's disease
  - ✔ Reduced aldosterone production

Remember, aldosterone promotes sodium reabsorption while enhancing the excretion of magnesium & potassium

Calcium competes with magnesium for protein binding sites on cell membranes and at the neuromuscular junction, influencing muscle excitability & nerve conduction

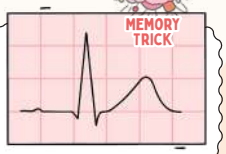
HYPERMAGNESEMIA (> 2.5 MG/DL)

S&S

- **S**evere hypotension,
- **S**hallow, weak respirations
- **E**nergy low
- **D**ecreased HR, BP
- **A**bsent or diminished bowel sounds
- **T**ired & drowsy
- **E**CG changes
- **D**eep tendon reflexes (decreased)

IN HYPERMAGNESEMIA, EVERYTHING IS LOW & SLOW!

Flat **P**-waves, prolonged **P**R interval, prolonged **Q**T interval, wide **QRS** complex, & **T**-wave elevation. Remember **PQRST**!



TREATMENT

Mild hypermagnesemia

- Discontinue magnesium-containing medications (e.g. antacids, laxatives, supplements)
- Restrict magnesium-rich foods

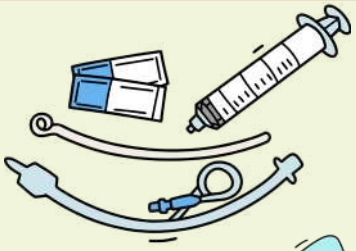
Moderate to severe hypermagnesemia

- Loop & thiazide diuretics
- IV calcium gluconate
- Hemodialysis (severe cases)

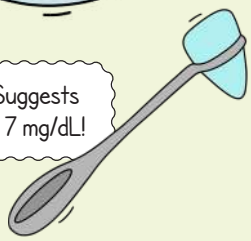
- ✕ Dark chocolate
- ✕ Bananas
- ✕ Avocados
- ✕ Leafy greens
- ✕ Peanut butter
- ✕ Salmon
- ✕ Pumpkin seeds
- ✕ Figs

HYPERMAGNESEMIA (> 2.5 MG/DL)

- Continuous ECG monitoring
- Watch for bradycardia or hypotension
- Monitor airway & respiratory status
- Monitor magnesium & calcium levels
- Monitor kidney function (BUN & creatinine)
- Implement safety precautions for the lethargic patient
- Monitor deep tendon reflexes & observe for progressive muscle weakness



Be prepared for endotracheal intubation!



No reflexes? Suggests a Mg level of ≈ 7 mg/dL!

HYPOMAGNESEMIA (< 1.5 MG/DL)

CAUSES

Losses

▶ Diuretics (loop & thiazide), NG/OG tube suction, vomiting, burns

Alcoholism

▶ Causes diuresis, damaged GI tract (poor absorption), malnutrition, & impaired liver metabolism

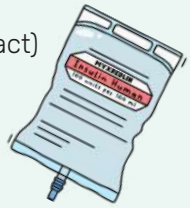
Medications

▶ Due to malabsorption

✔ Proton pump inhibitors (GI tract) & aminoglycosides (kidneys)

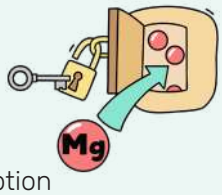
▶ Due to kidney damage

✔ Amphotericin B & cisplatin



Hyperinsulinism or exogenous insulin administration

▶ Insulin shifts magnesium into cells, lowering serum levels



Chronic kidney disease/failure

▶ Prevents magnesium reabsorption

Hyperaldosteronism

▶ Excess aldosterone increases magnesium wasting

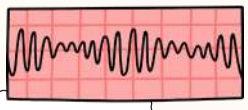
HYPOMAGNESEMIA (< 1.5 MG/DL)

S&S

Tachycardia, **T**etany, **T**witching, **T**oxic (digoxin)
Ouch (cramping & spasms)
Respirations (quick & shallow)
Seizures
Altered (confused, irritable)
Dyspnea, **D**iarrhea, ↑ **D**eep tendon reflexes (hyperreflexia)
Elevated BP, ECG changes
Signs (Chvostek's & Trousseau's)

If the patient is taking Digoxin simultaneously, there is an increased risk for toxicity

IN HYPOMAGNESEMIA, EVERYTHING IS HIGH & TIGHT!



Prolonged PR, prolonged QT, & wide QRS
Associated lethal arrythmia: Torsades de Pointes

Remember, magnesium & calcium have a parallel relationship - when one is low, the other often is as well. Therefore, Chvostek's & Trousseau's signs, may be present in both hypocalcemia & hypomagnesemia!

TREATMENT

Magnesium

▶ Oral magnesium supplements for **mild hypomagnesemia**

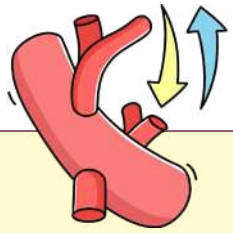
▶ IV magnesium for **moderate to severe hypomagnesemia**

Magnesium should be administered slowly & with caution. Monitor for signs of hypermagnesemia, including hypotension, diminished deep tendon reflexes (DTRs), & respiratory depression.

HYPOMAGNESEMIA (< 1.5 MG/DL)

- Continuous ECG monitoring
- Monitor BP for hypertension
- Monitor serum digoxin levels if the patient is on digoxin
- Assess neuromuscular status for tremors, hyperreflexia, muscle cramps, or weakness

- Monitor magnesium, calcium, & potassium levels
- Implement seizure precautions as needed
- Monitor kidney function (BUN & creatinine)
- Provide dietary recommendations for magnesium-rich foods



PHOSPHATE (2.5 - 4.5 MG/DL)

WHAT DOES PHOSPHATE DO IN THE BODY?

CALCIUM & PHOSPHATE HAVE AN INVERSE RELATIONSHIP ↑ Ca → ↓ PO ↓ Ca → ↑ PO

PROVIDES STRUCTURAL INTEGRITY TO BONES & TEETH

Forms hydroxyapatite ($Ca_5(PO_4)_3$) with calcium which is a mineral that provides structural "hardness" to bones & teeth

PLAYS A ROLE IN DNA & RNA SYNTHESIS

Essential component of nucleic acids along with a pentose sugar and nitrogenous base

HELPS PRODUCE ENERGY - ADENOSINE TRIPHOSPHATE (ATP)

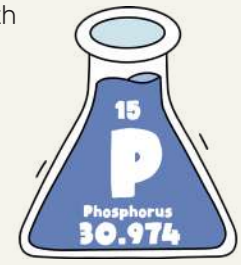
Component of ATP, the body's main energy molecule, contributing to muscle function & strength

MAINTAINS CELL MEMBRANE STRUCTURE

Integral to phospholipids, which maintain cell membrane integrity

HELPS REGULATE NEUROTRANSMITTERS

Involved in phosphorylation (adding phosphate groups to molecules), which influences neurotransmitter release at the neuronal synapse



HYPERPHOSPHATEMIA VS HYPOPHOSPHATEMIA

HYPERPHOSPHATEMIA (PO > 4.5 MG/DL)

CAUSES

- **Chronic kidney disease/failure**
- **Excess dietary phosphate intake**
- **Use of phosphate-containing enemas (e.g. Fleet enemas)**
- **Hypoparathyroidism**
  - ✓ Decreases calcium levels, indirectly increasing phosphate levels

- **Tumor lysis syndrome & chemotherapy**
  - ✓ Release of intracellular phosphate from lysed cells
- **Diabetic ketoacidosis (DKA)**
  - ✓ Intracellular to extracellular phosphate shift
  - ✓ Decreased renal clearance due to associated dehydration

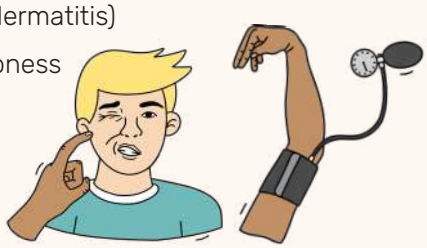
HYPERPHOSPHATEMIA (PO > 4.5 MG/DL)

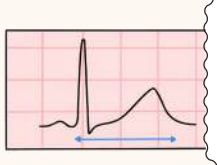
S&S

The S&S of hyperphosphatemia are the same as those of hypocalcemia due to phosphate binding with calcium!

- **H**eart failure, **H**eart rate low (bradycardia)
- **Y**awn (lethargy/sluggishness)
- **P**ositive Chvostek's sign & Trousseau's sign
- **O**verly dry skin (dermatitis)
- **C**ircumoral numbness
- **A**LOC/seizures
- **L**aryngospasm
- **C**onfusion
- **E**CG changes

MEMORY TIP

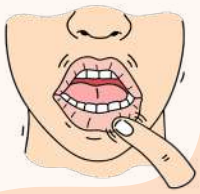




- **Prolonged QT interval**
- ST elevation (Resembles heart attack!)
- Inverted T-waves
- Prominent U-waves

- **M**uscle irritability (tetany, twitches, cramps, hyperactive bowels)
- **I**ncreased bleeding
- **A**udible stridor

MOST COMMON!



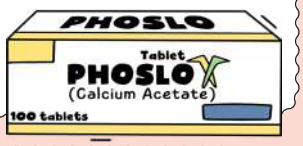
HYPERPHOSPHATEMIA (PO > 4.5 MG/DL)

TREATMENT

Mild to moderate hyperphosphatemia

- Phosphate binders: calcium acetate or sevelamer
- Avoid phosphate-containing enemas
- Restrict dietary phosphate

When taken with food, these medications bind to dietary phosphate in the gastrointestinal tract to form insoluble compounds that are poorly absorbed and subsequently excreted in the feces



✕ Dairy ✕ Organ meat ✕ Dark soda ✕ Seeds & nuts
✕ Processed meats (lunch meats, hot dogs, etc.)

Severe hyperphosphatemia

- Dialysis

NURSING CARE

- Implement hypocalcemia precautions
  - ✓ Airway monitoring for stridor/laryngospasm
  - ✓ Seizure precautions
  - ✓ Fall risk precautions
- Monitor phosphate & calcium levels
- Instruct patients to take **calcium acetate with food**
- Monitor kidney function (BUN & creatinine)

HYPOPHOSPHATEMIA (PO < 2.5 MG/DL)

CAUSES

Severe malnutrition or refeeding syndrome

- The reintroduction of carbohydrates triggers a surge in insulin, which drives phosphate from the bloodstream into the cells

High risk groups for refeeding syndrome:

- Anorexia nervosa
- Cancer patients
- Chronic alcoholism
- Critically ill

Hyperparathyroidism

- Elevated parathyroid hormone increases serum calcium, which indirectly lowers phosphate levels by enhancing its renal excretion

Excessive losses

- Nasogastric (NG/OG) suctioning, use of diuretics, & fluid shifts from burns

This shift of phosphate into the cells occurs most frequently in patients being treated with exogenous insulin for diabetic ketoacidosis (DKA), where insulin drives phosphate intracellularly

Chronic alcoholism

- Associated with poor dietary intake, diarrhea, & impaired renal reabsorption of phosphate

Antacid overuse

- Especially aluminum- or magnesium-containing antacids, which can bind phosphate in the gut and reduce its absorption

Vitamin D deficiency

- Vitamin D is essential for phosphate absorption in the gastrointestinal tract & kidneys; deficiency impairs this process

Insulin & respiratory alkalosis

- Both conditions promote intracellular shifting of phosphate, lowering serum phosphate levels

HYPOPHOSPHATEMIA (PO < 2.5 MG/DL)

S&S

Paresthesia
Hypoactive bowels sounds
Osteomalacia
Seizures
Problems breathing (respiratory failure)
Hunger gone (no appetite)
Ouch (bone pain)
Reflexes (↓ deep tendon reflexes)
Unusual behavior (irritable, confused)
Severe muscle weakness — MOST COMMON!

Soft, weak bones - high risk for fractures!

MEMORY TIP

In severe cases of **severe hypophosphatemia**, patients may experience profound neurological impairment, potentially progressing to a comatose state

HYPOPHOSPHATEMIA (PO < 2.5 MG/DL)

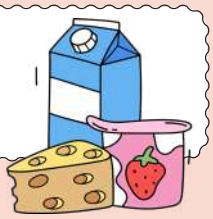
TREATMENT

Mild hyperphosphatemia

- Oral phosphate supplements with vitamin D

Vitamin D helps absorb the phosphate

- ✓ Dairy
- ✓ Fish
- ✓ Organ meat
- ✓ Nuts
- ✓ Pork
- ✓ Chicken
- ✓ Beef
- ✓ Whole grain cereal & bread



Severe hyperphosphatemia

- IV phosphate replacement

Sodium phosphate or potassium phosphate

NURSING CARE

- Monitor for muscle weakness & respiratory failure
- Implement fall precautions
- Monitor calcium & phosphate levels
- Educate on dietary phosphate sources

DOSAGE CALCULATION

Dosage calculation is a critical component of nursing practice. Developing proficiency in this skill ensures the safe and effective administration of medications. In clinical settings, the dose ordered by the Provider is often not available in the exact strength or unit provided by the pharmacy or stocked in the Pyxis. Therefore, it is the nurse's responsibility to accurately calculate and administer the correct dose to ensure patient safety!

GENERAL INSTRUCTIONS

- Show all work for each problem, and write clearly & legibly
- Always include appropriate units in your final answer (e.g. mcg, mL, kg)
- Always include leading zeroes (e.g. 0.5 is correct; .5 is not).
- Do not include trailing zeroes after a decimal (e.g. 5 is correct; 5.0 is not)
- Use standard rounding rules (outlined below)

$66\ lb = 30\ kg \left(\frac{2.2\ lb}{1\ kg} = \frac{66\ lb}{X kg}\right)$

$45mg/kg/day \times 30kg = 1{,}350mg/day \div 3\ doses = 450mg\ per dose$

$\frac{450mg \times 1mL}{125mg} = 3.6mL$

50 mg

Leading Zero

0.7

7.0

Trailing Zero

STANDARD ROUNDING RULES

▶ Begin rounding by examining the number farthest to the **right** of the decimal

- If the digit is **≥ 5**, round the number **immediately to the left up**
- If the digit is **≤ 4**, round the number **immediately to the left down**

▶ If you've reached the **appropriate decimal place, stop** - you have your final answer

▶ If further rounding is needed, continue assessing the digit to the immediate left until you reach the correct place value

▶ **Only round once - at the end of your calculation**. Avoid rounding during intermediate steps.

EXAMPLES:

ROUNDING TO THE NEAREST WHOLE NUMBER

1.47 ➔ 1.5 ➔ **2**

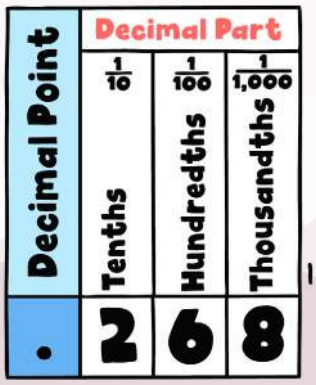
ROUNDING TO THE NEAREST TENTH

27.431 ➔ 27.43 ➔ 27.**4**

ROUNDING TO THE NEAREST HUNDREDTH

0.458

➔ 0.4**6**



In nursing school, you will not round beyond the hundredth place, as medication administration tools do not support accuracy beyond this level. Calculations should reflect realistic and safe clinical practice.

SPECIFIC ROUNDING GUIDELINES BY CALCULATION TYPE

CALCULATION TYPE	ROUND TO
Drip rates (gtt/min)	Nearest **whole number**
IV pump infusions (mL/hr)	Nearest **whole number**
Scored tablets or pills	Nearest **whole number or tenth**, as appropriate
Oral solutions ≥ 1 mL	Nearest **tenth**
IV push medications (mL)	Nearest **tenth**
Dose-based flow rates (e.g. mcg/min)	Nearest **tenth**
Oral solutions < 1 mL	Nearest **hundredth**

"Scored" or "unscored" refers to whether a pill has an indentation made by the manufacturer to facilitate splitting. Only **scored** tablets can be accurately divided. Therefore, when calculating dosages for scored tablets, your final answer should be expressed as a **whole number** (e.g. 1 tablet, 2 tablets) or rounded to the **nearest half tablet** (e.g. ½ tablet, 2 ½ tablets).

THREE METHODS FOR DOSAGE CALCULATION

The nurse practitioner orders 4,000 mg IV daily of a given medication. The pharmacy sends you a vial which contains 8g/2ml. How many ml will you administer per dose?

METHOD	SUMMARY	HOW DO YOU SOLVE IT?
DIMENSIONAL ANALYSIS	Proceed by applying appropriate conversion factors to convert between units. Cancel out units step by step until you arrive at the correct unit and measurement required to solve the problem accurately.	$\frac{4{,}000\ \cancel{mg}}{1\ \text{dose}} \times \frac{1\ \cancel{g}}{1000\ \cancel{mg}} \times \frac{2\text{mL}}{8\ \cancel{g}} = \frac{8{,}000\ \text{mL}}{8{,}000\ \text{dose}} = 1\ \text{mL/dose}$ (1, 2, 3, 4)
RATIO & PROPORTION	This method uses a ratio - representing the relationship between two quantities (e.g. 1:3) - and a proportion, which compares two ratios, to calculate the volume or dose needed. By setting up equivalent ratios, you can determine the correct amount to administer based on the dose available and the dose ordered.	$\frac{8\text{g}}{2\text{ ml}} = \frac{4{,}000\text{ mg}}{x\text{ ml}} = \frac{8{,}000\text{ mg}}{2\text{ ml}} = \frac{4{,}000\text{ mg}}{x\text{ ml}}$ (1, 2, 3, 4) cross multiply $= 8{,}000x(\text{mL}) = 8{,}0000 = 1\text{ mL/dose}$ Since the units don't match, first step is to convert from g to mg - 1 g = 1,000 mg (metric table), So 8 g = 8,000 mg! Solve for X by dividing both sides by 8,000!
DESIRED OVER HAVE FORMULA	**FORMULA:** D/H x Q = X D = desired (ordered) dose H = volume you have on hand Q = quantity X = dose to give (amount)	$\frac{4{,}000\text{ mg}}{8\text{g}} = \frac{4\ \cancel{g}}{8\ \cancel{g}} \times 2\text{ mL} = 0.5 \times 2\text{ mL} = 1\text{ mL/dose}$ (1, 2, 3, 4) Since the units don't match, first step is to convert from mg to g - 1,000 mg = 1 g (metric table), So 4,000 mg = 4 g! The grams cancel each other out!

SOLVING DOSAGE CALCULATION PROBLEMS

Most dosage calculations require a solid understanding of basic unit conversions. Without this foundational knowledge, accurate calculations are not possible. Be sure to commit these conversion tables to memory for success in both coursework and clinical practice!

CONVERSION TABLES

WEIGHT

1,000 mcg = 1 mg
1,000 mg = 1 g
30 g = 1 oz
1,000 g = 1 kg = 2.2 lbs
1 lb = 16 oz = 0.45 kg = 454 g

VOLUME

1 mL = 1 cc = 20 drops (gtt)
5 mL = 1 tsp = 1 dram
3 tsp = 15 mL = 1 tbsp
2 tbsp = 30 mL = 1 fl oz
8 fl oz = 1 cup = 240 mL
16 fl oz = 1 pint
2 pints = 1 qt
4 qt = 1 gallon = 8 pints

TIME

60 seconds = 1 min

60 mins = 1 hr

24 hours = 1 day

STANDARD TIME TO MILITARY TIME

AM: add a leading zero
4:30 AM ➔ 0430

PM: add 1200 to the standard time
9:15 PM ➔ 2115

When converting between standard time & military time, **always remove the colon.** For example, 2:30 PM becomes 1430 hours.

The following problems are solved using dimensional analysis. While this is a reliable and widely used method, it is not the only approach to dosage calculations. *Explore all three methods and choose the one that works best for your learning style and clinical accuracy!*

SIMPLE CONVERSIONS

Some problems will require multiple unit conversions before reaching the final answer (see Problem #2). Others may appear more complex than they actually are - such as Problem #3, which contains extra wording and a distractor but is ultimately just a simple conversion. Set up your conversion equations carefully so that units can be **cross-canceled diagonally**, allowing for a clear & accurate dimensional analysis.

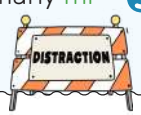
1 How many ml are in 12 oz?

1 $\frac{12\ \cancel{oz}}{1} \times \frac{30\ ml}{1\ \cancel{oz}} = 360\ ml$

2 How many mcg are in 2 g?

2 $\frac{2\ \cancel{g}}{1} \times \frac{1{,}000\ \cancel{mg}}{1\ \cancel{g}} \times \frac{1{,}000\ mcg}{1\ \cancel{mg}} = 2{,}000{,}000\ mcg$

3 The Physician orders 2L of D5 ½ NS with 40 mEq of potassium chloride over 24 hours. How many ml per hour will you program into the pump?



3 $\frac{2\ \cancel{L}}{24\ hrs} \times \frac{1{,}000\ ml}{1\ \cancel{L}} = \frac{2{,}000\ ml}{24\ hrs} = 83.\overline{33} = 83\ ml/hr$

This symbol means the three continues to repeat *infinitely*

DISTRACTOR WARNING: Many dosage calculation problems include extra information or numerical values that are not relevant to the question being asked. In this example, the contents or concentration of additives in IV fluids do not impact the calculation of the infusion rate. Focus only on the data necessary to solve the specific problem.

ROUNDING RULE

Round to nearest **whole number** in problems with an infusion pump (you can't program a pump for fractions of a ml!)

PO MEDICATIONS, IV PUSH/IV INFUSIONS, & WEIGHT-BASED MEDICATIONS

Set up your equation such that you are moving from ***what's ordered to what you've got***. You may be required to perform intermittent conversion(s) between what's ordered & your final answer. Be sure that the equation is set up so that you can ***cross cancel units diagonally*** until you are left with the units you are solving for.

PO MEDICATIONS

LIQUID MEDICATIONS

ROUNDING RULE

Oral liquid medications should be rounded to the nearest **tenth**. When administering, you can draw the dose into a syringe for accuracy and then dispense it into a medication cup for patient administration.

1 The Nurse Practitioner orders pain medication 100 mg po q 6 hrs. The bottle reads 50 mg/3ml. How many teaspoons will you administer per dose?

What's given (ordered)? 100 mg
What you've got: 50mg/3ml
What do you want to know?
How many teaspoons per dose

$$\frac{100\ \cancel{mg}}{1\ dose} \times \frac{3\ \cancel{ml}}{50\ \cancel{mg}} \times \frac{1\ tsp}{5\ \cancel{ml}} = \frac{300\ tsp}{250} = 1.2\ tsp/dose$$

Sequence: what's given (ordered) ➔ what you've got ➔ conversion ➔ answer

TABLETS

ROUNDING RULE

Tablets are rounded to the nearest half (tablets can be split in two halves)
Ex. 1.8 tablets = 2 tablets
Capsules are rounded to the nearest whole (you can't split a capsule)
Ex. 2.2 capsules = 2 capsules

2 The Physician orders a medication 0.6 mg PO BID. The medication is dispensed as tablets, 300 mcg/tab. How many tablets should be administered per dose?

What's given (ordered)? 0.6 mg
What you've got: 300 mcg tablets
What do you want to know?
How many tablets per dose

$$\frac{0.6\ \cancel{mg}}{1\ dose} \times \frac{1{,}000\ \cancel{mcg}}{1\ \cancel{mg}} \times \frac{1\ tab}{300\ \cancel{mcg}} = \frac{600\ tab}{300} = 2\ tablets/dose$$

Sequence: what's given (ordered) ➔ conversion ➔ what you've got ➔ answer

IV MEDICATIONS

IV PUSH

3 The Physician orders a medication 2 mg IV push q 2 hrs. PRN pain. The vial contains 0.6 mg/ml. How many ml will you administer per dose?

What's given (ordered)? 2 mg
What you've got: 0.6 mg/ml
What do you want to know? How many ml/dose

$$\frac{2\ \cancel{mg}}{1\ dose} \times \frac{1\ ml}{0.6\ \cancel{mg}} \times = \frac{2\ ml}{0.6} = 3.33\ ml = 3.3\ ml/dose$$

Sequence: what's given (ordered) ➔ what you've got ➔ answer

PO MEDICATIONS, IV PUSH/IV INFUSIONS, & WEIGHT-BASED MEDICATIONS

IV INFUSIONS

4 The CRNA writes an order to infuse 4L of Lactated Ringers over 24 hours. The drip factor is 20 gtts/ml. How many drops per minute will be administered?

What's given (ordered)?
4L/24 hrs

What you've got:
A drip factor of 20 gtts/ml

What do you want to know?
How many gtts/minute

$$\frac{4\ \cancel{L}}{24\ \cancel{hr}} \times \frac{1\ \cancel{hr}}{60\ \text{min}} = \frac{4\ \cancel{L}}{1{,}440\ \text{min}} \times \frac{1{,}000\ \cancel{ml}}{1\ \cancel{L}} \times \frac{20\ \text{gtts}}{1\ \cancel{ml}} = \frac{80{,}000\ \text{gtts}}{1{,}440\ \text{min}}$$

$$= 55.55 = 56\ \text{gtts/min}$$

ROUNDING RULE
Round to the nearest **whole number** for drops (you can't accurately measure ½ of a drop)

Sequence: what's given (ordered) ➔ conversion ➔ conversion ➔ what you've got ➔ answer

WEIGHT-BASED

5 The Physician orders a medication to be infused at 25 mcg/kg/min. The medication has a concentration of 500 mg in 500 ml. The patient weighs 175 lbs. What rate (ml/hr) will you set your pump at?

ROUNDING RULE
Round kg to the nearest **tenth**

What's given (ordered)?
25 mcg/kg/min, patient weighs 175 lbs

What you've got: 500 mg in 500 ml

What do you want to know?
The rate in ml/hr.

Sequence: what's given (ordered) ➔ conversion ➔ what's given (ordered) ➔ conversion ➔ what you've got ➔ conversion ➔ answer

$$\frac{175\ \cancel{lbs}}{1} \times \frac{1\ \cancel{kg}}{2.2\ \cancel{lbs}} \times \frac{25\ \cancel{mcg}/\text{min}}{1\ \cancel{kg}} \times \frac{1\ \cancel{mg}}{1{,}000\ \cancel{mcg}} \times \frac{500\ \text{ml}}{500\ \cancel{mg}} = 1.98\overline{63}\ \text{ml}$$

$$\rightarrow \frac{1.98\overline{63}\ \text{ml}}{1\ \cancel{min}} \times \frac{60\ \cancel{min}}{1\ \text{hr}} = 119.32 = 119\ \text{ml/hr}$$

ROUNDING RULE
Do not round until you reach your final answer. If you prematurely round 1.98 mL to 2 mL during the calculation, your final answer will be 120 mL/hr instead of the correct value of 119 mL/hr. Although the difference may seem minor, such discrepancies are considered incorrect on exams and could lead to dosing errors in practice.

PEDIATRIC SAFE DOSING RANGE

These types of problems should be set up as two distinct equations (one for the low threshold & one for the high threshold). The answers will give you the appropriate range.

1 The Pediatrician orders an infusion for a child that weighs 32 lbs. The safe dose range for the medication is 7-10 mcg/kg/min. What is the safe dose range for this child?

$$\frac{32\ \cancel{lbs}}{1} \times \frac{1\ \cancel{kg}}{2.2\ \cancel{lbs}} \times \frac{7\ \text{mcg/min}}{1\ \cancel{kg}} = 101.8\ \text{mcg/min}$$

ROUNDING RULE
Dose-based flow rates should be rounded to the nearest **tenth**

$$\frac{32\ \cancel{lbs}}{1} \times \frac{1\ \cancel{kg}}{2.2\ \cancel{lbs}} \times \frac{10\ \text{mcg/min}}{1\ \cancel{kg}} = 145.5\ \text{mcg/min}$$

Safe Range: 101.8 mcg/min – 145.5 mcg/min

INFUSION TIMES

FOLLOW THESE STEPS:

1. Solve for the number of hours
2. Convert the remainder into minutes
3. Add the total time to your start time

1 The PA orders 3L of Lactated Ringers at 135 ml/hr. If you start the infusion at 23:00, what time will the infusion be completed?

$$\frac{3\,\cancel{L}}{1} \times \frac{1{,}000\,\cancel{ml}}{1\,\cancel{L}} \times \frac{1\,hr}{135\,\cancel{ml}} = \frac{3{,}000\,hr}{135} = 22.2\bar{2}\,hr$$

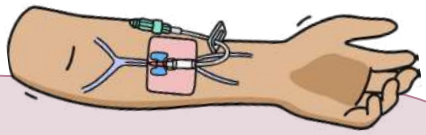
$$\frac{0.22\,\cancel{hr}}{1} \times \frac{60\,min}{1\,\cancel{hr}} = 13.2\,min = 13\,min = 22\,hrs\,13\,min$$

Add the solved number of hours to the solved number of minutes!

23:00 + 22 hrs 13 min = 21:13

IV ACCESS

PERIPHERAL LINES



PIV CATHETERS

Single lumen, flexible catheters inserted into a vein to infuse fluids, blood, medication, & nutrition

WHO CAN PLACE AN IV?

- **L**icensed **v**ocational **n**urse (**LVN**)/**l**icensed **p**ractical **n**urse (**LPN**)
- **R**egistered **n**urse (**RN**)
- **M**edical **d**octor (**MD**), **p**hysician **a**ssistant (**PA**), **n**urse **p**ractitioner (**NP**)

This varies state by state!

WHERE ARE THEY PLACED?

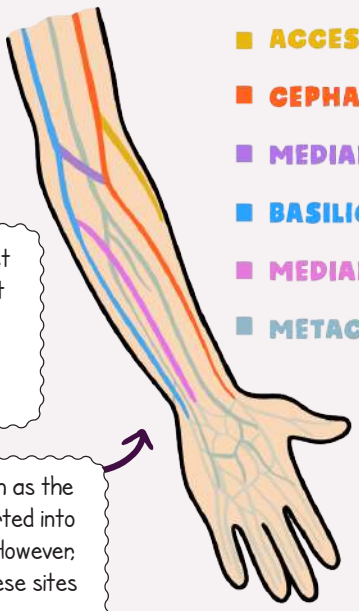
This location is usually the most comfortable for the patient

- Hand (metacarpal veins)
- Forearm (cephalic & basilic veins)
- **A**nte**c**ubital fossa (**AC**) (cephalic, basilic, accessory cephalic, median cubital veins)

The antecubital fossa is typically the easiest site to obtain IV access. However, frequent bending of the elbow can impede IV flow, making this site less ideal for patients who are agitated, laboring, or pediatric.

HOW LONG CAN THEY REMAIN IN PLACE?

- Up to 96 hours (4 days)



This list is not exhaustive – IVs can also be placed in alternative sites such as the neck, chest, legs, & feet. Additionally, ultrasound-guided IVs may be inserted into deeper upper arm vessels, including the basilic, brachial, & axillary veins. However, whenever possible, IVs should be placed in the lower arms or hands, as these sites are associated with a lower risk of complications and easier monitoring.

PIV CATHETER SIZES

IV GAUGE	USES

The lower the number, the larger the IV (diameter)!

16 GAUGE

Used in emergency & critical situations requiring rapid fluid or blood product administration:

- ✓ Trauma
- ✓ Uncontrolled hemorrhage
- ✓ Massive transfusions

18 GAUGE

Preferred for:

- ✓ Blood transfusions
- ✓ Surgical procedures
- ✓ Trauma
- ✓ Fluid resuscitation
- ✓ CT scans with contrast

(preferred gauge for optimal flow)

20 GAUGE

Versatile and commonly used in adult patients:

- ✓ Can deliver higher IV fluid rates
- ✓ IV push medications delivery
- ✓ CT scans with contrast

(acceptable if 18G not available)

22 GAUGE

Suitable for:

- ✓ Standard IV fluid administration
- ✓ IV push medication delivery

Smaller gauge IVs (22-24 gauge) are ideal for patients with small or fragile veins, such as pediatric patients, older adults, or individuals with developmental conditions (e.g. Down syndrome, cerebral palsy), where vascular access may be more challenging

24 GAUGE

Used for:

- ✓ Standard IV fluid rates
- ✓ IV push delivery

These IVs are ideal for smaller pediatric patients & neonates

MIDLINE CATHETERS

Longer single- or double-lumen IV catheter (8–12 cm) inserted into the upper arm, with the distal tip positioned near the axilla

WHO CAN PLACE A MIDLINE?

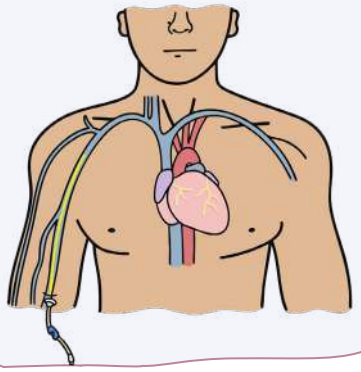
- Specially trained registered nurse (e.g. "PICC nurse")
- MD/PA/NP

WHERE ARE THEY PLACED?

- Brachial vein
- Cephalic vein

HOW LONG CAN THEY REMAIN IN PLACE?

- Up to 4 weeks



Avoid inserting IVs in limbs with:

- Arteriovenous (AV) fistulas
- A mastectomy or lymph node dissection on the same side
- Burns
- Active infections
- Tattoos

Insertion & maintenance:

- Use strict aseptic technique during IV insertion
- Date, time, & initial all IV dressings
- Change PIV sites according to hospital policy (typically every 72–96 hours)
- Use transparent dressings for easy site assessment

Monitoring:

- Assess IV sites every 4 hours for signs of phlebitis, infiltration, or infection
- Change dressings as needed per hospital protocol or when wet/soiled
- Flush IVs with 10 mL normal saline every shift or maintain a "**k**eep **v**ein **o**pen" (**KVO**) rate of approximately 5 mL/hr

When infusing a **vesicant medication** (a medication that has a high risk of causing thrombophlebitis & extravasation), the IV site should be reassessed every **1-2 hours** to monitor for signs of infiltration or tissue damage

Documentation:

- Document all PIV insertions, assessments, & interventions

CENTRAL LINES

SHORT-TERM ACCESS

NON-TUNNELED CENTRAL VENOUS CATHETER

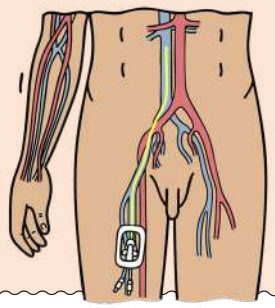
These catheters can be placed at the bedside

Long catheter inserted into a central vein and advanced into the superior vena cava, just above the right atrium

Where are they placed?

- Subclavian vein
- Internal jugular vein
- Femoral vein

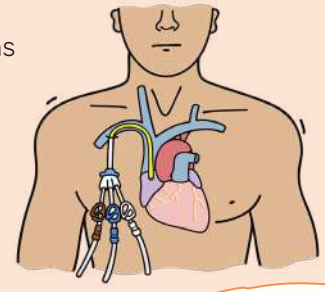
Femoral central lines carry the highest risk of infection due to the groin's proximity to areas with high bacterial colonization. This risk is especially elevated in patients who are incontinent or have compromised hygiene, as the area is warm, moist, & difficult to keep clean.



The femoral central line is an exception in terms of placement, as the catheter terminates in the inferior vena cava rather than the distal superior vena cava

Indications

- Inability to obtain peripheral access
- Safe administration of vesicant medications
  - ✓ Vasopressors
  - ✓ **T**otal **p**arenteral **n**utrition (**TPN**)
  - ✓ Concentrated potassium
  - ✓ Hypertonic saline
  - ✓ Chemotherapy
- Transvenous pacing
- Frequent blood draws

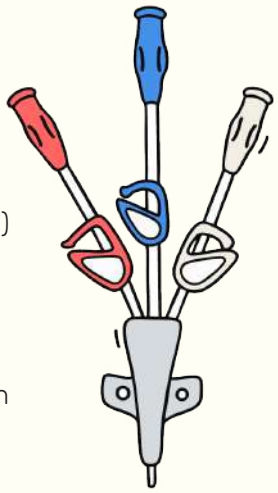


Most central lines are **double** or **triple lumen** catheters, meaning they have multiple distinct internal channels (ports) that exit at different points along the distal tip. This design allows for the **simultaneous infusion of incompatible medications** or fluids.

WHITE PORT (proximal lumen):
- ✓ Blood sampling
- ✓ Medication administration
- ✓ Blood product administration

BLUE PORT (medial lumen):
- ✓ **T**otal **p**arenteral **n**utrition (**TPN**)
- ✓ Medication administration

RED/BROWN PORT (distal lumen):
- ✓ Blood product administration
- ✓ High-volume fluid resuscitation
- ✓ Colloids
- ✓ Medication administration



DIALYSIS CATHETER

Similar to a non-tunneled CVC but dual-lumen, designed for hemodialysis:

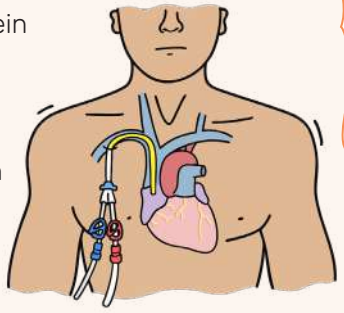
➡ **Red port:** draws blood from the patient
➡ **Blue port:** returns filtered blood to the patient

Where are they placed?

- Subclavian vein
- Internal jugular vein
- Femoral vein

Indications

Emergent dialysis in acutely ill patients



SHORT-TERM ACCESS

CORDIS CATHETER ("TRAUMA LINE")

Single-lumen, large bore, shorter than a standard CVC

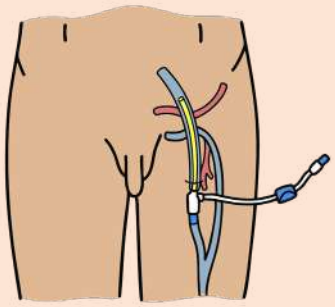
4-10 inches long

Where are they placed?

- Internal jugular vein
- Femoral vein

Indications

- Massive transfusion needs (e.g. trauma, GI bleed, surgery, DIC)
- Rapid fluid or blood product administration



SWAN-GANZ CATHETER

Specialized catheter inserted through the venous system and threaded into the pulmonary artery

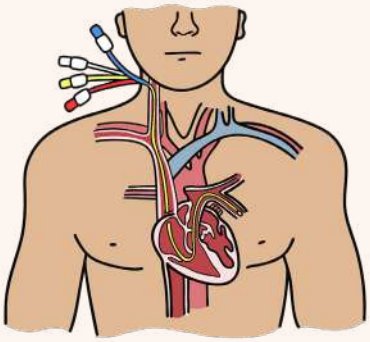
Where are they placed?

- **Internal jugular vein** MOST COMMON!
- Subclavian vein
- Femoral vein

Indications

- Severe heart failure
- Cardiogenic shock
- Pulmonary hypertension

Monitors cardiac function, hemodynamics, & pulmonary pressures



LONG-TERM ACCESS

TUNNELED CENTRAL VENOUS CATHETER

Similar to a non-tunneled CVC, but tunneled under the skin through the subcutaneous tissue before entering the vein:

➡ **Tunneling** increases the distance pathogens must travel, reducing infection risk

➡ **Dacron cuff** at the exit site encourages tissue growth to anchor the catheter and prevent dislodgement

Where are they placed?

- Internal jugular vein
- Subclavian vein

Indications

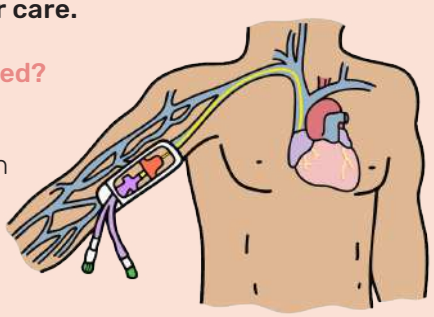
- Long-term administration of:
  - ✓ Antibiotics or antifungals
  - ✓ Chemotherapy
  - ✓ TPN

PERIPHERALLY INSERTED CENTRAL CATHETER (PICC)

A single or double-lumen catheter inserted into a peripheral arm vein and advanced into the superior vena cava. This line can remain in place up to 6 months with proper care.

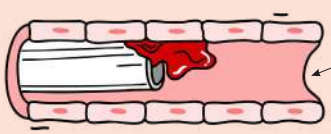
Where are they placed?

- Brachial vein
- Median cubital vein
- Basilic vein
- Cephalic vein



Indications

- Difficult peripheral access
- Long-term administration of:
  - ✓ Fluids
  - ✓ Antibiotics or antifungals
  - ✓ Chemotherapy
  - ✓ TPN

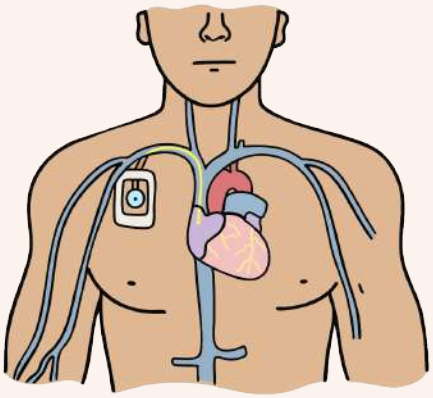


PICC lines carry the **highest risk of catheter-associated thrombosis** among central lines. Their smaller diameter & placement in peripheral veins increase the likelihood of venous stasis & clot formation.

LONG-TERM ACCESS

PORT-A-CATH

A small, subcutaneously implanted reservoir (port) connected to a catheter that terminates in the superior vena cava



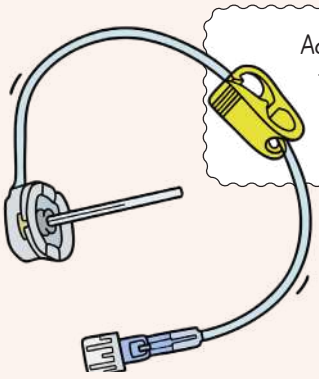
Where are they placed?

- Typically placed in the right upper chest with the catheter threaded into the superior vena cava

> Port-a-caths can also be placed via the internal jugular vein or, less commonly, the femoral vein if there are contraindications to traditional chest placement

Indications

- **Chemotherapy** — MOST COMMON!
- TPN
- Long-term antibiotic or antifungal therapy



> Access requires the use of a Huber-point needle

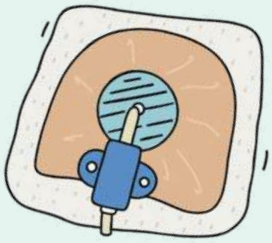
NURSING CARE

CARE OF THE CENTRAL VENOUS CATHTER

- Always verify correct catheter placement with a chest X-ray prior to initial use of any newly inserted central line

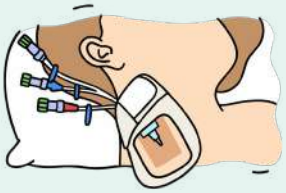
> Central lines placed in the femoral vein do not require any imaging to confirm placement

- Change the central line dressing and antimicrobial pad (e.g. *BioPatch or Tegaderm CHG*) at least once per week and any time it becomes soiled, loose, or wet



> Use **sterile technique** when changing a central line dressing!

- When not in use, cover all ports with antimicrobial-impregnated caps (e.g. *Curos caps*) to reduce infection risk



- Assess patency of each port at least once per shift
- Regularly inspect the insertion site and surrounding skin for signs of infection, including redness, swelling, warmth, or purulent drainage

CENTRAL VENOUS CATHETER REMOVAL

- Place the patient in a supine position with the head of bed flat
- Instruct the patient to take a deep breath and perform the Valsalva maneuver (bear down as if having a bowel movement) while the catheter is being withdrawn

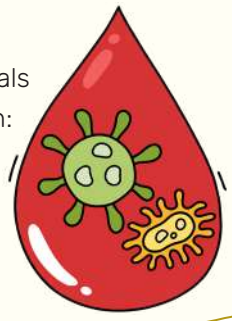
> This technique reduces the risk of an air embolism

- After removal, apply sterile gauze and firm pressure at the insertion site until bleeding stops
- Inspect the catheter tip to ensure it is intact; send the catheter for culture if infection is suspected

CLABSI: CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTION

Patients with central lines are at increased risk for **CLABSI**, which occurs when microorganisms enter the bloodstream through the catheter. To reduce this risk, most hospitals implement **CLABSI bundles** - standardized care protocols that focus on infection prevention:

- Frequent assessments
- Aseptic technique/hand hygiene
- Scrubbing the hub for 20-30 seconds
- Application of proper skin barriers
- Prompt removal
- Selection of low-risk sites



IV THERAPY: AN OVERVIEW

PHYSIOLOGICAL OVERVIEW

BODY FLUID COMPARTMENTS

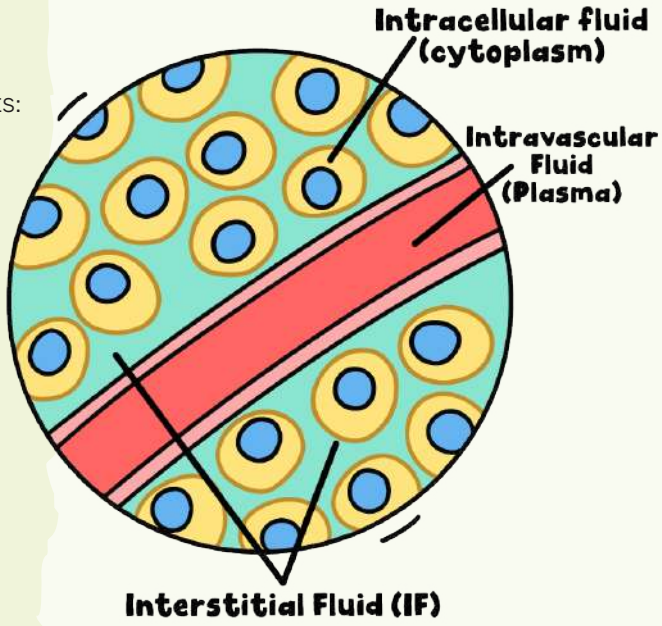
- The human body is approximately **60% water**
- Total body water is divided into two main compartments:

Intracellular fluid (ICF)

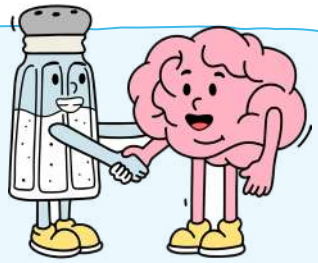
- Fluid located **inside the cells** ("cytoplasm")
- Accounts for about two-thirds of total body water

Extracellular fluid (ECF)

- Fluid located **outside the cells**
- Composed of:
  - ✓ Interstitial fluid: fluid between cells and outside blood vessels
  - ✓ Intravascular fluid: fluid within blood vessels (plasma)



SODIUM AS A KEY SOLUTE



IN NURSING PRACTICE, SODIUM IS A CRITICAL SOLUTE TO MONITOR BECAUSE IT HEAVILY INFLUENCES FLUID SHIFTS AND PATIENT MANAGEMENT

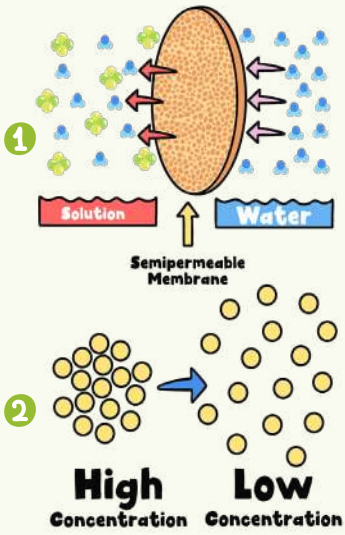
- *Example:* Patients at risk for **increased intracranial pressure (ICP)** may receive **hypertonic saline** (e.g. 3% or 2% sodium chloride)
- The high sodium concentration in the **intravascular space** pulls water out of the cells and interstitial fluid by osmosis, reducing brain swelling & ICP
- A diuretic like **mannitol** is then used to help the body eliminate the excess fluid through urination, further lowering intracranial pressure

OSMOSIS, DIFFUSION, & HOMEOSTASIS

➡ The body strives to maintain **homeostasis**, a balanced internal environment. Body fluids are separated by **semipermeable membranes** that allow **solutes** (like sodium) & **solvents** (water) to move between compartments based on **osmotic gradients**. Changes in solute concentrations drive the movement of fluids & solutes back and forth to maintain balance.

These movements happen through two key processes:

1. **Osmosis:** water (the solvent) moves across the membrane toward the area with a **higher solute concentration** to balance concentrations
2. **Diffusion:** solutes move from an area of **higher concentration** to an area of **lower concentration** until equilibrium is reached



IV THERAPY

IV FLUIDS

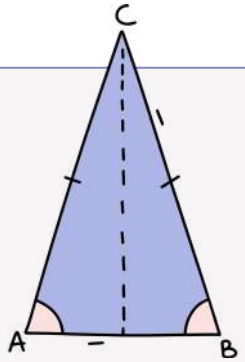
➡ Solutions infused directly into a vein via an IV catheter to provide hydration, increase fluid volume, or replace electrolytes/calories

Always inspect the IV fluid bag **before administration**:

- ✔ Check the **expiration date**
- ✔ Ensure the bag is **intact** with no leaks or punctures
- ✔ Gently squeeze the bag to check for any leaks - any compromise can affect sterility & patient safety

CRYSTALLOIDS

ISOTONIC FLUIDS



MEMORY TRICK

THINK ISOTONIC FLUIDS HAVE AN *EQUAL NUMBER* OF DISSOLVED SOLUTES AS BLOOD LIKE AN ISOSCELES TRIANGLE HAS *TWO EQUAL SIDES*

▶ Same solute concentration as blood (same osmolality)

▶ Do not draw fluid from inside cells; remain mostly in intravascular space (volume expanders)

A general rule of thumb is to **avoid** giving crystalloids to patients with volume overload, heart failure, pulmonary edema, or kidney failure

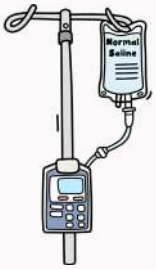
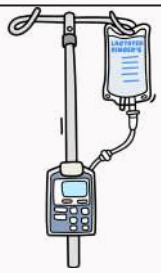
No change in the cell's shape or volume

NURSING CARE

- Monitor for fluid overload signs: crackles, hypertension, bounding pulses, JVD, peripheral edema
- Check electrolytes, I&Os, & daily weights

ISOTONIC FLUIDS

COMMON ISOTONIC FLUIDS

FLUID	INDICATIONS	CAUTION
Normal saline - 0.9% (NS)   Normal saline is the only intravenous fluid considered compatible with blood products. This is because using other fluids, such as Lactated Ringer's or dextrose solutions, with blood can increase the risk of clot formation or hemolysis.	Dehydration, mild hyponatremia, ECF losses (vomiting, diarrhea, burns, bleeding)	▶ Edema (low albumin), volume overload These are not absolute. In acute emergencies, a Provider may still order fluids that are typically avoided if the potential benefits outweigh the risks. For example, hypertonic saline might be administered to a patient with a traumatic brain injury despite elevated sodium levels. Whenever there is uncertainty, it is important to seek clarification to ensure safe & appropriate patient care. Without sufficient albumin, there is no oncotic pressure to "hold" the fluid in the intravascular space. Giving NS will cause more fluid to leak into the tissue & make the edema worse.
Lactated ringer's (LR) 	Hypovolemia (hemorrhage, burns, sepsis), metabolic acidosis	▶ Lactic acidosis ▶ Liver failure ▶ Hyperkalemia ▶ Alkalosis

HYPERTONIC FLUIDS

MEMORY TRICK

HYPERTONIC FLUIDS CAUSE THE CELLS TO DIMINISH IN SIZE LIKE A HYPER PERSON WHO CONSTANTLY EXERCISES

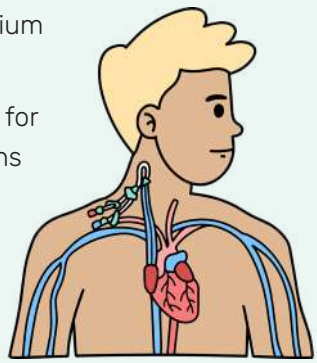
▶ **Higher solute concentration than blood** (greater osmolality)

▶ **Draw water out of cells** into intravascular space

Cells lose volume & shrink

NURSING CARE

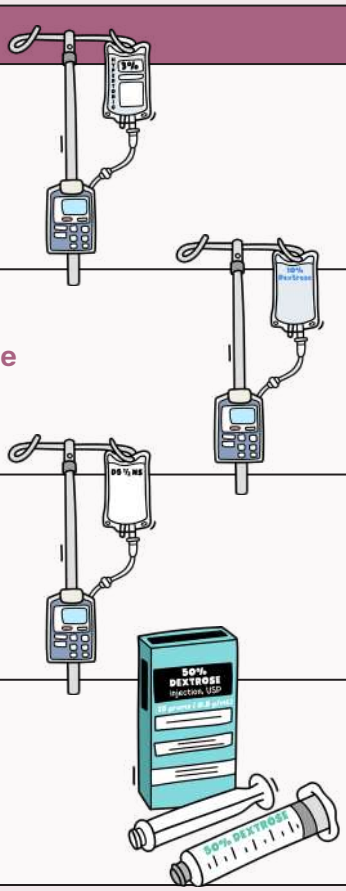
- Monitor fluid overload (same as isotonic)
- Monitor labs: sodium (3% NaCl), glucose & potassium (dextrose fluids)
- Use a central line for high-rate infusions (risk of phlebitis & extravasation)



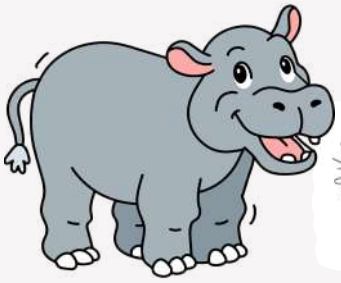
HYPERTONIC FLUIDS

COMMON HYPERTONIC FLUIDS

FLUID	INDICATIONS	CAUTION
3% NaCl	Cerebral edema, ↑ ICP, severe hyponatremia	▶ Hypernatremia ▶ Fluid retention
10% Dextrose (D10W)	Hypoglycemia, dehydration, calorie source	▶ Hyperglycemia ▶ Hypokalemia
D5 ½ Normal saline	Sodium/chloride replacement & calories	▶ Hyperglycemia ▶ Hypokalemia
Dextrose 50% (D50)	Acute hypoglycemia (blood glucose < 70 mg/dL)	▶ Hyperglycemia



HYPOTONIC FLUIDS

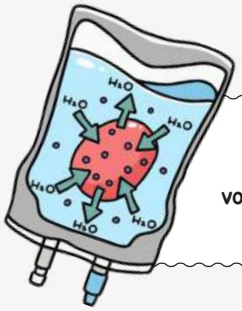


MEMORY TRICK

HYPOTONIC FLUID CAUSES THE CELLS TO ENLARGE & GET FAT LIKE A HIPPO!

▶ **Lower solute concentration than blood** (lower osmolality)

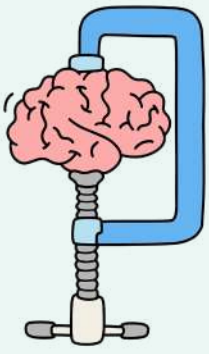
▶ Water moves **from the intravascular space into the cells**



Cells gain volume & swell

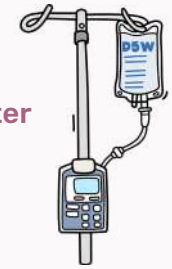
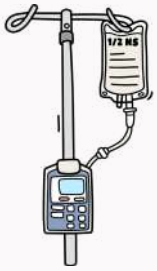
NURSING CARE

- Monitor for fluid deficit (extracellular to intracellular fluid shifts)
- Perform neuro checks (risk cerebral edema)
- Check contraindications (↑ ICP risk)
- Avoid rapid infusion



HYPOTONIC FLUIDS

COMMON HYPOTONIC FLUIDS

FLUID	INDICATIONS	CAUTION
Dextrose 5% in water (D5W) 	Dehydration, hypernatremia, hypoglycemia D5W initially functions as an **isotonic** solution. However, once it enters the bloodstream, the dextrose is rapidly metabolized by the body, leaving behind free water. This free water behaves as a **hypotonic fluid**, moving into cells and causing them to swell. Because of this physiological effect, D5W is treated as a hypotonic solution in clinical practice.	▶ Risk for ↑ ICP ▶ Hyperglycemia ▶ Hypokalemia ▶ Worsens hyponatremia Do not give to patients with liver disease or burns, as this can worsen hyponatremia
0.45% Sodium chloride (½ NS) 	D5W has a lower osmolality than intracellular fluid, which allows it to cross the semi-permeable membranes of brain cells. Once inside, the free water increases the intracellular fluid volume, causing the cells to swell. As these brain cells swell, the overall volume within the rigid skull increases, which can lead to elevated intracranial pressure. Fluid replacement for hypernatremia If your saline solution is less the 0.9%, you have a hypotonic fluid! Other less common examples of hypotonic saline solutions are 0.33% sodium chloride & 0.225% sodium chloride.	▶ Hyponatremia

COLLOIDS

➡ **Contain larger molecules, remain in intravascular space longer**

➡ **Used for volume expansion in refractory shock patients**

Colloids are considered a second line of defense after typical IV fluids due to their inherent risks, which include allergic reactions, coagulopathy, and potential kidney injury. While they are effective at expanding intravascular volume and are used in specific clinical situations (such as severe hypoalbuminemia or refractory shock), they are generally reserved for cases where crystalloids are not sufficient or appropriate.

COMMON COLLOIDS

FLUID	INDICATIONS	CAUTION
Dextran 	Fluid resuscitation (burns, trauma, GI bleed), improve circulation in peripheral vascular disease	▶ Thrombocytopenia, increased bleeding risk
Hydroxyethyl starch (Hetastarch) 	Last resort fluid resuscitation	▶ Coagulopathy, CHF, renal failure, liver disease

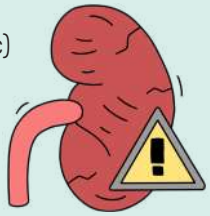
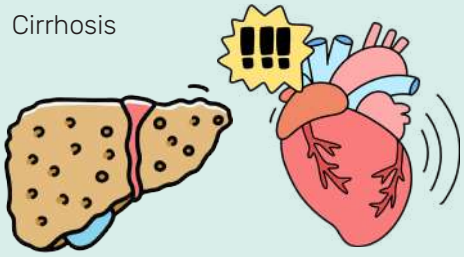
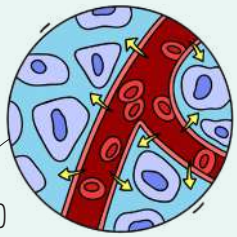
COMMON COLLOIDS

FLUID	INDICATIONS	CAUTION
Albumin (5% & 25%) 	Hypoalbuminemia (pancreatitis, cirrhosis, nephrotic syndrome), hypotension, edema, burns	▶ CHF ▶ Fluid overload ▶ Renal failure 

Albumin is a protein synthesized by the liver that plays a crucial role in maintaining oncotic pressure within the blood vessels. Oncotic pressure is the pulling force exerted by proteins like albumin to keep fluid within the intravascular space. When albumin levels are low, this pressure decreases, leading to fluid leaking out of the vessels and into the surrounding tissues - a phenomenon known as "third spacing." This can result in significant edema and fluid imbalances. Albumin administration is often used therapeutically to restore oncotic pressure and reduce third spacing in conditions such as liver disease, nephrotic syndrome, or severe inflammation (pancreatitis).

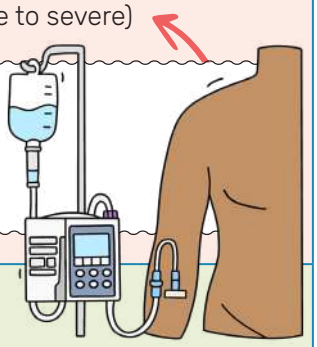
When administering albumin, it is important to hold ACE inhibitors for 24 hours prior to infusion. The interaction between albumin & ACE inhibitors can lead to elevated bradykinin levels, which may cause dangerous hypotension.

HYPERVOLEMIA VS. HYPOVOLEMIA

	HYPERVOLEMIA	HYPOVOLEMIA
OTHER NAMES	✓ "Fluid overload" ✓ "Volume overload" ✓ "Fluid volume excess" ✓ "Overhydration" ✓ "Water intoxication" 	✓ "Fluid deficit" ✓ "Volume depletion" ✓ "Fluid volume deficit" ✓ "Dehydration" 
WHAT IS IT?	**Too much fluid** in the blood	**Too little fluid** in the blood
CAUSES	MOST COMMON! ✓ **Kidney failure** ✓ Excessive IV fluids (isotonic/hypertonic) ✓ Heart failure ✓ Pregnancy ✓ Nephrotic syndrome ✓ Cirrhosis  	MOST COMMON! ✓ **Bleeding/hemorrhage (internal or external)** ✓ Surgical loss ✓ GI loss (emesis, diarrhea, ostomies) ✓ Dehydraton ✓ Diuresis (diuretics, diabetes mellitus, diabetes insipidus) Patients with DI can urinate over 15L of fluid per day! ✓ Exessive output (NG/OG tubes, drains) ✓ Insensible loss (tachypnea, diaphoresis) Water loss that can't be measured ✓ Third spacing (sepsis, burns, ascites) 

	HYPERVOLEMIA	HYPOVOLEMIA
S&S	**H**eadache **Y**awn (drowsiness) **P**ulse bounding **E**dema (dependent, pitting) **R**espiratory (dyspnea) **V**eins distended (JVD) **O**uch (swollen abdomen with cramps) **L**ungs (crackles, rhonchi) **E**levated CVP **M**ore weight (rapid gain) **I**ncreased BP & HR **A**ltered LOC (confusion) MOST COMMON! MEMORY TIP	**H**ypotension **Y**ellow (concentrated, dark urine) **P**arched (thirsty), **P**ulse (rapid & weak) **O**ut of it (altered mental status) **V**ery dry skin - ↓ skin turgor ("tenting") **O**liguria **L**ow CVP **E**xcessive fatigue, lethargy **M**ucous membranes dry **I**ncreased respiratory rate **A**nxious MEMORY TIP CVP = Central venous pressure
LABS	↓ Serum osmolality ↓ Urine specific gravity ↓ Hgb & Hct ↓ BUN ↓ Na MEMORY TRICK WHEN THE BLOOD IS DILUTED, THE LAB VALUES ARE DECREASED	↑ Serum osmolality ↑ Urine specific gravity ↑ Hgb & Hct ↑ BUN ↑ Na MEMORY TRICK WHEN THE BLOOD IS CONCENTRATED, THE LAB VALUES CLIMB
TREATMENT	✓ Diuretics ✓ Sodium/fluid restrictions ✓ Dialysis or paracentesis (if critical)	✓ PO fluids (mild) ✓ Blood product administration (if indicated) ✓ IV rehydration (moderate to severe)
NURSING CARE	• Measure daily weights • Maintain strict I&Os • Monitor labs closely (especially Na) • Implement safety measures for the confused patient ✓ Utilize a sitter ✓ Move patient closer to the nurses' station ✓ Set a bed alarm	

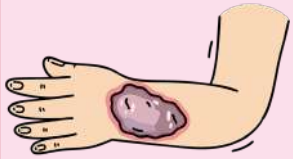
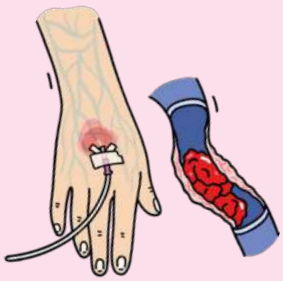
Critical sodium imbalances (hypernatremia or hyponatremia) must be corrected **slowly over 12-48 hours** to prevent **osmotic demyelination syndrome (ODS)**, a potentially fatal condition caused by rapid fluid shifts in the brain. Gradual correction with IV fluids or diuretics and **frequent sodium monitoring** is essential to avoid serious neurological damage.



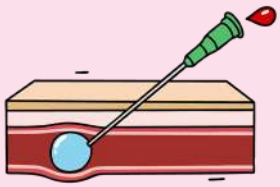
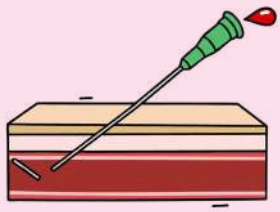
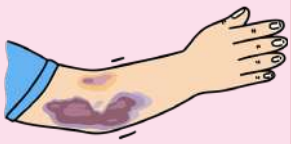
Daily weights can help provide a trend related to the patient's fluid status. Consistent weight gain indicates worsening fluid overload, while weight loss can indicate a worsening fluid deficit.

	HYPERVOLEMIA	HYPOVOLEMIA
NURSING CARE	• Elevate the HOB • Assess lung sounds frequently • Monitor sodium in medications & IV fluids	• Take orthostatic vitals • Assist with position changes • Monitor response to fluids

COMPLICATIONS

COMPLICATION	WHAT IS IT?	S&S	INTERVENTIONS/TREATMENT	PREVENTION TIPS
INFILTRATION 	▶ Non-vesicant IV fluid leaks into surrounding tissue	✓ Local swelling ✓ Cool, taut skin ✓ Pain at or around site ✓ Sluggish or painful flushing	✓ Stop infusion & remove IV ✓ Elevate limb ✓ Apply warm or cold compress	✓ Regular IV site checks ✓ Secure IV properly ✓ Monitor during & after medication administration
EXTRAVASATION 	▶ Vesicant fluid leaks into tissue, causing potential tissue damage	✓ Burning or stinging ✓ Redness, swelling ✓ Blistering or skin necrosis	✓ Stop infusion immediately ✓ Aspirate residual drug ✓ Remove IV ✓ Elevate limb ✓ Cold compress (initially), warm after 24 hrs (if indicated)	✓ Monitor site frequently ✓ Use central line for vesicants ✓ Know which medications are vesicants
PHLEBITIS/ THROMBOPHLEBITIS 	▶ Inflammation of the vein (phlebitis = superficial; thrombophlebitis = deep vein involvement)	✓ Redness, pain, warmth along vein ✓ Vein feels hard or "cord-like" ✓ Swelling	✓ Discontinue IV ✓ Elevate limb ✓ Warm compress ✓ Culture site if needed	✓ Minimize site trauma ✓ Avoid joints and small veins ✓ Use ultrasound guidance when trained ✓ Advocate for central access when needed

Medications that commonly cause phlebitis:
Glucose solutions, potassium infusions, mannitol, vancomycin, erythromycin, diazepam, digoxin

COMPLICATION	WHAT IS IT?	S&S	INTERVENTIONS/TREATMENT	PREVENTION TIPS
AIR EMBOLUS 	▶ Air enters venous system, potentially blocking blood flow	✔ Sudden SOB ✔ Chest pain ✔ Hypotension ✔ Altered mental status ✔ Dysrhythmia or stroke-like symptoms An air embolus may either resolve harmlessly or cause serious harm if it lodges and blocks blood flow. Its signs and symptoms can resemble those of other embolic events, such as myocardial infarction, stroke, or pulmonary embolism.	✔ Administer 100% oxygen ✔ Place in **left lateral Trendelenburg** ✔ Prepare for possible resuscitation Known as the **Durant maneuver** - helps prevent an air embolus from moving from the right side of the heart into the pulmonary arteries Hyperbaric oxygen therapy can also be used to shrink the size of the air embolus, thereby reducing the risk of impaired blood flow to tissues	✔ Remove air from syringes & tubing ✔ Use air-eliminating filters when required ✔ Clamp lines when not in use
CATHETER EMBOLUS 	▶ Piece of catheter breaks off and enters bloodstream	✔ Sudden pain along vein ✔ Cyanosis ✔ SOB, cough ✔ Weak pulse, hypotension	✔ Apply tourniquet proximally ✔ Notify Provider ✔ Imaging (US, CT) ✔ Prep for surgical retrieval	✔ Never reinsert needle into catheter after it has been deployed ✔ Inspect catheter tip after removal
HEMATOMA 	▶ Blood collects under skin due to vein trauma	✔ Bruising or discoloration ✔ Swelling or firmness ✔ Localized pain	✔ Remove IV ✔ Apply firm pressure for 4 -5 mins ✔ Elevate limb ✔ Apply cold pack	✔ Use proper technique after "flash" of blood ✔ Avoid veins prone to rupture ✔ Assess coagulation status prior to IV insertion
INFECTION (LOCAL/SYSTEMIC) 	▶ Local or systemic infection from IV or insertion site	✔ Local: redness, swelling, tenderness ✔ Systemic: fever, chills, malaise, tachycardia	✔ Remove IV ✔ Culture site &/or tip ✔ Administer antibiotics as ordered	✔ Use aseptic technique ✔ Change dressings per protocol ✔ Remove IV when no longer needed ✔ Educate patient not to manipulate site

OXYGENATION

KEY CONCEPTS & PHYSIOLOGY

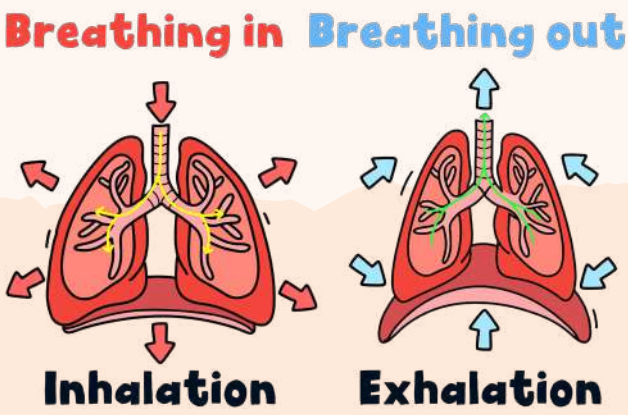
WHAT IS IT?

The process by which **oxygen is taken in from the environment, exchanged for carbon dioxide in the lungs, and transported through the bloodstream to body tissues** for cellular respiration

VENTILATION (BREATHING MECHANICS)

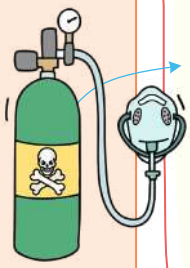
Inhalation (inspiration):

- Diaphragm & intercostal muscles contract
- Ribcage expands, increasing thoracic cavity volume
- Negative pressure created, drawing air into the lungs



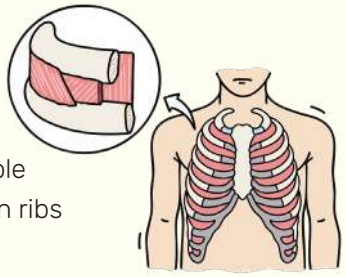
Exhalation (expiration):

- Diaphragm & intercostal muscles relax
- Ribcage returns to resting position, reducing thoracic cavity volume
- Positive pressure pushes carbon dioxide-rich air out of the lungs



KEY CONCEPTS

ACCESSORY MUSCLE USE/INTERCOSTAL RETRACTIONS: activation of muscles not typically used in normal breathing (e.g. sternocleidomastoid, scalene, intercostals); visible retractions of skin between ribs during labored breathing



APNEA: temporary absence of breathing

DYSPNEA: difficulty or labored breathing (shortness of breath)

DYSPNEA ON EXERTION: SOB triggered by physical exertion

HYPERCAPNIA: elevated carbon dioxide levels in the blood

HYPERVENTILATION: rapid breathing leading to decreased carbon dioxide levels

Breathing too quickly leads to excessive loss of carbon dioxide (CO_2), while breathing too slowly or shallowly results in CO_2 buildup in the body

HYPOVENTILATION: slow or shallow breathing causing carbon dioxide retention

HYPOXEMIA: low oxygen in arterial blood

Hypoxemia is a primary cause of hypoxia because oxygen must first be present in the blood to reach the tissues!

HYPOXIA: insufficient oxygen delivery to tissues

ORTHOPNEA: difficulty breathing when lying flat, relieved by sitting up

OXYGEN TOXICITY: damage caused by excessive supplemental oxygen

S&S
- Cough
- Muscle twitching
- Throat irritation
- Blurred vision
- Chest pain
- Headache
- Nausea/vomiting

PAROXYSMAL NOCTURNAL DYSPNEA: sudden episodes of SOB during sleep causing awakening

Most commonly occurs with congestive heart failure

HYPOXIA

EARLY HYPOXIA

Everything goes up ↑

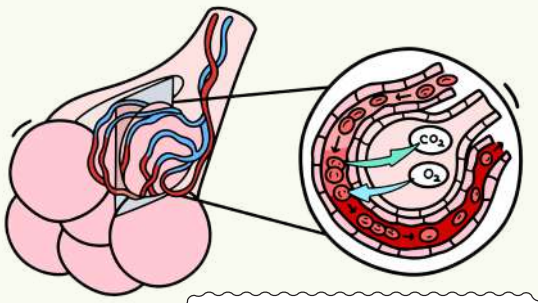
- ↑ Restlessness & anxiety
- ↑ Respiratory rate
- ↑ Heart rate
- ↑ Blood pressure
- ↑ Vasoconstriction (pallor)

LATE HYPOXIA

Everything goes down ↓

- ↓ Level of consciousness (coma)
- ↓ Respiratory rate
- ↓ Heart rate
- ↓ Blood pressure
- ↓ O_2 saturation of hemoglobin (cyanosis)

GAS EXCHANGE



The thin layer of tissue between the alveoli & the capillaries

DIFFUSION: movement of oxygen across the alveolar-capillary membrane into the blood, and carbon dioxide out of the blood into the alveoli

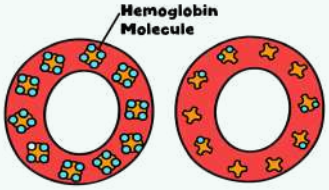
PERFUSION: blood flow through pulmonary capillaries surrounding the alveoli, ensuring continuous delivery of deoxygenated blood for oxygenation

Remember: **diffusion** follows a concentration gradient - molecules move from an area of higher concentration to an area of lower concentration. In the **lungs**, oxygen (O_2) is more concentrated in the **alveoli** than in the surrounding **capillaries**, so it diffuses **into the blood**. Conversely, carbon dioxide (CO_2) is more concentrated in the **capillaries** than in the **alveoli**, so it diffuses **into the lungs** to be exhaled.

PHYSIOLOGICAL BARRIERS TO EFFECTIVE OXYGENATION

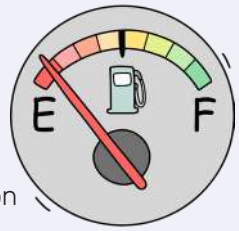
➡ **Reduced oxygen-carrying capacity** ➔ conditions that impair the blood's ability to transport oxygen

- **Anemia**: low hemoglobin levels reduce oxygen delivery
- **Carbon monoxide poisoning:** CO binds to hemoglobin more effectively than oxygen
- **Abnormal hemoglobin:** impairs oxygen binding & delivery (e.g. sickle cell disease)



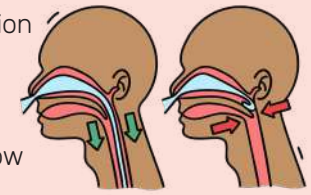
➡ **Hypovolemia (decreased blood volume)** ➔ reduced circulating volume limits oxygen delivery to tissues

- **Hemorrhage:** blood loss reduces both volume & oxygen-carrying capacity
- **Dehydration:** low fluid volume reduces perfusion & oxygen delivery
- **Excessive vomiting or diarrhea:** leads to fluid loss and decreased circulation



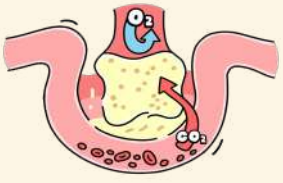
➡ **Reduced inspired oxygen (airway obstruction)** ➔ obstruction prevents oxygen from reaching the lungs

- **Foreign body:** physical blockage of the airway
- **Airway trauma:** swelling or damage from injury
- **Anaphylaxis:** severe allergic reaction causing airway swelling & narrowing
- **Tongue displacement:** often in unconscious patients, blocking airflow



➡ **Pulmonary conditions affecting gas exchange** ➔ diseases that impair alveolar-capillary gas transfer

- **Pneumonia:** inflammatory fluid in the alveoli impairs diffusion
- **Acute respiratory distress syndrome (ARDS):** alveolar damage reduces gas exchange
- **Pulmonary fibrosis:** stiffening of lung tissue limits diffusion capacity
- **Chronic obstructive pulmonary disease (COPD):** chronic airway inflammation & obstruction

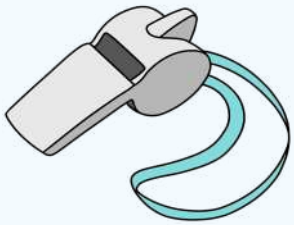


OXYGENATION IN PRACTICE

BREATHING PATTERNS

PATTERN	DESCRIPTION
EUPNEA 	Normal breathing: **10–20 breaths per minute**, regular depth & rhythm
BRADYPNEA 	Abnormally **slow breathing: < 10 breaths per minute**
TACHYPNEA 	Abnormally **fast breathing: > 20 breaths per minute**, shallow
HYPERPNEA 	**Deep, regular** breathing at a **normal rate** (10–20 breaths/min)
KUSSMAUL 	**Rapid, deep, & labored** breathing (often **> 20 breaths/min**); seen in metabolic acidosis (e.g. DKA)
ATAXIC/BIOT'S 	**Completely irregular** breathing with unpredictable rate & depth; may include apnea
CHEYNE-STOKES 	**Crescendo-decrescendo** pattern with gradually deeper breaths followed by periods of **apnea**
APNEUSTIC 	**Prolonged inspiratory** phase followed by prolonged expiration; indicates brainstem damage
AGONAL 	**Gasping, irregular, ineffective** breaths; often a sign of impending death

ABNORMAL LUNG SOUNDS

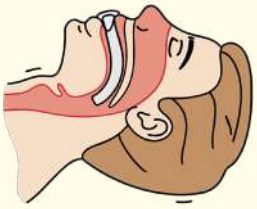
LUNG SOUND	PHASE	SOUNDS LIKE	CAUSE	ASSOCIATED CONDITIONS
COARSE CRACKLES ("RALES") 	▶ Early inspiratory phase	▶ Pulling Velcro apart	▶ Excess fluid or mucus in the airways	▶ Pulmonary edema, pneumonia, chronic bronchitis
FINE CRACKLES 	▶ Late inspiratory phase	▶ Pouring milk over Rice Krispies	▶ Alveoli or small airways popping open due to fluid	▶ Pulmonary fibrosis, pneumonia, early pulmonary edema
PLEURAL FRICTION RUB 	▶ Inspiration & expiration	▶ Walking on fresh snow	▶ Inflamed pleural surfaces rubbing together (↓ pleural fluid)	▶ Pleuritis, pleurisy
WHEEZE 	▶ Typically expiration (can occur during inspiration)	▶ High-pitched, musical "whistling"	▶ Air moving through narrowed or constricted airways	▶ Asthma, COPD, bronchospasm
RHONCHI 	▶ Primarily expiration	▶ Snoring or gurgling	▶ Air passing through large airways with secretions	▶ COPD, pneumonia, bronchitis, cystic fibrosis
STRIDOR 	▶ Often heard without stethoscope	▶ High-pitched, harsh "musical" sound	▶ Upper airway obstruction	▶ Croup, epiglottitis, foreign body aspiration

AIRWAY ADJUNCTS

WHAT ARE THEY?

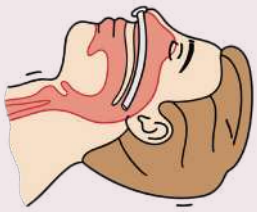
Medical devices used to help **maintain an open (patent) airway** in patients who are **unable to maintain it independently**

OROPHARYNGEAL AIRWAY (OPA)



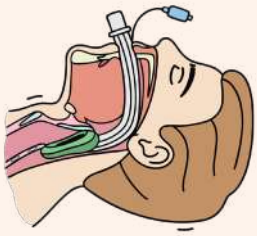
- Rigid, curved plastic device inserted into the mouth
- Used for **unconscious patients only** - prevents the tongue from obstructing the airway
- Contraindicated in conscious or semi-conscious patients (may trigger gag reflex)

NASOPHARYNGEAL AIRWAY (NPA)



- Soft, flexible tube inserted into a nostril
- Used for **conscious or semi-conscious patients** - improves airflow when oral access is not possible
- Preferred in patients with an intact gag reflex or **trismus** (jaw clenched shut)

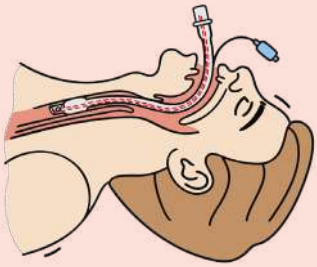
LARYNGEAL MASK AIRWAY (LMA)



- A supraglottic airway device that sits above the vocal cords and seals around the laryngeal inlet
- Typically used in **unconscious patients** for short-term airway management during procedures or in emergencies when intubation is not possible

An LMA is typically replaced by an endotracheal tube, which offers more definitive protection of the airway

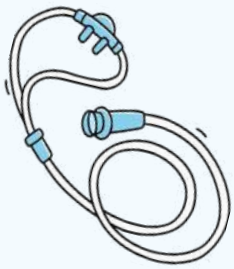
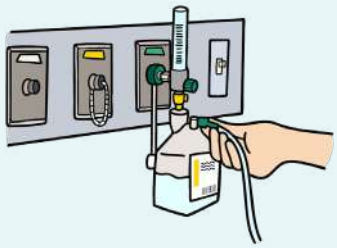
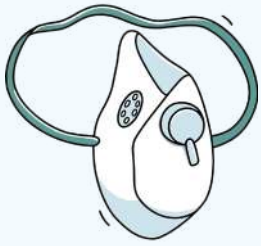
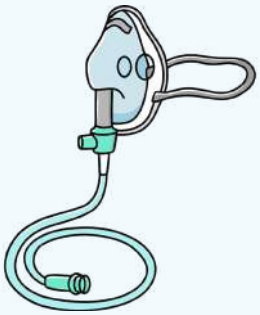
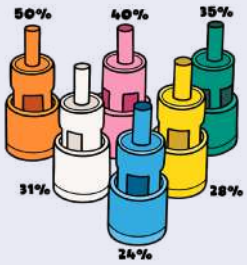
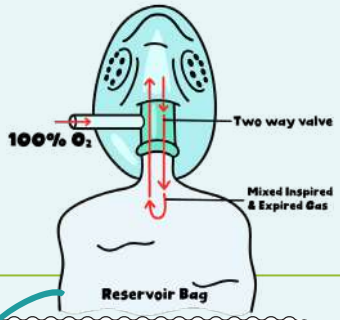
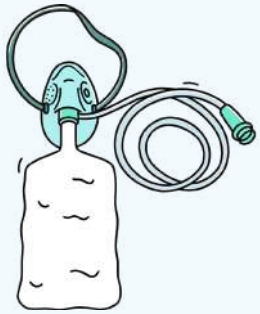
ENDOTRACHEAL TUBE (ETT)



- Flexible tube inserted through the vocal cords into the trachea
- Provides a **definitive airway** and is used for mechanical ventilation, respiratory failure, or airway protection in **unconscious or critically ill patients**

An ET tube can be passed through the mouth or the nose

OXYGEN THERAPY

DEVICE	O_2 CONCENTRATION (FIO_2) & FLOW RATE	INDICATIONS	RISKS/ COMPLICATIONS	NURSING CONSIDERATIONS
NASAL CANNULA 	**24–44% (1–6 L/min)**	✔ Mild O_2 need ✔ COPD ✔ Pneumonia ✔ Heart failure	✔ Dry mucosa, epistaxis ✔ Skin breakdown ✔ Easily dislodged	✔ Assess skin & prong patency ✔ Humidify if > 4 L/min 
SIMPLE FACE MASK 	**40–60% (5–8 L/min)**	✔ Alternative for mouth breathers	✔ Claustrophobia ✔ Can't eat/drink while in use	✔ Ensure full coverage of nose & mouth ✔ Monitor skin
VENTURI MASK 	**24–50% (4–12 L/min)**	✔ COPD exacerbation needing precise O_2 delivery 	✔ Bulky, uncomfortable ✔ Reduced efficacy if loose fit	✔ Use correct diluter ✔ Ensure tight fit ✔ Monitor skin 
PARTIAL REBREATHER 	**40–70% (10–15 L/min)**	✔ Bridge before BiPAP or intubation	✔ CO_2 retention if flow too low ✔ General mask discomfort	✔ Flow ≥ 10 L/min ✔ Prevent bag collapse ✔ Snug fit

Before using any device that delivers oxygen via the nose, first assess to ensure the nares are patent

The Venturi mask utilizes color-coded diluter attachments to deliver a precise concentration of oxygen

The partial rebreather utilizes a **two-way valve**, allowing the patient to rebreathe a small portion of their exhaled carbon dioxide

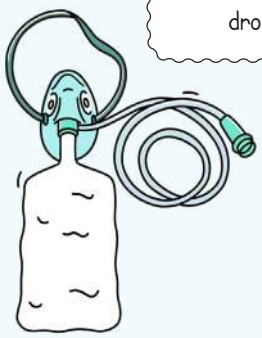
Pros: reduces the risk of suffocation associated with one-way valves used in non-rebreather masks

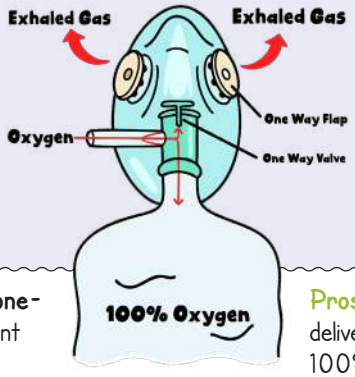
Cons: delivers a lower concentration of oxygen due to the rebreathing of exhaled gases

OXYGEN THERAPY

DEVICE	O_2 CONCENTRATION (FIO_2) & FLOW RATE	INDICATIONS	RISKS/ COMPLICATIONS	NURSING CONSIDERATIONS
NON-REBREATHER	**Up to 100% (12–15 L/min)**	✔ Respiratory failure ✔ Pre-intubation	✔ **Risk of suffocation** if O_2 runs out	✔ Flow ≥ 12 L/min ✔ Bag should not fully deflate ✔ Watch for suffocation signs
CPAP/BIPAP	**Up to 100% (2–10 L/min) + pressure support**	✔ CHF, pulmonary edema ✔ COPD, pneumonia ✔ Early respiratory failure	✔ Mask discomfort ✔ Aspiration risk if vomiting	✔ Elevate HOB ✔ Skin checks ✔ Assess tolerance and ability to remove mask ✔ Position patient in semi-fowlers or higher
HIGH-FLOW NASAL CANNULA (HFNC)	**Up to 100% (up to 60 L/min)**	✔ Long-term high O_2 needs ✔ Pre/post intubation ✔ Asthma/COPD exacerbations ✔ DNI/palliative care	✔ Discomfort from heat/ flow ✔ Nasal dryness/ bleeds ✔ May delay needed intubation	✔ Elevate HOB ✔ Adjust prongs for fit ✔ Monitor closely for decompensation

Application of a non-rebreather mask is often the first-line intervention for patients experiencing a sudden and significant drop in SpO_2





Because non-rebreather mask does not permit the inhalation of ambient air; there is a risk of suffocation if the oxygen source is depleted - for example, during patient transport with an oxygen cylinder that runs empty

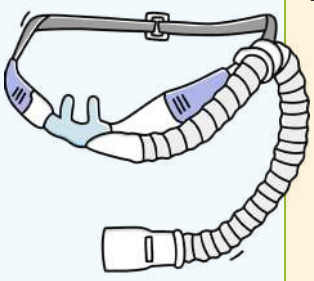
This device uses a **one-way valve** to prevent the patient from rebreathing exhaled carbon dioxide

Pros: capable of delivering close to 100% oxygen when fitted properly with adequate flow

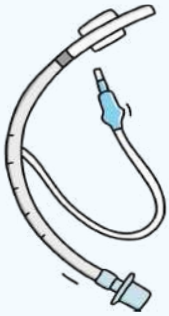
Cons: in the event of oxygen flow interruption, the one-way valve may prevent air entry, posing a risk of suffocation

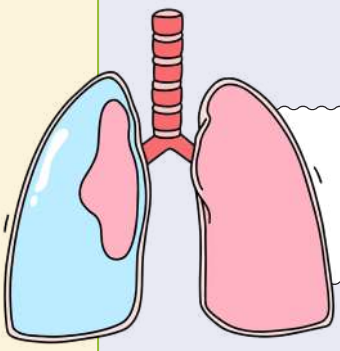
Used for patients with respiratory conditions that require pressure support to maintain airway patency, increase tidal volume (the amount of air exchanged during a single respiratory cycle), & prevent alveolar collapse. This positive pressure support helps decrease the patient's work of breathing.

If the patient is unable to remove the mask independently, continuous supervision (e.g. a sitter) will be needed



OXYGEN THERAPY

DEVICE	O_2 CONCENTRATION (FIO_2) & FLOW RATE	INDICATIONS	RISKS/ COMPLICATIONS	NURSING CONSIDERATIONS
BAG-VALVE MASK (BVM) 	**Up to 100% (15 L/min)**	✔ Respiratory failure ✔ Unresponsive/apneic	✔ Gastric inflation ➔ aspiration ✔ Barotrauma	✔ Ensure mask seal ✔ Monitor chest rise & stomach distention
ENDOTRACHEAL TUBE (ETT)/VENTILATOR 	**Up to 100% (60–120 L/min)**	✔ Severe respiratory failure ✔ Inability to protect airway	✔ Aspiration, VAP ✔ Barotrauma ✔ Trauma to mouth/airway ✔ Sedation & weaning challenges	✔ Reposition ETT every shift ✔ Adequate sedation ✔ Oral care (q2–4h) ✔ Monitor for pneumothorax & unequal chest rise



Barotrauma occurs when excessive pressure causes alveolar rupture, potentially resulting in a pneumothorax

Ventilator-acquired pneumonia

NURSING CARE

SITUATION		NURSING INTERVENTION		WHY?
Patient dyspneic or using accessory muscles	➔	Elevate HOB, apply O_2 as ordered, assess SpO_2	➔	Improves ventilation and gas exchange
SpO_2 < 90% on room air	➔	Verify probe placement, assess for hypoventilation or obstruction	➔	Prevents unnecessary escalation
Crackles in lungs	➔	Encourage coughing, suction if needed	➔	Clears secretions to improve diffusion
Anxiety/restlessness	➔	Assess oxygenation first	➔	Early sign of hypoxia
O_2 therapy in COPD	➔	Use Venturi mask for precise FiO_2	➔	Prevents CO_2 retention
On high-flow or mask O_2	➔	Check skin, humidify if > 4 L/min	➔	Prevents breakdown & dryness

MEDICATION ADMINISTRATION

7 RIGHTS OF MEDICATION ADMINISTRATION

The most widely used framework for safe medication administration is the '7 Rights' of medication administration. However, it is not the only system in use - other models such as the 5 Rights, 9 Rights, and even 10 Rights are also followed in various settings to enhance patient safety and reduce the risk of medication errors!

1. RIGHT PATIENT

- Use two patient identifiers: name and date of birth
- Always confirm with the patient and cross-check with the **m**edication **a**dministration **r**ecord (**MAR**) or wristband if the patient is non-verbal

2. RIGHT MEDICATION

- Verify that you have the correct medication & formulation
- Cross-check using the MAR &/or written order

3. RIGHT DOSE

- Double-check the dosage against the order
- When necessary, have a second nurse verify the drawn amount (especially for high-risk medications)

4. RIGHT TIME

- Administer medications within 30 minutes of the scheduled time (before or after)
- Verify if the timing aligns with other considerations (e.g. food, lab draws, procedures)

5. RIGHT DOCUMENTATION

- Document administration promptly & accurately in the MAR
- Record the patient's response when appropriate (e.g. pain relief, side effects)

6. RIGHT ROUTE

- Ensure the route matches the order
- Common routes include:

PO (per os / by mouth)
NG/OG (nasogastric/orogastric)
PEG (percutaneous endoscopic gastrostomy)
AU (otic)
IN (intranasal)
INH (inhalation)
OPHT (ophthalmic)
SL (sublingual)
BUC (buccal)
TD (transdermal)
REC (rectal)
ID (intradermal)
IM (intramuscular)
Subcut (subcutaneous)
IV (intravenous)

AU = **au**ricular ("related to the ear")

7. RIGHT REASON

Confirm that the medication is appropriate for the patient's diagnosis & current condition

SEQUENCE OF MEDICATION ADMINISTRATION

1. REVIEW THE MEDICATION ORDER

✓ Carefully confirm the accuracy, appropriateness, & completeness of the order

2. RETRIEVE THE MEDICATION FROM PROPER STORAGE

✓ Use clean technique and verify the medication label as you remove it

Never remove meds for more than one patient at a time!

3. VERIFY MEDICATIONS USING THE MAR

✓ Cross-check each medication against the MAR to ensure it matches the order

Most hospitals also utilize barcode scanning for added verification

4. IDENTIFY THE PATIENT CORRECTLY

✓ Ask the patient to state their **full name** and **date of birth**

✓ If the patient is non-verbal or unable to respond, confirm identity by comparing the **wristband** to the MAR

5. PERFORM THE 7 RIGHTS CHECK

✓ Confirm the **right patient, medication, dose, route, time, documentation,** & **reason** before proceeding

If using a barcode scanning system, scan the medication *after* completing the 7 Rights check!

6. ADDRESS ANY PATIENT QUESTIONS OR CONCERNS

✓ Take time to explain the medication and answer questions to ensure understanding and promote compliance

7. ADMINISTER THE MEDICATION SAFELY

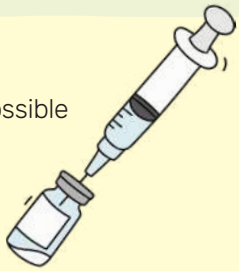
✓ Use the correct technique based on the route of administration (e.g. PO, IM, IV)

8. DOCUMENT ADMINISTRATION PROMPTLY

✓ Record the time, dose, & route in the MAR

✓ Note any relevant observations or patient responses if appropriate

9. EVALUATE THE EFFECTIVENESS OF THE MEDICATION



✓ Monitor the patient for therapeutic outcomes and possible side effects

Examples: *Reassess pain level, recheck vital signs, observe for adverse reactions*

COMMON MEDICATION ERRORS

- ✕ **INCORRECT RATE (IV)**
- ✕ **INCORRECT ADMINISTRATION TIME**
- ✕ **INCORRECT DOSE**
- ✕ **INCORRECT IV FLUID**
- ✕ **INCORRECT MEDICATION**
- ✕ **INCORRECT ROUTE**
- ✕ **INCORRECT PATIENT**

Medication errors can result in serious harm to patients. As nurses, we serve as the final line of defense - the gatekeepers responsible for ensuring patient safety. Always review the 7 Rights of Medication Administration before giving any medication to help prevent errors and protect those in our care.

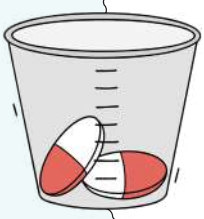
Including the patient in the verification process can improve safety and reduce errors. Encourage patients to ask questions and confirm their medications - they are active partners in their care!

ROUTES OF ADMINISTRATION (PARENTERAL VS NON-PARENTERAL)

ENTERAL ADMINISTRATION

PER OS (PO)

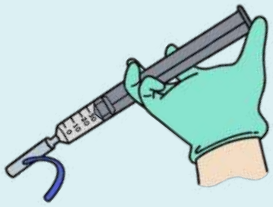
- Assess aspiration risk:
  - ✓ Review patient chart for NPO status
  - ✓ Check for documented swallow screen results
- Ensure the patient is alert and able to follow commands
- Position the patient in high Fowler's (60–90°)
- Ask if the patient has difficulty swallowing pills
- If giving an oral suspension, shake the bottle well
- Perform a bedside swallow screen if needed
- Ask if the patient prefers to take one medication at a time or all at once



Oral medications should **never be administered** to individuals with **altered mental status or decreased level of consciousness**, due to the high risk of **aspiration**

Some patients may be unable to swallow water but can take medications mixed with thicker substances like applesauce, pudding, or Jell-O. Ensure the medication is safe to mix with food. Do not crush enteric-coated or extended-release (ER) medications, as this can alter drug absorption and increase the risk of side effects.

NASOGASTRIC/OROGASTRIC/PERCUTANEOUS ENDOSCOPIC GASTROSTOMY (NG/OG/PEG)



- Confirm with pharmacy if the medication is available in liquid form. If not:
  - ✓ Crush the pills to a fine powder
  - ✓ Open the capsules & empty contents
- Mix each medication separately with 30 mL of warm water
- Flush the tube with 30 mL of water prior to administration
- Instill the medication using a 60 mL syringe
- Flush with another 30 mL of water and clamp the tube

When administering multiple medications via gastric tube, **give each medication separately** and flush the tube with 15-20 mL of water between doses

PARENTERAL ADMINISTRATION

INTRAVENOUS (IV)

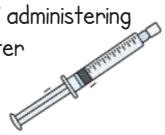
IV medications can be administered as an IV push, an IV piggyback, or a continuous infusion

MEDICATIONS GIVEN INTRAVENOUSLY ARE GIVEN INTO THE VEIN!

- Confirm IV site is within expiration timeframe (usually 96 hours)
- Scrub the hub with alcohol for 10–15 seconds; let dry
- Check patency by flushing with 10 mL of saline
- Prepare & prime medication tubing, ensuring no air bubbles
- Infuse the medication over the recommended time
- Flush the catheter with another 10 mL of saline post-infusion

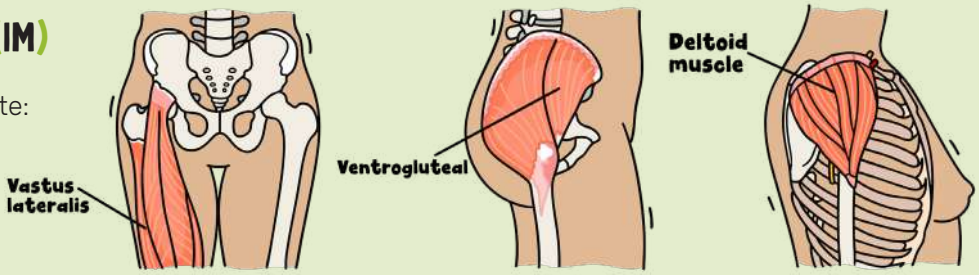
When administering an IV piggyback, ensure the primary IV fluid is clamped and the secondary medication line is unclamped to allow proper infusion

When administering IV push medications, give each medication separately and flush the line with saline between doses. If administering medications IV push, administer **one at a time** with a saline flush between meds!



NURSING CARE

INTRAMUSCULAR (IM)



- Select appropriate site:
  - ✓ Vastus lateralis
  - ✓ Ventrogluteal
  - ✓ Deltoid
- Draw up the correct dose of the medication (max volume: 3 mL)
- Use a 20-25 gauge, 1-1.5" needle
- Clean the site with alcohol for 30 seconds; allow it to dry
- Use the Z-track method to minimize leakage:
  - ✓ Pull the skin laterally, applying tension with non-dominant hand; hold the skin taut
- Insert the needle at 90°, inject slowly (10 sec/mL)
- Withdraw the needle and apply pressure with gauze for 5–10 seconds

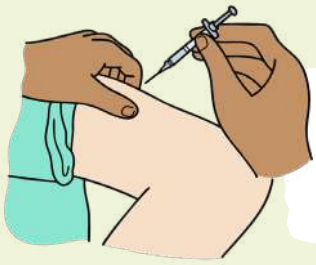
Extremely thin or elderly patients may tolerate no more than 2 mL per injection site

MEMORY TRICK

MEDICATIONS GIVEN INTRAMUSCULARLY ARE GIVEN INTO THE MUSCLE!

Do not massage!

SUBCUTANEOUS (SUBQ)

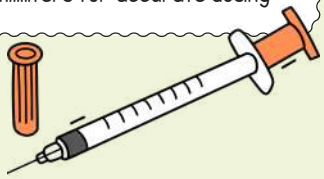


MEMORY TRICK

MEDICATIONS GIVEN SUBCUTANEOUSLY ARE GIVEN INTO THE SUBCUTANEOUS FAT!

- Select appropriate site:
  - ✓ Abdomen (≥ 2 inches from umbilicus)
  - ✓ Upper arm (back/side)
  - ✓ Thigh (front/side)
- Draw up the correct dose of the medication using an **insulin or tuberculin syringe** (max 2 mL)
- Use a 25–30 gauge, ½–⅝" needle
- Clean the site with alcohol for 30 seconds; allow it to dry
- Pinch the skin & inject at 45–90° angle
- Inject slowly (10–20 seconds), then apply pressure with gauze (bandage if needed)

When administering insulin, always use an insulin syringe, as it is calibrated in units rather than milliliters for accurate dosing

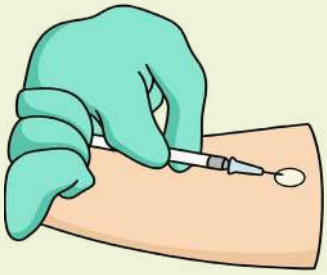


The thinner the patient, the more shallow the injection angle should be

NURSING CARE

PARENTERAL ADMINISTRATION

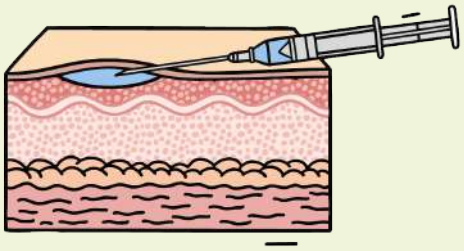
INTRADERMAL (ID)



MEMORY TRICK

MEDICATIONS GIVEN INTRADERMALLY ARE GIVEN INTO THE DERMIS!

- Select appropriate site:
  - ✓ Inner forearm
  - ✓ Upper back, beneath scapula
- Use an insulin or tuberculin syringe (max 0.1 mL)
- Use a 25–30 gauge, ¼–½" needle
- Clean the site with alcohol for 30 seconds; allow it to dry
- Pull the skin taut; insert the needle at 5–15° angle
- Inject slowly to create a visible bleb



Small bubble under the skin

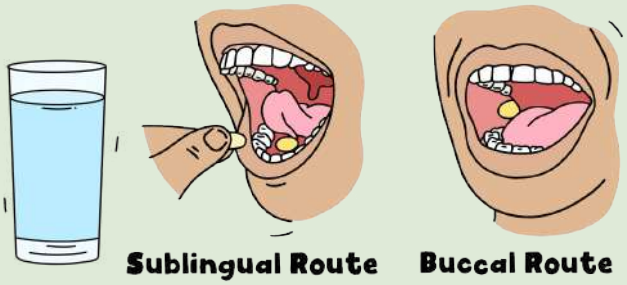
Do not massage!

- Apply light pressure afterward; apply a bandage if needed

TRANSMUCOSAL ADMINISTRATION

SUBLINGUAL (SL) & BUCCAL (BUC)

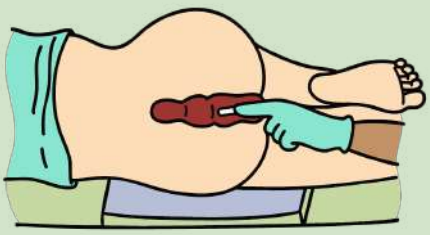
- Ensure the mouth is moist - offer water if needed
- Instruct the patient not to chew or swallow
  - ✓ SL: place under the tongue
  - ✓ BUC: place between cheek & gum



Sublingual Route

Buccal Route

RECTAL (REC)



- Check for contraindications:
  - ✗ Thrombocytopenia
  - ✗ Rectal bleeding
  - ✗ Recent rectal/bowel surgery
  - ✗ Immunosuppression
- Encourage having a bowel movement prior to administration
- Position the patient in left Sims
- Lubricate the enema/suppository with a water-soluble gel
- Insert 3–4 inches into the rectum
- Have the patient remain in position for 10–15 minutes post-administration

Monitor for signs of a vagal response, such as bradycardia, hypotension, light-headedness, & pallor

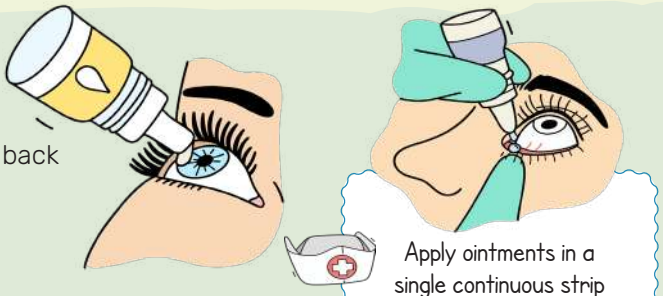
NURSING CARE

TRANSMUCOSAL ADMINISTRATION

INTRANASAL (IN)

- Have the patient blow their nose before administration
- Position the patient supine or seated with their head tilted back
- Insert device tip into one nostril while occluding the other
- Instruct the patient to hold their breath for 2–3 seconds, then breathe through their mouth
- Advise against blowing their nose immediately afterward

OPHTHALMIC (OPHT)



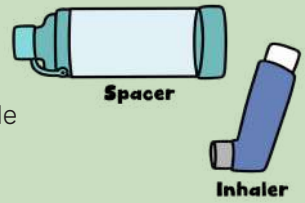
- Position the patient supine or seated, head tilted back
- Clean the eye area (inner to outer canthus)
- Gently pull down the lower lid
- Hold dropper 2 cm above the eye and instill drops into the conjunctival sac
- Instruct the patient to close their eyes and move them to distribute the medication

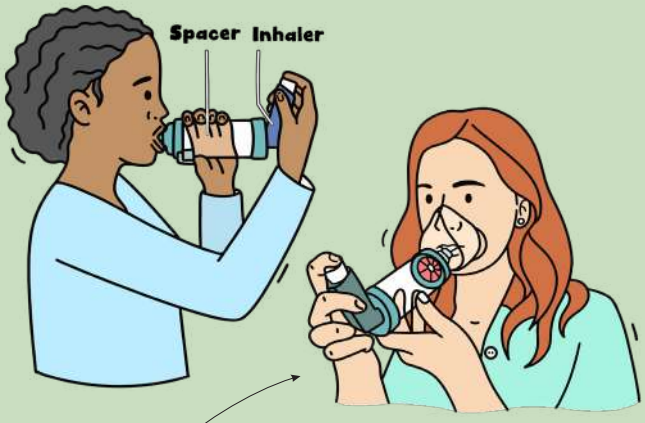
Apply ointments in a single continuous strip

The pocket created by the lower eyelid & the eyeball

OTHER ROUTES

INHALATION (INH)





- Use a spacer if available
- Shake the inhaler well
- Sit the patient upright with a slight head tilt
- Patient may place the mouthpiece 1–2 inches from their mouth or seal their lips around it
- Depress the canister fully while the patient inhales slowly (3–5 seconds)
- Wait 1 minute between doses
- Notify the Provider if there is no relief after 3 doses
- If using a corticosteroid, rinse the inhaler with warm water after use

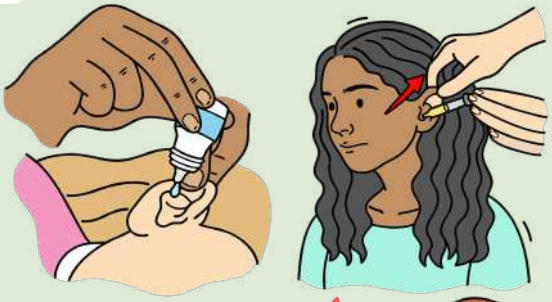
If the patient is capable, they can perform this step independently under your supervision

If the inhaler is used for medications other than steroids, it only needs to be cleaned **once a week**

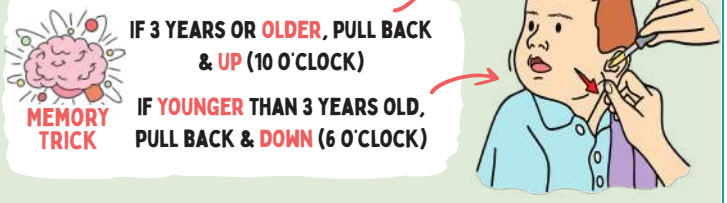
NURSING CARE

OTHER ROUTES

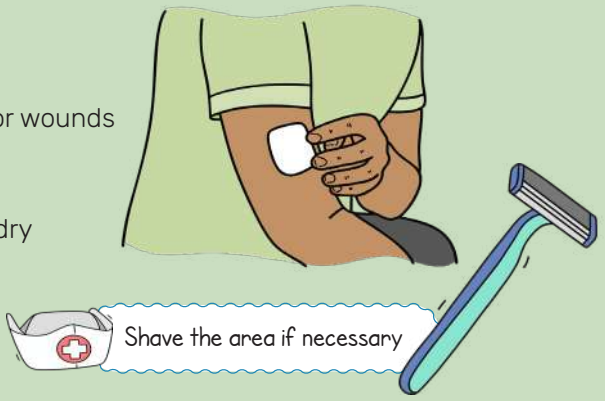
OTIC (AU)



- Position the patient lying on their side or seated with their head tilted so the affected ear is facing upward
- Clean the external ear with a warm washcloth
- Pull the pinna back to open the ear canal
- Hold the dropper 2–3 cm above the ear; instill the drops
- Massage the tragus gently
- Keep the patient in position for 2–3 minutes



TRANSDERMAL (TD)



- Choose a skin area free from irritation, hair, rashes, or wounds
- Remove old patches/ointment
- Clean the site with mild soap & water; allow time to dry
- Apply the prescribed dose/patch; ensure it's secure
- Label the patch with date, time, and your initials

PHARMACOKINETICS (ADME)

WHAT IS IT?

Pharmacokinetics is **the study of how drugs move through the body** - from the time they are administered to the point of elimination. It is broken down into four major phases:

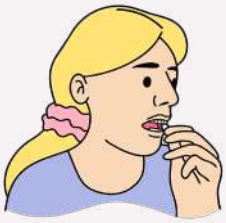
1. **ABSORPTION**
2. **DISTRIBUTION**
3. **METABOLISM**
4. **EXCRETION**

ADME
SOME PHARMACOLOGY!

Together, these phases determine how much of a drug reaches its target site, how long it stays active, & how it is ultimately cleared from the body.

Absorption:

Refers to the process by which a drug moves from the site of administration into the bloodstream



The **bioavailability** of a drug is the percentage of the administered dose that reaches systemic circulation in its active form. This can vary widely depending on several factors:

Because intravenous (IV) medications are delivered directly into the bloodstream, they have 100% bioavailability, meaning the full dose reaches systemic circulation. In contrast, other routes (such as oral, intramuscular, or subcutaneous) have lower and more variable bioavailability due to factors like enzymatic breakdown, first-pass metabolism, tissue perfusion, & membrane permeability.

➡ **Route of administration:** Oral medications are absorbed more slowly than intravenous medications, which bypass the absorption phase entirely

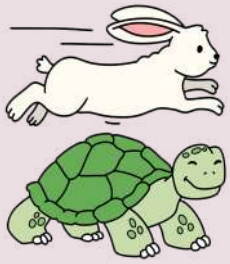
➡ **Physical & chemical characteristics of the medication:** Lipid-soluble drugs and those with smaller molecular size tend to be absorbed more easily

➡ **Patient's age:** Infants and elderly patients may have altered absorption due to differences in gastric pH, enzyme levels, or GI motility

➡ **Body's pH:** A drug's ionization state, which affects its ability to cross cell membranes, can be influenced by pH

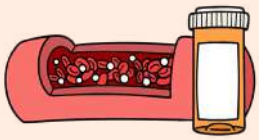
➡ **Other substances/food:** Some drugs require an empty stomach for optimal absorption, while others are better absorbed with food. Drug-drug interactions in the GI tract may also interfere.

FASTEST TO SLOWEST ABSORPTION FOR THE MOST COMMON ROUTES OF MEDICATION ADMINISTRATION:

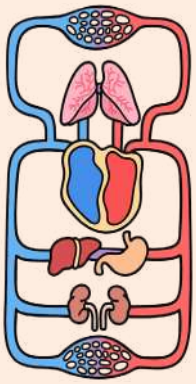


1. Intravenous
2. Sublingual
3. Intramuscular
4. Subcutaneous
5. Oral

Distribution:

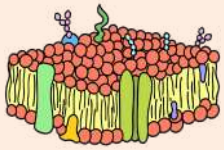


Refers to the movement of a drug from the bloodstream into the tissues & organs where it will exert its effect. Several physiological factors influence how efficiently and widely a drug is distributed:



➡ **Blood flow to tissues:** Adequate blood circulation is essential for drug delivery. Impaired perfusion due to dehydration, hemorrhage, burns, atherosclerosis, or hypertension can limit drug access to certain tissues.

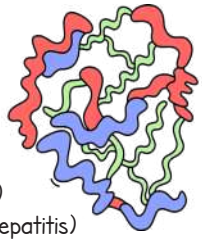
➡ **Cell membrane permeability:** For a drug to reach its target site, it must often cross cell membranes. This is more likely if the drug is:



- ✔ Small in molecular size
- ✔ Lipid-soluble (lipophilic)
- ✔ Electrically neutral (uncharged)

➡ **Protein binding:** Many drugs bind reversibly to plasma proteins, primarily **albumin**. When bound, the drug is inactive. Only the **free (unbound)** portion of the drug can enter tissues and exert a pharmacological effect.

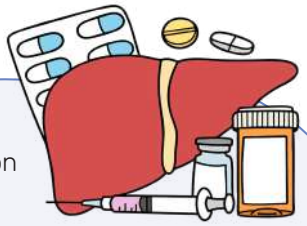
In patients with **low albumin levels** (e.g. due to malnutrition or liver disease), more free drug circulates in the bloodstream, increasing the risk of side effects and toxicity



Causes of hypoalbuminemia

- ✔ Malnutrition
- ✔ Inflammation & infection
- ✔ Kidney disease (nephrotic syndrome & glomerulonephritis)
- ✔ Liver disease (cirrhosis or hepatitis)

METABOLISM:



The body's way of chemically altering a drug, either to activate it or to prepare it for excretion

➡ **PRIMARY SITE OF METABOLISM**

- Most drug metabolism takes place in the **liver**

➡ **OTHER METABOLIC SITES:**

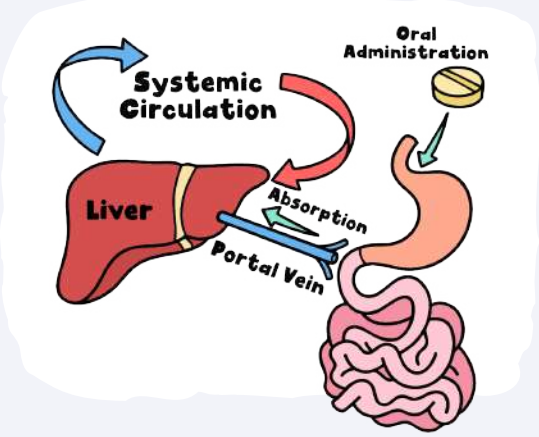
- Lungs
- GI tract
- Kidneys
- Blood plasma

➡ **KEY FACTORS INFLUENCING METABOLISM:**

First pass effect:

- Some orally administered drugs are extensively metabolized by the liver before reaching systemic circulation. This can significantly reduce the amount of active drug available.

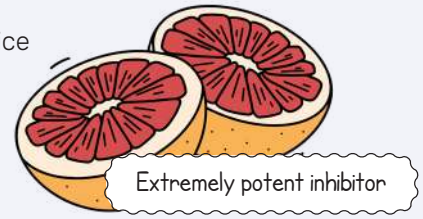
Example: *Oral nitroglycerin undergoes such extensive first-pass metabolism that it is rendered ineffective in its PO form. Instead, sublingual or transdermal routes are used to bypass the liver and affect the blood vessels directly before being metabolized.*



CYP450 enzyme system:

- This family of liver enzymes is responsible for the metabolism of the majority of prescription drugs. Certain substances can inhibit or induce these enzymes, significantly altering drug levels. **CYP450 inhibitors** slow down drug metabolism, increasing plasma drug concentration and the risk of toxicity. Common inhibitors include:

- Grapefruit juice
- Alcohol
- Smoking

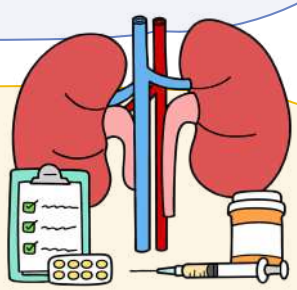


- Medications such as:
  - ✓ Amiodarone
  - ✓ **SSRI**s (**s**elective **s**erotonin **r**euptake **i**nhibitors)
  - ✓ Certain antibiotics (e.g. fluoroquinolones and macrolides)

➡ **OTHER FACTORS THAT AFFECT METABOLISM:**

- Age (infants & elderly have reduced metabolic capacity)
- Gender
- Genetics (some individuals metabolize certain drugs faster or slower based on genetic enzyme variants)
- Diet

EXCRETION:



The process by which drugs and their metabolites are eliminated from the body

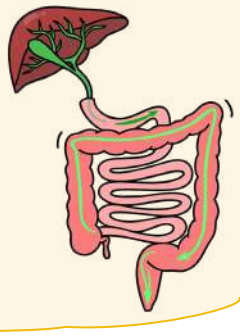
➡ **PRIMARY ROUTE OF EXCRETION:**

- Most drug elimination takes place through the **kidneys**

➡ **OTHER EXCRETORY ROUTES:**

- Liver ➔ bile ➔ feces
- Lungs ➔ exhalation
- Other body fluids such as sweat, saliva, & tears

➡ **FACTORS AFFECTING EXCRETION:**



Kidney dysfunction:

- If renal function is impaired, drugs may accumulate in the bloodstream, increasing the risk of toxicity. Dose adjustments are often required for renally excreted drugs.

Liver dysfunction

- When the liver cannot metabolize & excrete drugs effectively, drug levels may rise to dangerous levels, especially in medications that undergo extensive hepatic processing

COMMUNICATION

THERAPEUTIC COMMUNICATION

WHAT IS IT?

Therapeutic communication is a **purposeful, goal-directed form of interaction used in healthcare to build trust, gather information, support emotional needs, & promote patient well-being**. It involves both **verbal** and **non-verbal expressions** that help establish a strong therapeutic alliance between the patient and healthcare professionals.

VERBAL COMMUNICATION

Verbal communication refers to anything expressed through **spoken language**. The tone, content, & delivery all affect how a message is received.

TYPES OF VERBAL COMMUNICATION:

Passive communication

▶ Prioritizes others' needs while neglecting one's own. Often marked by indecisiveness, self-blame, or avoidance.

Examples

- Guarded, non-confrontational statements
- Excessive apologizing
- Indecisive language

"I'm so sorry we don't have your favorite soda. Honestly, I'd throw the orange juice at me too. I'll see if I can go get it on my break."

Aggressive communication

▶ Dominating, threatening, or disrespectful. Shows little regard for others' perspectives.

Examples

- Blaming, interrupting or yelling
- Using curse words
- Overly critical

"If you keep ringing the call light nonstop, I'm pulling it out of the wall! I have other patients too!"

Passive-aggressive communication

▶ Indirectly expresses frustration or resentment while appearing agreeable on the surface

Examples

- Sarcasm, backhanded compliments
- Denying obvious feelings of resentment
- Complaining under one's breath

"Funny - most patients don't complain of pain this much. I'm sure it's serious enough to buzz every 15 minutes."

Assertive communication

▶ Respectfully & confidently expresses one's thoughts and needs while honoring others' perspectives

Examples

- Using "I" statements, clarification, & collaboration
- Balancing compliments with honesty
- Speaking in easy-to-understand language

"If I'm understanding you correctly, you're too tired to use your incentive spirometer. That's valid but not using it regularly increases your risk for pneumonia. Let's try for a few minutes now, and then you can rest."

NON-VERBAL COMMUNICATION

Non-verbal communication includes facial expressions, posture, gestures, eye contact, & tone of voice - often conveying more than words alone

BODY LANGUAGE:

Positive body language:

- Appropriate eye contact
- Open & neutral posture
- Nodding to show attentiveness
- Therapeutic touch when appropriate

Negative body language

- Avoiding eye contact or excessive staring
- Crossed arms, clenched fists, or hunched posture
- Standing too close or violating personal space
- Eye rolling or excessive head nodding that seems dismissive

Non-verbal communication plays an even more significant role than verbal communication. In fact, studies suggest that up to 93-95% of our communication is conveyed through non-verbal cues such as body language, facial expressions, posture, eye contact, and tone of voice.

VOICE QUALITY:

Positive vocal qualities

- Calm, friendly tone
- Moderate volume and clear enunciation
- Steady rhythm & pace of speech

Negative vocal qualities

- Condescending or patronizing tone
- Speaking too quickly or too slowly
- Yelling or whispering unnecessarily
- Long, awkward pauses that disrupt conversation

THERAPEUTIC COMMUNICATION TECHNIQUES

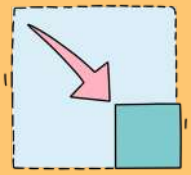
THE FOLLOWING TECHNIQUES ARE COMMONLY USED BY NURSES AND OTHER HEALTHCARE PROFESSIONALS TO FOSTER CONNECTION, ENHANCE UNDERSTANDING, & SUPPORT EMOTIONAL EXPRESSION:

TECHNIQUE	OUTCOME	EXAMPLE
RESTATING 	Rephrases what the patient said to confirm understanding	*"So, you're saying you feel left out when you're kept in isolation?"*
REFLECTION 	Mirrors the patient's emotions or thoughts to help them explore feelings	*"You seem really frustrated today. Do you want to talk about what's going on?"*
OFFERING SELF 	Builds rapport by offering time & presence	*Sitting with the patient during a meal, watching a show together, or checking in regularly*

TECHNIQUE	OUTCOME	EXAMPLE
OPEN-ENDED QUESTIONS 	Encourages deeper, more thoughtful responses	*"What's been the most difficult part of your treatment so far?"*
ACTIVE LISTENING 	Demonstrates full engagement through posture, eye contact, & feedback	*"I hear you saying that you're anxious about surgery. What specifically is worrying you?"*
VALIDATION 	Confirms shared understanding of a concern or emotion	*"So, you feel it's unfair that you were removed from group when you were upset - is that right?"*

NON-THERAPEUTIC TECHNIQUES

THESE TECHNIQUES CAN DAMAGE RAPPORT, SHUT DOWN CONVERSATION, OR INVALIDATE A PATIENT'S EXPERIENCE AND SHOULD BE AVOIDED

TECHNIQUE	OUTCOME	EXAMPLE
MINIMIZING 	Invalidates the patient's emotions by downplaying them	*"You're overreacting - it's not that big of a deal"*
EXCESSIVE QUESTIONING 	Overwhelms the patient and discourages open sharing	*"Why did you do that? When? How come? Why not just do it differently?"*
JUDGING 	Makes the patient feel criticized or ashamed	*"I don't think that was an appropriate way to respond in group therapy"*
GIVING ADVICE 	Undermines the patient's autonomy and problem-solving abilities	*"Just do what your doctor says and everything will be fine"*

TECHNIQUE	OUTCOME	EXAMPLE
CLOSED-ENDED QUESTIONS 	▶ Limits conversation and shuts down elaboration	*"Did you take your meds today?"*
ARGUING/ DEFENSIVENESS 	▶ Escalates conflict and harms the therapeutic relationship	*"That's not my fault! You can't blame me for what the voices are telling you!"*

SITUATION, BACKGROUND, ASSESSMENT, & RECOMMENDATION (SBAR)

WHAT IS IT?

A **standardized communication framework** used by nurses and other healthcare professionals to **clearly & efficiently convey critical information** to Providers and interdisciplinary team members. It **promotes patient safety** by ensuring all essential clinical details are communicated in a **structured, organized manner**.

SITUATION

Purpose:

➡ Describe the immediate reason for your communication

What to include:

➡ Your name, professional title, & unit or floor

➡ The patient's name and **m**edical **r**ecord **n**umber (**MRN**)

➡ A brief, focused statement describing the concern or clinical change

Example:

"Hello, this is Carly Jones, RN on the 4th floor. I'm calling about Ms. Sidwell, MRN 432198, because she's experiencing increased swelling in her left lower extremity."

In more urgent situations begin by clearly stating your name, professional title, & the patient's name and MRN. Once the Provider acknowledges the patient's identity, immediately focus on the critical issue at hand.

BACKGROUND

Purpose:

➡ Provide context to help the Provider understand the clinical picture

What to include:

➡ Code status

➡ Allergies

➡ Primary diagnosis & co-morbidities

➡ Current medications

➡ Pertinent labs, imaging, or procedures

➡ Specialist involvement & recent consults

➡ Detailed description of the acute change if applicable

Communicate background information relevant to the **current situation only**

This is where you would elaborate on your brief description from the Situation portion of your SBAR

Assessment

Purpose:

➡ Share your clinical findings and professional impression

What to include:

➡ Most recent vital signs, physical assessment findings, &/or lab results
➡ A concise statement of what you believe the problem is
➡ Any interventions you've already initiated and the patient's response

Be clear and confident - trust your nursing instincts. You are the one at the bedside, observing the patient in real time. If your gut is telling you something isn't right, listen to it and speak up.

Example: *"She has 2+ pitting edema extending to the mid-calf, no signs of infection, but a notable increase since yesterday. Vitals are stable. I elevated her leg & applied compression per orders."*

Recommendation

Purpose:

Clearly state what you believe should be done next

What to include:

➡ Your clinical recommendation or request
➡ Suggestions may include:
✔ Upgrading the level of care (e.g. to step-down or ICU)
✔ Starting or changing medications
✔ Ordering labs or diagnostic tests
✔ Initiating therapies (e.g. respiratory therapy)
✔ Requesting consults (e.g. vascular surgery, wound care)

Example: *"I recommend ordering a lower extremity Doppler to rule out DVT and would also like you to evaluate her today"*

You are your patient's advocate - make recommendations confidently and always in the patient's best interest

TELEPHONE ORDERS

1. **Only accept** if urgent/ emergent and no safer method is available
2. **Gather info**: patient name, MRN, diagnosis, allergies, vitals, labs
3. **Write order as given**: include date, time, med name, dose, route, frequency
4. **Repeat order back** to the Provider word-for-word ("read back & verified")
5. **Document clearly**:
   TO Dr. Davis - Read back & verified - J. Harris, RN @ 14:20
6. **Notify Provider** to co-sign within required timeframe (e.g., 24 hrs)
7. **Never accept** TOs for PRN restraints, chemotherapy, or high-risk procedures

SAFETY

DOMESTIC SAFETY

ADULTS (19-64 YEARS OLD)

INTIMATE PARTNER VIOLENCE (DOMESTIC ABUSE)

- ✔ Educate on signs, statistics, & risk factors
- ✔ Provide access to confidential resources and support services

Always assess & interview the patient in a private setting to ensure confidentiality

SUBSTANCE ABUSE

- ✔ Discuss risks related to current substance use
- ✔ Offer resources for detoxification, treatment, & ongoing recovery support

OLDER ADULTS (65+)

FALL PREVENTION

- ✔ Remove loose rugs & clutter
- ✔ Install grab bars in showers and near toilets; use raised toilet seats
- ✔ Use brightly colored tape to mark steps or elevation changes
- ✔ Encourage properly fitting footwear with traction or non-slip socks
- ✔ Ensure good lighting throughout the home
- ✔ Confirm prescription eyewear is current

OXYGEN SAFETY

- ✔ Post "No Smoking" signs where oxygen is in use
- ✔ Keep oxygen at least 10 ft away from flames or electrical sources
- ✔ Store tanks upright & secured
- ✔ Avoid oils, greases, or flammable products (lip balm, lotion, hairspray)

- ✔ Avoid extension cords; use grounded equipment only
- ✔ Use cotton linens - avoid synthetic or wool fabrics

Oxygen fuels combustion - when combined with fire, it dramatically increases heat and the risk of explosion or severe burns

MENTAL HEALTH

- ✔ Promote social interaction, exercise, & enjoyable routines
- ✔ Encourage good sleep, balanced diet, & purposeful activities

MEDICATION

- ✔ Use pill organizers, med-alert bracelets, & stress adherence to schedules

HOSPITAL SAFETY

PATIENT SAFETY

FALL PRECAUTIONS

✔ Perform a fall risk assessment at the beginning of every shift and after any significant change in the patient's condition

If a patient is identified as a fall risk, **hourly rounding** is required to ensure their safety

✔ If the patient is identified as a fall risk, apply a fall-risk identification band and place fall-risk signage outside their room

✔ Ensure essential items (such as the call light, water, glasses, hearing aids, & phone), are always within the patient's reach

✔ Keep the bed in its lowest position with wheels locked at all times

✔ Use bed & chair alarms when appropriate to alert staff of attempted movement

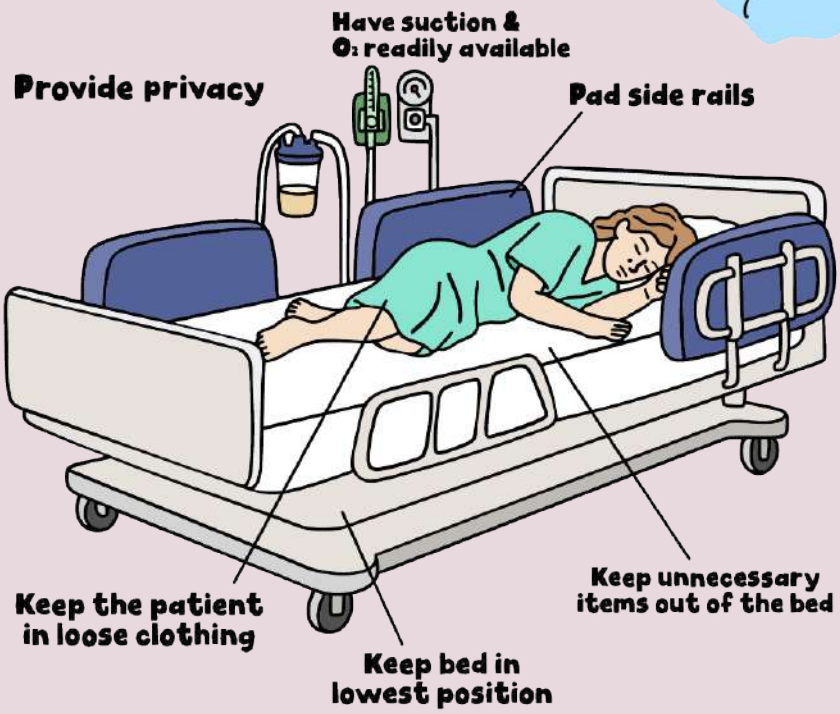
✔ Consider placing high-risk patients in rooms near the nurses' station for easier monitoring

✔ Utilize sitters when necessary, and refer the patient to physical therapy for mobility & strength training

✔ Promote adequate hydration & nutrition to support muscle function & balance

✔ Review medications that may increase fall risk such as antihypertensives, opioids, & sedatives - discuss potential side effects with the patient

SEIZURE PRECAUTIONS



HOSPITAL SAFETY

PATIENT SAFETY

SUICIDE PRECAUTIONS

- ✔ Maintain constant 1:1 observation with trained staff for patients identified as a suicide risk
- ✔ Remove all sharp objects, cords, toxic substances, glass, & medications from the patient's environment
- ✔ Use only plastic utensils during meals - no metal or breakable items allowed
- ✔ Lock all windows and eliminate access to anything that could be used for self-harm, such as belts, shoelaces, or drawstrings
- ✔ Apply physical or chemical restraints only if absolutely necessary and clinically justified, following hospital policy
- ✔ Document all interventions and closely monitor for changes in mood, behavior, or risk level

STERILE FIELD

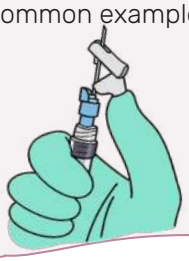
- ✔ All personnel in the room must wear a mask, hair covering, & gloves
- ✔ Long hair should be securely tied back
- ✔ Keep the room doors closed to minimize air disturbance
- ✔ Only sterile items may come into contact with the sterile field
- ✔ Limit room access to essential staff only; unnecessary personnel and visitors should remain outside
- ✔ Prepare the sterile field immediately before use to reduce contamination risk
- ✔ Once sterile gloves are donned, keep hands & arms above waist level
- ✔ Never touch the sterile field without sterile gloves
- ✔ Do not turn your back on the sterile field, and never leave it unattended
- ✔ Inspect all sterile supplies - discard any items with compromised packaging or visible damage
- ✔ Avoid talking, coughing, or sneezing over the sterile field
- ✔ If sterility is in question, discard the field and reestablish a new sterile setup

The longer sterile supplies are exposed to the environment, the higher the risk of contamination

NURSE SAFETY

SHARPS SAFETY

- ▶ Sharps are any objects capable of puncturing or cutting the skin. Common examples in healthcare include:
  - ➡ **Needles** – IV needles, hypodermic needles, suture needles
  - ➡ **Sharp medical instruments** – scalpels, blades, scissors
  - ➡ **Glass items** – broken ampules, vials, or laboratory tubes

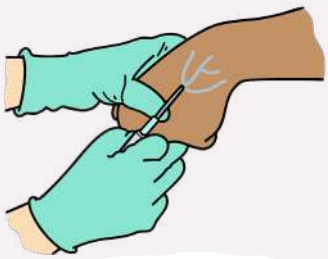


HOSPITAL SAFETY

NURSE SAFETY

Safe practice with sharps

- ✔ Always wear gloves when handling sharps to reduce the risk of exposure to bloodborne pathogens
- ✔ Never recap needles—this is a common source of accidental needlestick injuries
- ✔ Keep needles and sharps pointed away from yourself and others at all times
- ✔ Alert others nearby when a sharp is being used
- ✔ When starting an IV or drawing blood, be sure to anchor the vein below the insertion site to prevent movement
- ✔ Keep sharps within your direct line of sight—do not place them down and walk away
- ✔ When giving a subcutaneous injection, allow yourself a safe margin of space to prevent injury
- ✔ If the sharp has a safety feature, activate it immediately after use
- ✔ Dispose of sharps directly into a sharps-approved container immediately after use. Never place them in a regular trash bin.



MEMORY TRICK

"PINCH AN INCH"

Never reach inside a sharps container for any reason - even if you're trying to retrieve a dropped medication, label, or personal item

SHARPS INJURY PROTOCOL

Immediately stop what you are doing. Wash the wound thoroughly with soap & water for at least 15 minutes

If the wound continues to bleed, apply direct pressure to control bleeding

Report the injury immediately to your charge nurse & supervisor

Get your blood drawn as soon as possible after cleaning the wound to establish baseline status

Follow-up Blood Tests:

Some antibodies may take time to develop, so follow-up labs are necessary:

Hepatitis B: 2 months after exposure

Hepatitis C: 6 months after exposure

HIV: 6 weeks, 3 months, & 6 months after exposure

If the risk of HIV or Hepatitis B infection is high, your Provider may recommend starting prophylactic medications even if your initial tests are negative

HOSPITAL SAFETY

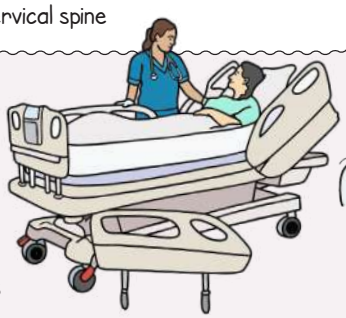
NURSE SAFETY

PROPER BODY MECHANICS

✔ Begin each shift or patient move by warming up - stretch, perform a few squats, & rotate your arms to loosen up

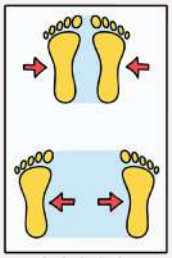
✔ Always assess the patient's weight, current position (lying, sitting, standing), & whether additional assistance or equipment is needed before attempting any movement

If a cervical spine injury is suspected, one nurse must be assigned solely to manually stabilize the patient's cervical spine



✔ If repositioning a patient in bed, raise the bed to waist height to reduce back strain

✔ Use all appropriate lifting aids available: draw sheets or chux pads, mechanical slings (Hoyer or ceiling lifts), gait belts, & slide boards



"Wide base of support"

✔ Maintain a solid base - feet shoulder-width apart, knees bent, & back straight

Always wear sneakers that fit properly with good traction

✔ Get as close to the patient as possible before moving them

✔ Engage your core & lift with your legs. Avoid twisting your torso during any maneuver.

Pivot if you need to change directions

SPLASH EXPOSURE

▶ Splash exposure occurs when bodily fluids come into contact with your mucous membranes (eyes, mouth, nose) or non-intact skin

Safe practice with body fluid

➡ Always wear proper **p**ersonal **p**rotective **e**quipment (**PPE**): gloves, gowns, face shields, & masks when necessary

➡ Wash your hands thoroughly after every patient interaction - even if gloves were worn

➡ Handle & dispose of all body fluids according to facility protocols

The amount and type of PPE required depend on the level of exposure risk during patient care. Higher-risk situations call for more comprehensive protection to prevent infection or contamination. Examples of high-risk procedures & activities include:

- Wound care & irrigation
- Endotracheal intubation
- Suctioning of airways
- Bronchoscopies
- Handling bodily fluids such as stool & urine (using bedpans, urinals, etc.)
- Assisting with invasive procedures
- Performing blood draws

Types of body fluid

- Blood
- Oral secretions
- Synovial fluid
- Vaginal secretions
- Pleural fluid
- Pericardial fluid
- Peritoneal fluid
- Amniotic fluid
- **C**erebral **s**pinal **f**luid (**CSF**)
- Semen
- Urine

HOSPITAL SAFETY

NURSE SAFETY

SPLASH EXPOSURE PROTOCOL

Skin:

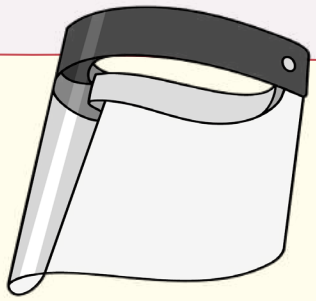
- Immediately flush the affected skin area with water for at least 15 minutes to thoroughly remove any contaminants

Eyes:

- If an eye wash station is available, use it to flush the eyes for at least 15 minutes. If not, manually irrigate the eyes using sterile fluids such as lactated ringers, normal saline, or clean water, ensuring continuous rinsing for the full 15 minutes.

Mouth:

- Rinse the mouth thoroughly with water 5 to 10 times to reduce potential contamination



➡ As with needlestick injuries, a splash exposure must be reported immediately to your charge nurse & supervisor. Follow-up blood work will be necessary to monitor for possible infections.

NURSE & PATIENT SAFETY

PHYSICAL RESTRAINTS

If all four side rails are raised, it is considered a physical restraint and requires a Provider's order!

WRIST/ANKLE RESTRAINTS (2-POINT/4-POINT)

HAND MITTS

LAP BELTS

BELT RESTRAINTS

VEST/JACKET RESTRAINTS

In addition to physical restraints, there are also **chemical restraints**. These include medications such as **antipsychotics, sedatives, & benzodiazepines** that are used to manage a patient's behavior or restrict movement.

When restraints are necessary

➡ A Provider's order must be **obtained within 1 hour** of application

➡ The order must be **renewed every 24 hours**

➡ Always choose the **least restrictive option** that's still effective (e.g. hand mitts are less restrictive than a vest restraint)

Restraints can never be ordered on a PRN (as-needed) basis!

HOSPITAL SAFETY

NURSE & PATIENT SAFETY

Safe practice with restraints

Restraints should always be a last resort. Prioritize non-restrictive interventions first:

- **Distraction techniques:** TV, music, puzzles, or small tasks (e.g. organizing belongings)
- **Minimize environmental stimuli:** lower noise levels, reduce interruptions
- **Pain management:** ensure timely administration of pain relief
- **Reorienting confused patients:**
  - ✔ Use bed/chair alarms with sensor pads
  - ✔ Encourage family presence
  - ✔ Place familiar personal items (photos, artwork) in the room
  - ✔ Provide clocks, calendars, & radios for orientation

Patients in significant pain can quickly become agitated or distressed if their discomfort is not promptly addressed

RESTRAINTS: ongoing monitoring & care

- ✔ Perform **CMS** checks (**c**irculation, **m**otor, **s**ensation) every 30 minutes
- ✔ Ensure you can fit two fingers under the restraint to avoid impeding circulation
- ✔ Perform skin assessments every 2 hours
- ✔ Use a quick-release knot (slip knot or half-bow)
- ✔ Offer **ROM** (**r**ange **o**f **m**otion) exercises regularly
- ✔ Restraints should be secured to the bed frame, not the side rails
- ✔ Remove restraints as soon as the patient is no longer a risk to themselves or others
- ✔ Offer food, water, & toileting every 2 hours

RESTRAINTS: family education

- ✔ Explain the purpose of restraints and the conditions required for removal
- ✔ Emphasize patient safety and the monitoring protocol in place

RESTRAINTS: documentation

- ➡ Documentation should include:
- ✔ Reason for restraint use
- ✔ Date & time of application
- ✔ Type of restraint applied
- ✔ Safety measures and nursing interventions
- ✔ CMS checks & findings
- ✔ Ongoing assessment of continued need
- ✔ ADLs offered (nutrition, hydration, toileting)
- ✔ Alternatives attempted before use

FIRE SAFETY (RACE & PASS)

RESCUE – remove any patient in immediate danger, prioritizing those in the direct path of the fire. Always protect life first.

ALARM – activate the nearest fire alarm & call 911. Know your facility's alarm locations and emergency numbers.

CONTAIN - close all doors behind you as you evacuate to help contain the fire and limit smoke spread

EXTINGUISH/**E**VACUATE – if the fire is small & manageable, use a fire extinguisher to put it out. If not, evacuate the area immediately.

PULL the pin to break the tamper seal

AIM low, pointing the nozzle at the base of the fire

SQUEEZE the handle to release the extinguishing agent

SWEEP from side to side at the base of the fire until it is out

The most important doors to close are the **fire doors**!

MOBILITY

PATIENT ASSESSMENT

FUNCTIONAL MOBILITY

- Refers to a **patient's ability to move & perform daily activities independently**. In nursing, the goal is to support & optimize a patient's safe and independent movement as much as possible.

COMPONENTS OF FUNCTIONAL MOBILITY

1. BED MOBILITY

The patient's ability to move around while in bed, including:

- Rolling from side to side
- Scooting while lying flat
- Moving from lying down (supine) to sitting, and back again
- Scooting along the edge of the bed while seated

2. TRANSFERRING

Moving from one surface to another, which may require assistance or assistive devices:

- Moving from bed to chair, toilet, or wheelchair and back

Assistive devices used for transfers include slide sheets, transfer belts, hoists, sliding boards, & sit to stand lifts

3 AMBULATION

Ambulation is the ability to walk, either independently or with the help of a caregiver or assistive device such as a cane, walker, or crutches

ASSESSING FUNCTIONAL MOBILITY STATUS

- Patients are typically assessed shortly after admission by a physical therapist, who evaluates their ability to move safely using various tools:
  - ✓ **The Timed Up & Go test** (measures time taken to stand, walk a short distance, & sit down)
  - ✓ Muscle strength tests
  - ✓ Range of motion assessments
- Based on these assessments, patients are assigned a mobility level describing the amount of assistance needed from nursing staff:

MOBILITY LEVEL	NURSE ASSISTANCE	PATIENT EFFORT	DESCRIPTION
DEPENDENT	100%	0%	Nurse performs all movement for the patient
MAXIMUM ASSIST	75%	25%	Nurse does most of the work
MODERATE ASSIST	50%	50%	Effort is shared between nurse & patient
MINIMAL ASSIST	25%	75%	Nurse provides minor support
CONTACT GUARD ASSIST	–	–	Hands-on for safety, no active lifting
STAND-BY ASSIST	–	–	Nurse stays close to assist if needed
INDEPENDENT	0%	100%	Patient moves safely without assistance

CAUSES OF IMMOBILITY

- **Traumatic brain injury (TBI)**
- **Spinal cord injury**
- **Neurological diseases:**
  - Amyotrophic lateral sclerosis
  - Parkinson's disease
  - Huntington's disease
  - Multiple sclerosis
  - Cerebral palsy
  - Muscular dystrophy
- **Chronic pain conditions:**
  - Arthritis
  - Spinal stenosis
  - Degenerative disc disease
- **Chronic fatigue from systemic illnesses:**
  - Heart failure
  - Severe **c**hronic **o**bstructive **p**ulmonary **d**isease (**COPD**)

COMPLICATIONS OF IMMOBILITY

- **Deep vein thrombosis (DVT):** blood clots forming in deep veins, usually in legs
- **Pneumonia:** lung infection due to decreased ventilation & secretions buildup
- **Constipation:** slowed bowel motility from reduced activity
- **Pressure ulcers:** skin breakdown from prolonged pressure over bony areas
- **Contractures:** permanent tightening of muscles, tendons, or ligaments restricting joint movement
- **Bone loss:** osteoporosis from lack of weight-bearing activity
- **Muscle wasting:** atrophy and weakness due to disuse
- **Depression:** mental health decline due to reduced mobility & social isolation

This is why it is so important that we get our patients moving as much as possible!

COMMON WEIGHT BEARING ORDERS

Weight-bearing orders are typically written for patients with fractures or those recovering from orthopedic surgery

WEIGHT-BEARING STATUS INDICATES HOW MUCH WEIGHT A PATIENT CAN PUT ON AN AFFECTED LEG OR LIMB DURING MOVEMENT:

ORDER	DESCRIPTION
NON-WEIGHT BEARING	The patient cannot put any weight on the affected leg at all These patients will need to utilize crutches or a knee scooter
TOUCH-DOWN WEIGHT BEARING	Only toes may touch the floor for balance, but no weight is borne
PARTIAL WEIGHT BEARING	The patient can bear 25–50% of their weight with an assistive device
WEIGHT BEARING AS TOLERATED	The patient may put as much weight as comfortable on the affected leg
FULL WEIGHT BEARING	No restrictions; patient can put full weight on the affected leg

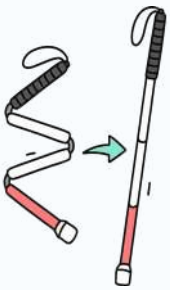
ASSISTIVE DEVICES

CANES

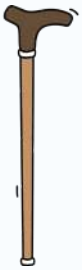
TYPES

"C" CANE

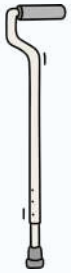
FOLDING CANE



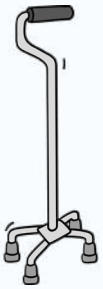
FUNCTIONAL GRIP CANE



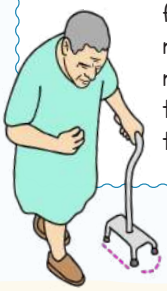
OFFSET HANDLE CANE



QUAD CANE

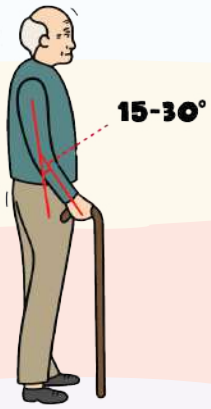


All other canes have a single point of contact with the ground. When using a quad cane, encourage the patient to maintain **all four points of contact with the ground**. Also, teach them to keep the flat side of the cane facing their body, rather than the rounded side, to help prevent tripping.



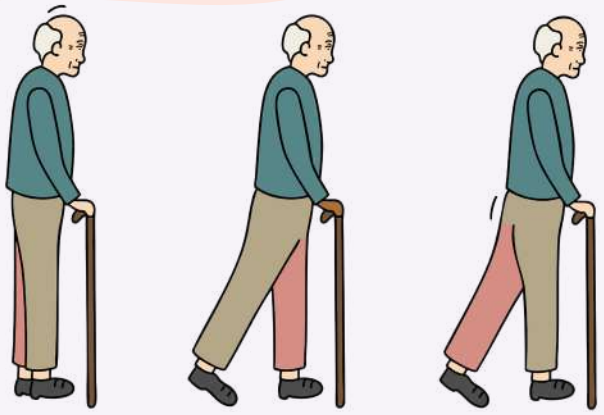
INDICATIONS ➡ Provide support & stability for individuals with weakness, pain, or deformities on one side of the body

PROPER FIT ➡ The cane should be positioned about 4-5 inches from the foot, with the elbow bent at 15-30°, so that the top of the cane aligns with the patient's wrist



HOW TO USE ➡ **AMBULATION**

1. Balance weight on the **strong leg**; advance cane & **weak leg** about 6 inches forward
2. Balance weight on the cane; move **strong leg** slightly past the cane
3. Repeat



The shaded area is the weak leg - the **cane always goes on the strong side**!

"Strong side" = "good side" = "unaffected side"

"Weak side" = "bad side" = "affected side"

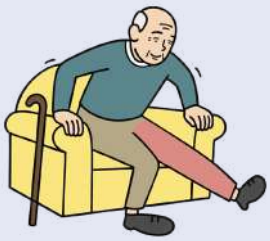
HOW TO USE ➡ **RISING & SITTING**

Standing up

Place **weak leg** forward; balance weight between cane & chair; push up with **strong leg**

Sitting down

Back up to chair; place cane within reach; hold chair arms; lower yourself mainly on **strong leg** & hands



CANES

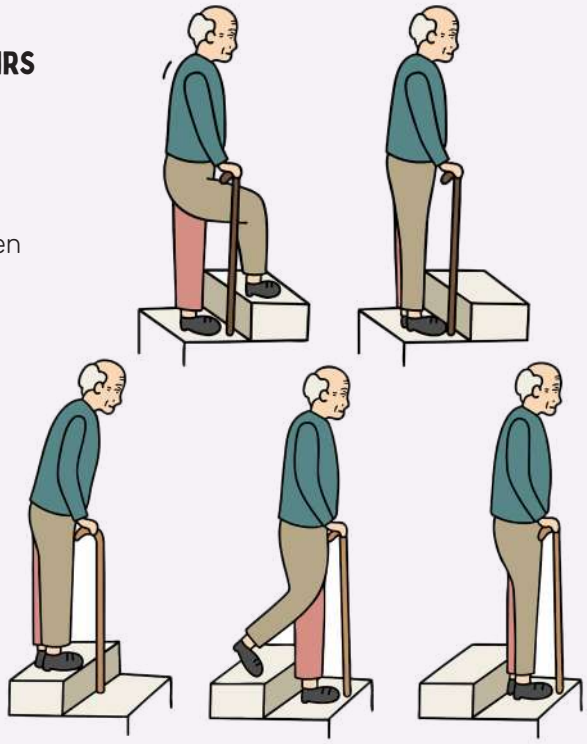
HOW TO USE ➡ STAIRS

Going up the stairs

1. Balance weight evenly at the foot of the stairs
2. Step onto first step with **strong leg**; balance weight between **weak leg** & cane
3. Bring **weak leg** & cane up simultaneously
4. Repeat

Going down the stairs

1. Balance weight on **strong leg**; place cane on step below
2. Step down with **weak leg**
3. Balance weight on cane; step down with **strong leg**
4. Repeat

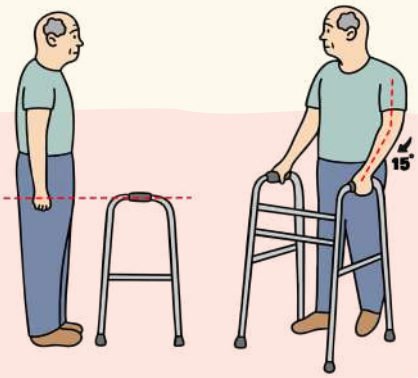


WALKERS

INDICATIONS ➡ Support & stability for balance, weakness, pain, or fatigue

PROPER FIT ➡ With elbows bent 15–30°, wrists should align with hand grips when standing upright

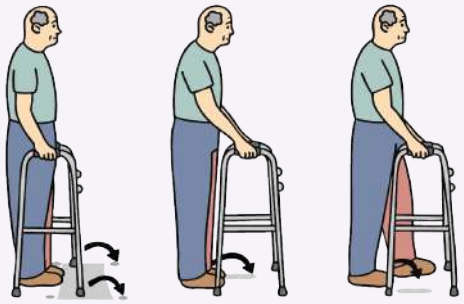
While canes are usually prescribed for patients with weakness or complications primarily on one side of the body, walkers are more often used by individuals who have balance, pain, or weakness affecting both sides evenly



HOW TO USE ➡ AMBULATION

Remain upright while ambulating!

1. Lift & move walker about 6 inches forward while balanced
2. Balance weight on hand grips; move **weak leg** forward
3. Maintain balance on hands, bring **strong leg** forward
4. Repeat



The stepping sequence is important only when one side is weaker than the other; if both sides are equally strong, either leg can lead during movement

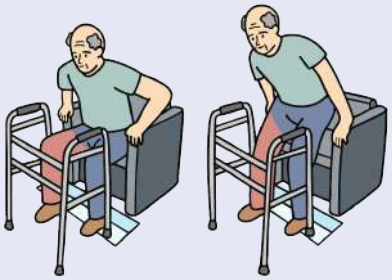
Maintain 4 points of contact!

WALKERS

HOW TO USE ➡ RISING & SITTING

Standing up

Brace chair arms (not walker), push up using arms & **strong leg**, then grasp walker handles



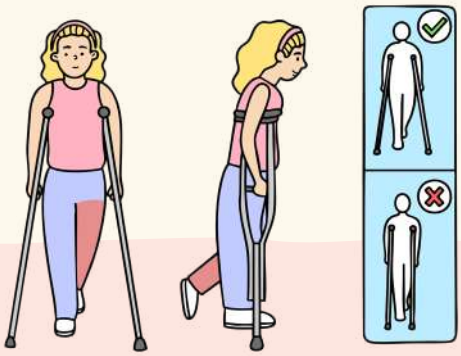
Sitting down

Move walker legs to chair legs; hold chair arms; bend knees and lower yourself with **strong leg** supporting

CRUTCHES

INDICATIONS ➡ Lower extremity injuries limiting weight bearing

Most common indications:
✔ Fractures ✔ Sprains ✔ Strains ✔ Tears ✔ Amputations



PROPER FIT

- ➡ Crutches under arms with 2-3 fingers between axilla & pad
- ➡ Elbows bent 15–30°
- ➡ Hand grips at hip height

If there is less space, the patient is at risk for **brachial plexus compressive neuropathy**, also known as "**crutch palsy**," which can cause numbness, weakness, or even long-term nerve damage in the arms & hands

AMBULATION GAITS

TWO-POINT GAIT

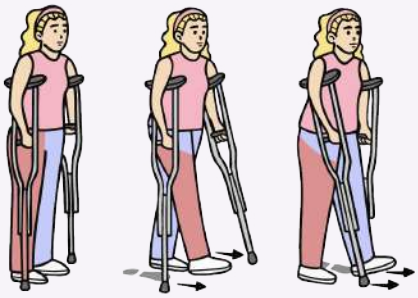
➡ Move **affected leg** & opposite crutch forward together; then **unaffected leg** & opposite crutch; repeat

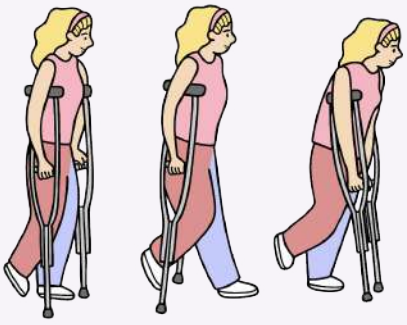
Requires **partial weight bearing on each leg**

THREE-POINT GAIT

➡ Balance on **unaffected leg** & both crutches; move crutches & **affected leg** forward; then **unaffected leg**; repeat

Can be **non-weight bearing on one of the extremities**





CRUTCH AMBULATION TIPS

Starting position:
Place the crutches slightly wider than shoulder-width apart, approximately **4-6 inches from each foot**

Hand placement:
Never rest your weight on your underarms. Instead, support your body using your **hands on the hand grips** with **elbows locked** to prevent nerve compression.

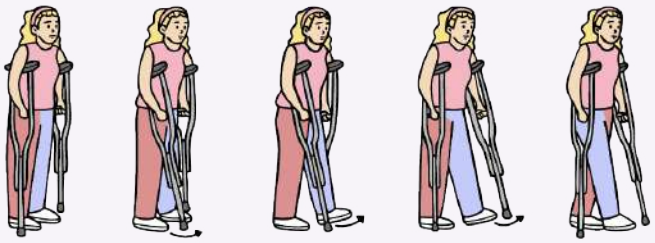
Crutch placement while walking:
Step or swing forward while placing the crutches about **12-18 inches** ahead of you, allowing for **controlled, stable movement**

CRUTCHES

FOUR-POINT GAIT

➡ Move crutch on **affected side**; **unaffected leg**; crutch on **unaffected side**; **affected leg**; repeat

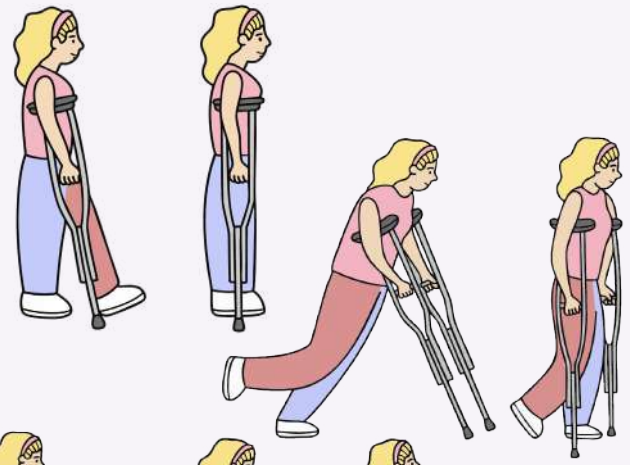
Must be **100% weight bearing on both lower extremities**



ONE CRUTCH GAIT

➡ Place crutch on **unaffected side**; move crutch & **affected leg** forward; bring **unaffected leg** up; repeat

Must be **100% weight bearing on affected leg**



SWING-TO GAIT

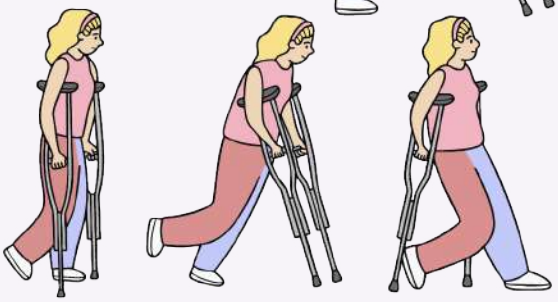
➡ Move both crutches forward; swing legs to crutches; repeat

Can be **non-weight bearing on one of the extremities**

SWING-THROUGH GAIT

➡ Move both crutches forward; swing legs beyond crutches; repeat

Can be **non-weight bearing on one of the extremities**



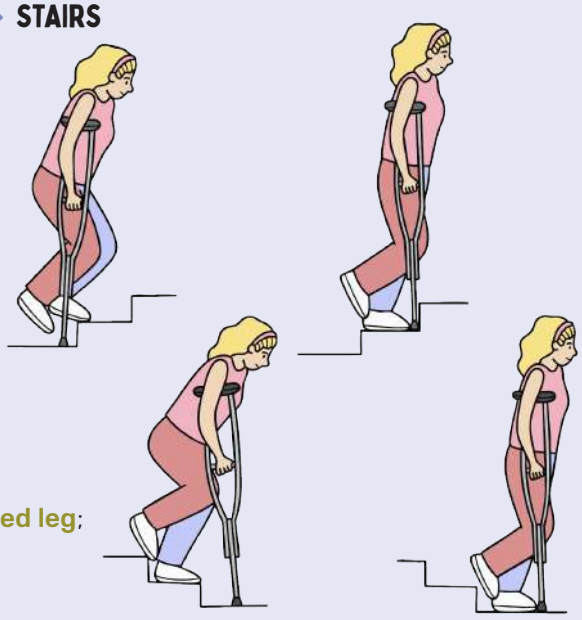
HOW TO USE ➡ STAIRS

Going up the stairs

1. Balance weight on both hands
2. Step up with **unaffected leg**
3. Step up with crutches & **affected leg**
4. Repeat

Going down the stairs

1. Start balanced on **unaffected leg**
2. Place both crutches on step below
3. Transfer weight to crutches; step down with **unaffected leg**; **affected leg** follows
4. Repeat

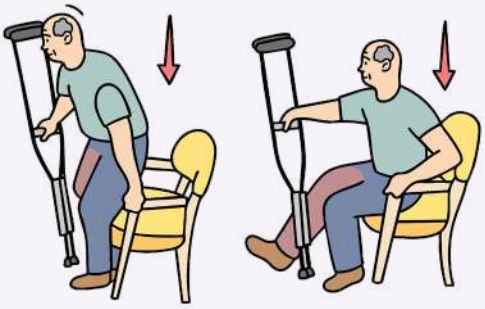


CRUTCHES

HOW TO USE ➡ RISING & SITTING

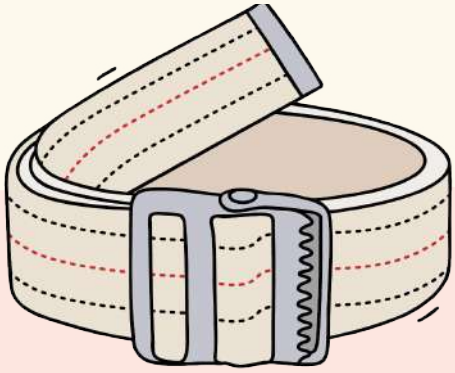
Standing up
Hold crutches on **unaffected side**; move to seat front; grip chair arm; push up with crutches & **strong leg**

Sitting down
Hold crutches on **affected side**; grip chair arm with hand on **unaffected side**; lower yourself slowly supporting weight on chair & strong leg



GAIT BELTS

INDICATIONS ➡ Used for patients who are **full weight-bearing** but at risk of falling due to balance, coordination, or strength impairments



PROPER FIT ➡ The belt should be **snug but not tight** - you should be able to comfortably fit **one finger** between the belt and the patient's body

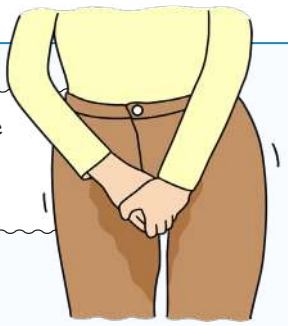
HOW TO USE

- ➡ Use proper body mechanics: bend at the knees and lift with your legs when assisting the patient from sitting to standing
- ➡ Let the patient set the pace - encourage slow, controlled ambulation
- ➡ Walk slightly behind and on the weak side of the patient
- ➡ For low fall risk patients, use one hand on the belt
- ➡ For higher fall risk, use both hands - one in front and one in back

Always prioritize patient safety and comfort when using a gait belt. Stay close, communicate clearly, and be ready to support the patient if their balance changes unexpectedly. Remember - the goal is to promote independence while preventing injury for both patient and caregiver.

IMPAIRED URINARY ELIMINATION

WHAT IS IT?



Impaired urinary elimination is not a kidney problem. In these cases, the kidneys function normally & produce urine. The issue lies in the body's ability to store or expel urine, such as with incontinence or retention. This differs from kidney disease or failure, where the kidneys can't filter waste and may require dialysis.

The **inability to effectively pass urine**, resulting in either:

1 Urinary incontinence
➔ inability to control urination

2 Urinary retention
➔ inability to fully empty one's bladder

Impaired urinary elimination can be either **temporary** (e.g. due to infection or post-surgery effects) or **permanent** (e.g. from neurological damage or chronic conditions)

Urinary retention can be either:
- **Complete** - the bladder cannot empty at all
- **Incomplete** - the bladder partially empties but retains residual urine

URINARY INCONTINENCE

MAJOR RISK FACTORS

- Age (especially women over 50)
- UTIs
- Pregnancy
- Enlarged prostate
- Neurogenic bladder
- Constipation

COMPLICATIONS

- Skin breakdown
- Shame, embarrassment
- Social withdrawal/ isolation

TREATMENT

Treatment focuses on identifying the cause, supporting bladder function, & improving the patient's quality of life

KEGEL EXERCISES
- Strengthen pelvic floor muscles to improve bladder control

BLADDER TRAINING (TIMED VOIDING)

Goal: gradually increase voiding intervals to 2-4 hours between episodes

- Start with short intervals (30 - 45 minutes) and gradually increase over time

MEDICATION

MOST COMMON: oxybutynin

- Anticholinergics to reduce bladder spasms

SURGERY
- Sling procedures to help provide support to the urethra which prevents urinary leakage

CATHETERS

- **Indwelling:** Foley catheters
- **External:** PureWick (female), condom catheter (male)

Indwelling catheters should be a **last resort** due to their high risk of infection, especially with long-term use. This is called a **c**atheter-**a**ssociated **u**rinary **t**ract infection (**CAUTI**).

NURSING CARE

PATIENT EDUCATION

- Maintain a healthy weight
- Limit caffeine
- Avoid fluids before bedtime
- Don't lift heavy objects (helps with stress incontinence)
- Take diuretics in the morning

URINARY RETENTION

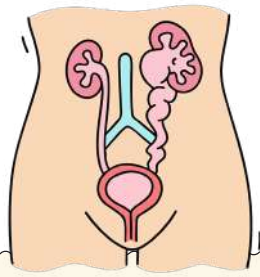
MAJOR RISK FACTORS

- Enlarged prostate
- Spinal cord injury
- Recent removal of indwelling catheter
- Urethral stricture
- Kidney stones

COMPLICATIONS

- Hydronephrosis/hydroureter

These conditions occur when **urine builds up** due to **urinary retention**:
Hydronephrosis: swelling of the kidneys
Hydroureter: swelling of the ureters



- UTI
- Kidney damage
- Bladder damage
- Kidney stones

Stagnant urine can crystallize & form stones

TREATMENT

CATHETERS

- Foley catheter
- Intermittent (straight) catheter
- Suprapubic catheter

BLADDER TRAINING

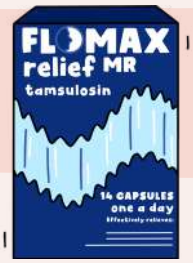
- Timed voiding (for overflow incontinence)
- Double voiding: urinate, pause briefly, then try again to empty residual urine

EXERCISES

- Kegel exercises to strengthen bladder-contracting muscles

MEDICATIONS (FOR ENLARGED PROSTATE)

- Alpha blockers (e.g. tamsulosin)
- 5-alpha reductase inhibitors (e.g. finasteride)



SURGERY

- **Enlarged prostate**
  - ✓ **T**rans**u**rethral **r**esection of the **p**rostate (**TURP**)
  - ✓ Prostatectomy
- **Kindey stones**
  - ✓ Ureteroscopy
  - ✓ Percutaneous nephrolithotomy

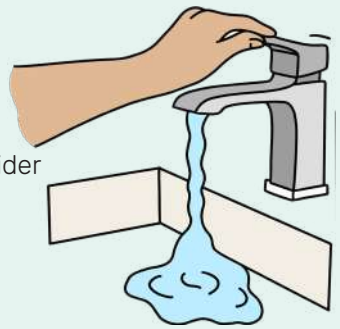
PROCEDURES

- Urethral stricture: urethral dilation
- Kidney stones: lithotripsy

NURSING CARE

PATIENT EDUCATION

- Provide privacy to help the patient relax
- If retention is suspected, perform a bladder scan and report results to the Provider
- Try non-invasive techniques to stimulate urination:
  - ✔ Run water in the sink
  - ✔ Have the patient place their hand in warm water
  - ✔ Apply gentle pressure over the bladder while the patient attempts to void



URINARY DEVICES

EXTERNAL URINARY COLLECTION DEVICES

Non-invasive collection devices used to support patients in managing urinary elimination - either independently or with nursing assistance

➡ **Urinal/bedpan**

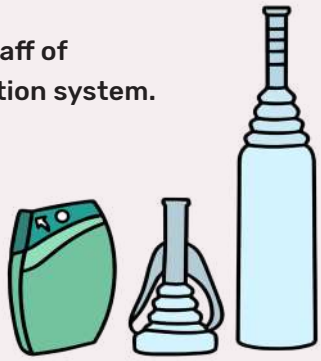
- ✔ Appropriate only for continent patients who are able to void voluntarily
- ✔ If the patient is independent, the device may be kept at the bedside - nursing staff should round frequently & empty as needed
- ✔ For patients who require assistance, ensure they have immediate access to the call light to request help
- ✔ If monitoring intake and output, educate both the patient & family not to discard urine

EXTERNAL INCONTINENCE DEVICES

Designed for patients who are incontinent or unable to consistently notify staff of toileting needs. These devices are worn externally and connected to a collection system.

➡ **Condom catheter (male)**

- ✔ Secured to the penis and connected to a gravity-dependent drainage bag
- ✔ Available in multiple sizes - ensure a proper fit to prevent leakage (if too loose) or skin/circulatory damage (if too tight)



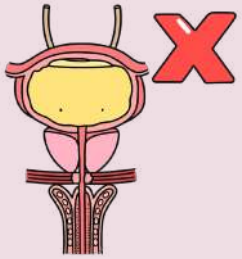
EXTERNAL INCONTINENCE DEVICES

➡ PureWick (female)

- ✔ Placed externally against the perineum and connected via tubing to a suction-based collection system
- ✔ Designed for single-patient, single-use

When using a PureWick, avoid using barrier creams as they can interfere with proper suction and cause leaks or skin breakdown

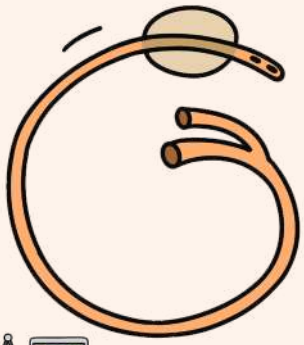
KEY CONSIDERATIONS



- ▶ Not effective for patients with urinary retention
- ▶ May be poorly tolerated in confused or agitated patients, who may remove the device
- ▶ Monitor closely for skin integrity - particularly in long-term use

URINARY CATHETERS (INVASIVE)

These devices involve the insertion of a flexible tube (typically latex, silicone, or Teflon) into the bladder via the urethra under sterile technique



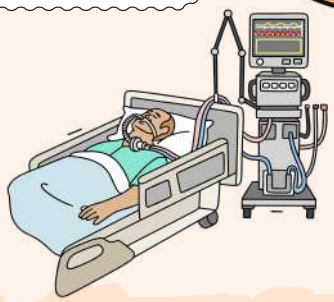
➡ Foley catheter (indwelling)

Used for short- to long-term urinary drainage

Indwelling catheters have a balloon at the tip that is inflated after insertion into the bladder to prevent the catheter from slipping out of the urethra

COMMON INDICATIONS:

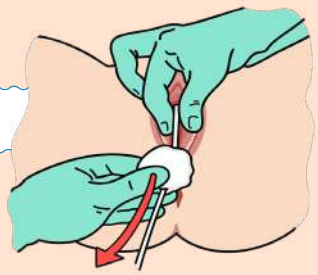
- ✔ Acute or chronic urinary retention
- ✔ Patients undergoing major surgery
- ✔ Precise fluid monitoring (strict I&Os)
- ✔ Sedated, unconscious, or palliative care patients
- ✔ Wound healing requiring dry perineal area (e.g. pressure ulcers)



KEY CONSIDERATIONS

- ▶ Foley catheters carry a high risk of infection (CAUTI)
- ▶ To reduce infection risk:
  - ✔ Avoid use unless absolutely necessary
  - ✔ Consider external alternatives when appropriate (condom catheter or PureWick)
  - ✔ Perform catheter care every shift and after soiling
  - ✔ Ensure gravity drainage (bag below bladder level)
  - ✔ Keep tubing free of kinks
  - ✔ Remove as soon as clinically appropriate

Use soap & water to clean!

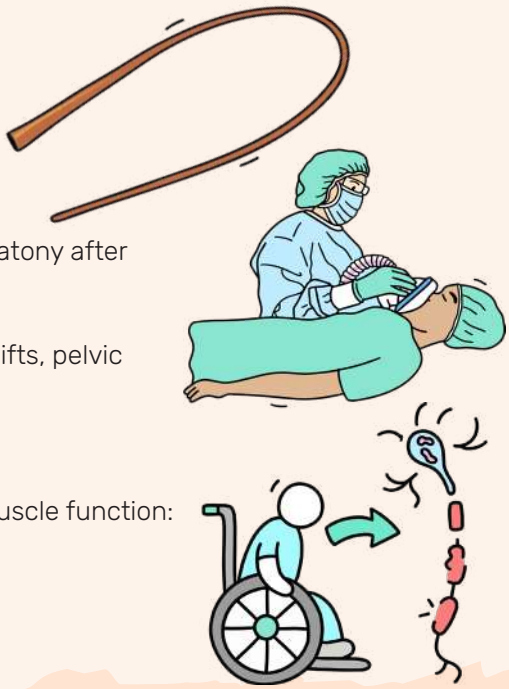


A drainage bag positioned above bladder level or kinks in the tubing can lead to stagnant urine, increasing the risk of infection

URINARY CATHETERS (INVASIVE)

➡ Intermittent urinary catheter

Inserted temporarily to drain the bladder and then immediately removed

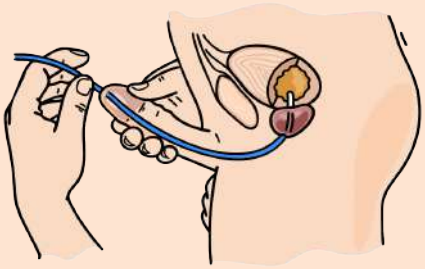


COMMON INDICATIONS:

- **Acute or chronic urinary retention**
  - ✓ **P**ost**o**perative **u**rinary **r**etention (**POUR**): often caused by bladder atony after Foley removal combined with anesthesia effect
  - ✓ **P**ostpartum **u**rinary **r**etention (**PUR**): may result from hormonal shifts, pelvic floor/nerve trauma, or epidural use during childbirth
- **Chronic urinary retention**
  - ✓ Frequently linked to neurological conditions that impair bladder muscle function:
    - Multiple sclerosis
    - Stroke
    - Neurogenic bladder

KEY CONSIDERATIONS

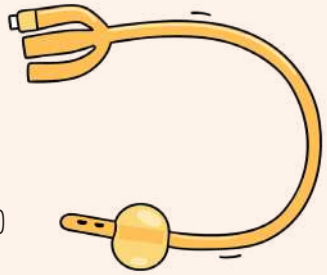
- Lower infection risk compared to indwelling (Foley) catheters
- If more than two catheterizations are needed for acute urinary retention, a Foley may be warranted
- Many patients (especially those with chronic conditions) can be taught to self-catheterize



URINARY CATHETERS (INVASIVE)

➡ Three-way catheter

An indwelling catheter with three lumens: one for urine drainage, one for balloon inflation, & one for **c**ontinuous **b**ladder **i**rrigation (**CBI**)



COMMON INDICATIONS:

- ✓ Postoperative management after **TURP** (**t**rans**u**rethral **r**esection of the **p**rostate)
- ✓ Bladder surgery requiring clot prevention or flushing

KEY CONSIDERATIONS

- Connected to a continuous saline infusion to irrigate the bladder and flush out blood clots
- Uses a larger catheter size (typically 20–24 Fr) to accommodate the additional irrigation lumen
- Duration: usually remains in place for 24–48 hours, depending on clinical need & bleeding control

URINARY CATHETERS (INVASIVE)

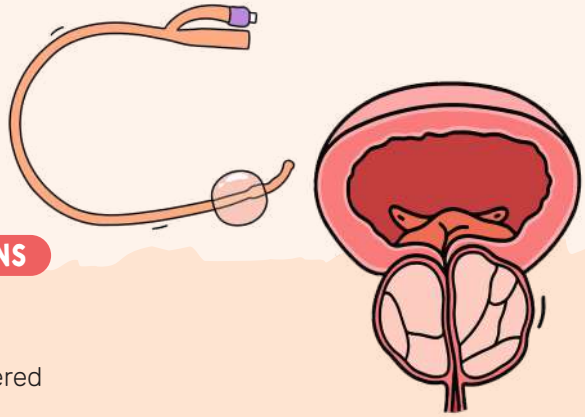
➡ Coude catheter

A catheter with a curved, rigid tip designed for easier insertion in patients with urethral obstruction or narrowing

COMMON INDICATIONS:

- ✓ Urethral stricture
- ✓ Enlarged prostate
- ✓ Post-surgical swelling

A coude catheter should be inserted only by trained nurses using sterile technique, with proper awareness of the curved tip to ensure safe placement



KEY CONSIDERATIONS

- ▶ Can be used as intermittent or indwelling
- ▶ Never force insertion; consult urology if resistance is encountered

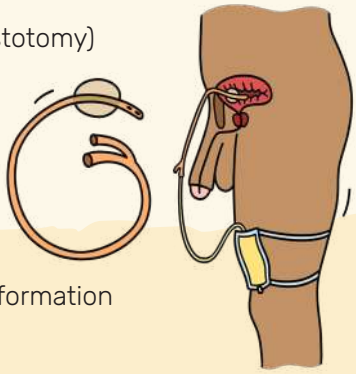
SURGICALLY-PLACED URINARY DIVERSION METHODS

➡ Suprapubic catheter

A catheter surgically inserted into the bladder through a small abdominal incision (cystotomy)

COMMON INDICATIONS:

- ✓ Urinary retention when urethral catheterization is not possible or contraindicated



KEY CONSIDERATIONS

- ▶ Initial catheter remains in place for ~6 weeks during tract formation
- ▶ After healing, monthly catheter changes are standard
- ▶ Flush daily to prevent blockage

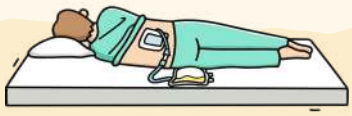
SURGICALLY-PLACED URINARY DIVERSION METHODS

➡ Nephrostomy tube

A catheter inserted directly into the renal pelvis through the lower back to bypass ureteral obstruction

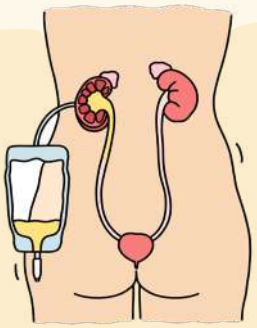
COMMON INDICATIONS:

Urinary obstruction due to: ✓ Kidney stones ✓ Tumors ✓ Infection or inflammation ✓ Scar tissue



KEY CONSIDERATIONS

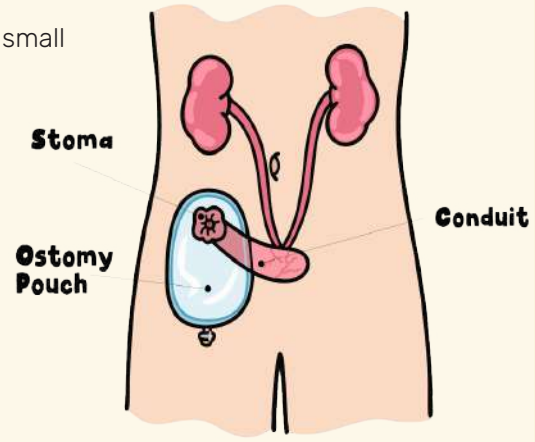
- ▶ Never clamp the tube
- ▶ Irrigate only with a Provider's order
- ▶ Encourage fluid intake (2–3 L/day)
- ▶ Notify the Provider for ➔
  - ✓ Urine leakage around the site (dislodgement)
  - ✓ Back pain or urine output < 30 mL/hr or none for 15+ minutes (possible obstruction)
  - ✓ Signs of infection (fever, chills, redness at site)
  - ✓ Cloudy or foul-smelling urine
  - ✓ Sediment in urine



SURGICALLY-PLACED URINARY DIVERSION METHODS

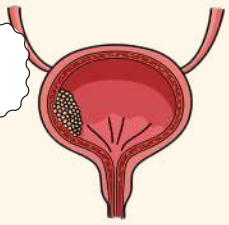
➡ Urostomy

A surgical diversion where the ureters are attached to a segment of the small intestine that exits through a stoma on the abdominal wall



COMMON INDICATIONS:

- ✓ Bladder removal (cystectomy)
  - Most common reason: **bladder cancer**



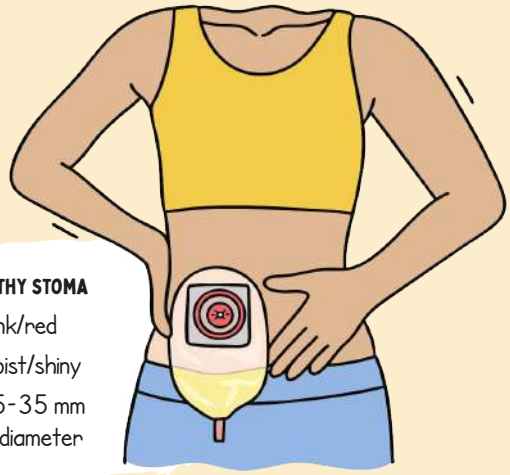
- ✓ Neurogenic bladder
- ✓ Congenital anomalies

The ureter may be surgically connected to a segment of the **ileum** (forming an **ileal conduit**, the most common type) or to the **colon** (known as a **colonic conduit**)

KEY CONSIDERATIONS

- Increase fluid intake to 2–3 L/day
- Monitor stoma for changes in color, shape, & integrity
- Practice meticulous skin care around the stoma (soap, water, pat dry)
- Empty the pouch when 1/2 to 1/3 full
- Replace appliance every 3–4 days or if leaking
- Watch for signs of infection:
  - ✓ Fever, chills
  - ✓ Redness or irritation at site
  - ✓ Cloudy or malodorous urine

Notify Provider immediately if stoma appears dark or dusky



HEALTHY STOMA

- Pink/red
- Moist/shiny
- 25-35 mm in diameter

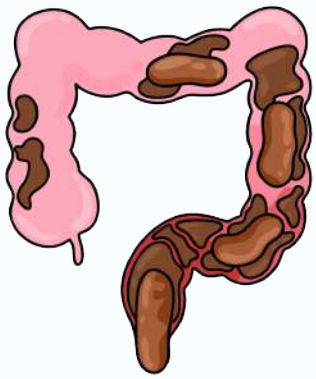
IMPAIRED BOWEL ELIMINATION

WHAT IS IT?

The **inability to effectively pass stool**, leading to either constipation or diarrhea:

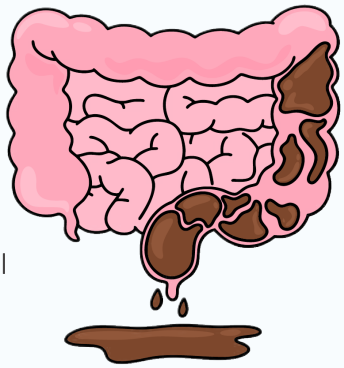
1 Constipation:

Difficulty passing stool, often associated with hard, dry, & infrequent bowel movements



2 Diarrhea:

Frequent passage of loose or watery stools, often accompanied by urgency & abdominal cramping



CONSTIPATION

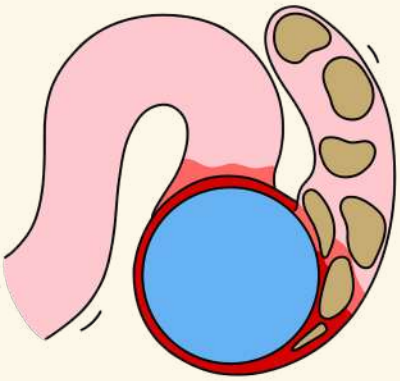
MAJOR RISK FACTORS

- Older age
- Low fiber diet
- Inadequate hydration
- Physical inactivity
- Pregnancy
- Neurological conditions
  - ✓ Parkinson's disease
  - ✓ Multiple sclerosis
- Surgery (e.g. paralytic ileus)
- Medications
  - ✓ Anticholinergics
  - ✓ Iron supplements
  - ✓ Diuretics
  - ✓ Opioids

Occurs when the natural muscular contractions that propel digestive contents forward ("peristalsis") stops

COMPLICATIONS

- Bowel obstruction
- Fecal impaction
- Hemorrhoids
- Rectal prolapse
- Urinary retention



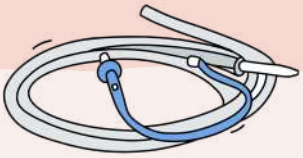
Left untreated, a bowel obstruction can cutoff blood supply (tissue death) and result in a perforated bowel!

TREATMENT

Medications

- Stool softeners (e.g. docusate)
- Laxatives
- Suppositories
- Enemas

Fecal disimpaction (manual removal if impacted)



NG tube or surgery (severe obstruction)

NURSING CARE

PATIENT EDUCATION

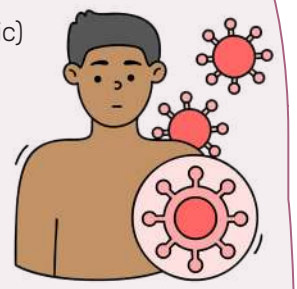
- Increase dietary fiber (fruits, vegetables, whole grains)
- Maintain adequate fluid intake
- Limit dairy
- Exercise regularly
- Eat smaller, more frequent meals
- Go to the bathroom when the urge occurs
- Create a calm, private environment
- Focus on relaxing pelvic floor muscles, not straining

Bearing down (Valsalva) can cause hemorrhoids, bradycardia, hypotension, fainting, & increased intracranial pressure

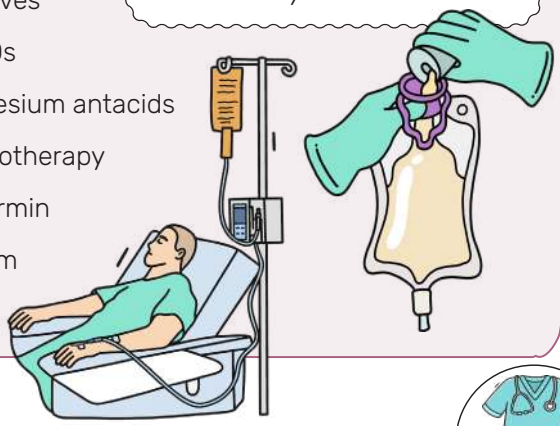
DIARRHEA

MAJOR RISK FACTORS

- Infection (bacterial, viral, parasitic)
- Poor hygiene
- Inflammatory bowel disease (Crohn's disease, ulcerative colitis)
- Stress or anxiety
- Dietary triggers (fatty, greasy, or spicy foods)
- Food allergies or intolerances
- Alcohol, caffeine, nicotine
- Tube feeds (dumping syndrome)
- Radiation therapy
- Medications
  - ✓ Laxatives
  - ✓ NSAIDs
  - ✓ Magnesium antacids
  - ✓ Chemotherapy
  - ✓ Metformin
  - ✓ Lithium



Rapid gastric emptying caused by the introduction of high sugar, high carbohydrate nutrition



TREATMENT

- Medications
  - ✓ Antidiarrheals (e.g. loperamide, bismuth subsalicylate)
  - ✓ Antibiotics & antivirals

Be cautious - antibiotics can increase the risk of developing C. diff infection

- Hydration
- Electrolyte replacement

Mild: PO (water, broth, ice cubes, Pedialyte)
Moderate to severe: IV fluids

- Fecal management system (e.g. rectal tube)

COMPLICATIONS

- Dehydration
- Electrolyte imbalances
- Skin breakdown
- Malnutrition

NURSING CARE

HOSPITALIZED PATIENT

- Monitor
  - ✓ Vital signs
  - ✓ Intake & output
  - ✓ Labs (electrolytes, renal function)
- Assess for signs of dehydration:
  - ✓ Thirst
  - ✓ Dry mucous membranes
  - ✓ Poor skin turgor ("tenting")
  - ✓ Tachycardia
  - ✓ Sunken eyes
  - ✓ Protect the skin – keep clean & dry

PATIENT EDUCATION

- Stay well hydrated
- Practice proper hand hygiene
- Manage stress
- Follow the **BRAT** diet (**B**ananas, **R**ice, **A**pplesauce, **T**oast)
- Avoid spicy, fatty, greasy foods, alcohol, & nicotine
- Ensure all food is cooked to a safe internal temperature

COLOSTOMY & ILEOSTOMY

WHAT ARE THEY?

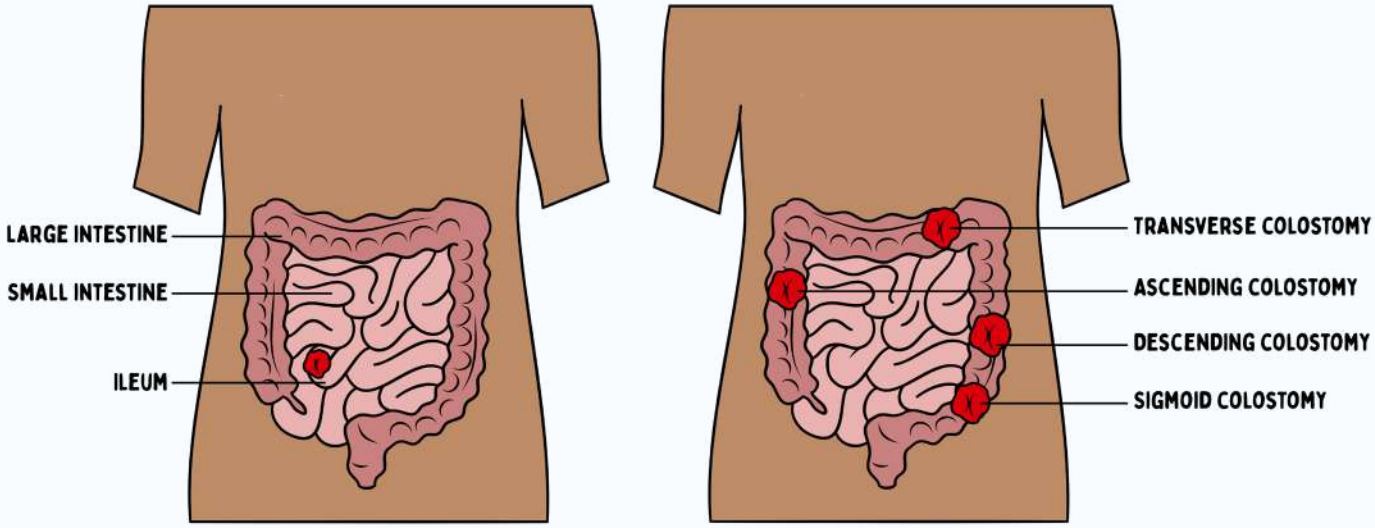
Surgically created **openings in the abdominal wall where a portion of the intestine is brought to the surface of the skin to form a stoma**. This stoma serves as a new pathway for stool to exit the body, bypassing the rectum & anus.

1 ILEOSTOMY

Created from the small intestine (ileum)

2 COLOSTOMY

Created from the large intestine (colon)

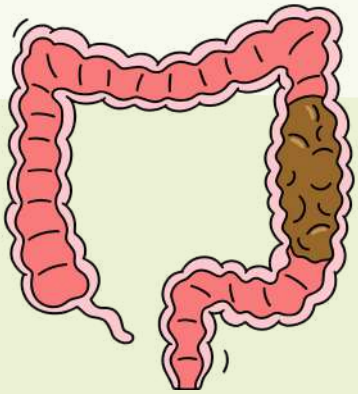


INDICATIONS

Colostomies & ileostomies may be temporary or permanent, depending on the patient's condition and surgical goals:

- **Permanent ostomies** are used when the bowel is no longer viable or cannot be reconnected after a resection
- **Temporary ostomies** allow time for healing and can often be reversed once bowel continuity is restored (**re-anastomosis**)

While some ostomies are intended to be temporary, a patient's condition may change, and the ostomy may ultimately become permanent if reversal is no longer feasible



COMMON INDICATIONS INCLUDE:

- **Bowel obstruction:** diverts stool to prevent buildup behind the blockage
- **Congenital conditions** (e.g. imperforate anus): provides stool diversion until corrective surgery
- **Injury or inflammation** (e.g. IBD, colorectal cancer, diverticulitis): allows the bowel to rest & heal
- **Post-surgical diversion** (e.g. after partial colectomy): protects the surgical site while the anastomosis heals

STOOL CONSISTENCY BY LOCATION

As digestive contents move through the gastrointestinal tract, water is gradually reabsorbed - primarily in the large intestine. Therefore, the location of the stoma directly influences the consistency of the ostomy output.

The further along the GI tract, the more formed the stool!

STOMA LOCATION	STOOL CONSISTENCY
ILEUM	Liquid 
ASCENDING COLON	Semi-liquid 
TRANSVERSE COLON	Loose (semi-formed) 
DESCENDING/SIGMOID COLON	Soft-formed 

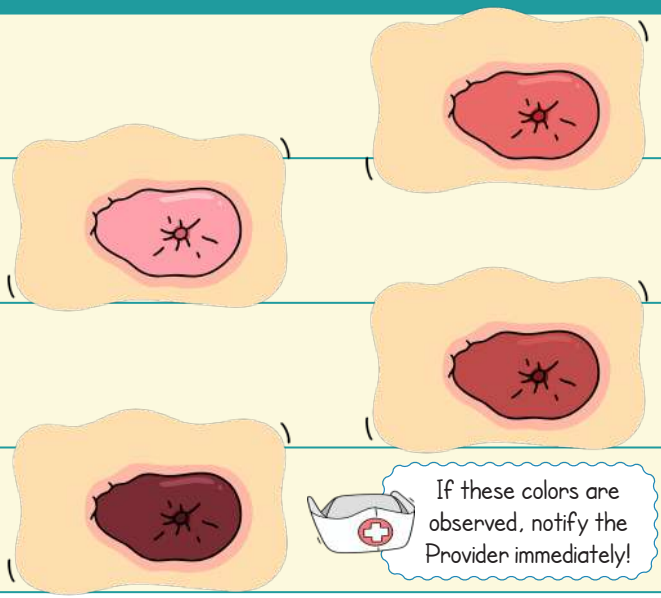
POST-OP CARE

- After surgery, the stoma will typically appear swollen, moist, & may have minor bleeding initially
- Expected color: dark pink to red (indicates healthy, well-perfused tissue)
- **Ostomy output**
  - ✔ Function typically begins within a few days post-op
  - ✔ Initial output may be greenish-yellow, becoming brown over the following weeks
  - ✔ Pus or foul odor may indicate infection - notify the Provider promptly

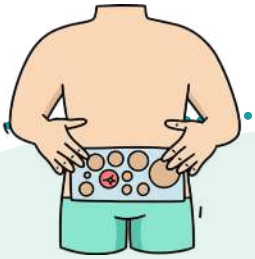
Swelling typically decreases gradually over the first month postoperatively

Patients with new ostomies are at high risk for **disturbed body image** in the immediate postoperative period. Provide empathetic, nonjudgmental emotional support. Encourage open discussion about concerns, offer reassurance, & involve the ostomy nurse or support groups as appropriate.

STOMA APPEARANCE	INTERPRETATION
DARK PINK/RED	Normal, well-perfused
PALE	Possible anemia
DUSKY BLUE/PURPLE	Compromised blood flow
BLACK	Tissue necrosis (dead tissue)



If these colors are observed, notify the Provider immediately!



NURSING CARE

PATIENT EDUCATION

STOMA CARE

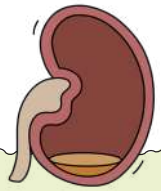
- Measure the stoma using the provided guide; ensure a 1.5 - 3 mm gap between the wafer opening and the stoma to reduce leakage & skin irritation
- Cut the wafer to size and apply it to clean, dry skin
- Press the wafer firmly in place for 3 - 4 minutes, then attach the pouch
- Change the ostomy appliance every 2 - 5 days or when 1/3 to 1/2 full
- Change the pouch in the morning before eating or at least 1 hour after meals
- If leaking occurs, change the appliance immediately
- After removing the wafer, perform a thorough skin assessment of the peristomal area:
  - ✓ Clean with mild soap & warm water
  - ✓ Allow the skin to completely dry before applying a new barrier

Ileostomy pouches generally require more frequent changes than colostomy pouches due to the higher volume and increased enzymatic activity of the output

DIET & LIFESTYLE

- Hydration is essential, especially for patients with an ileostomy
- Follow a low-fiber diet for 6-8 weeks post-op to prevent obstruction
- Chew food thoroughly
- Avoid gas-producing foods (e.g. cabbage, beans, onions)
- Eat small, frequent meals to minimize bloating & gas
- To reduce odor, avoid foods like garlic, onions, cheese, & eggs
- Avoid enteric-coated or extended-release medications, as they may not fully absorb

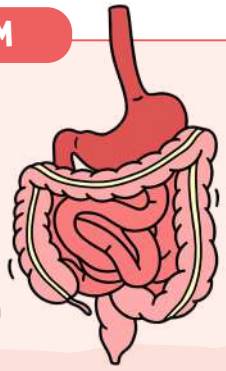
Patients with ostomies are at high risk for dehydration



NUTRITION: GENERAL

NUTRITION OVERVIEW

DIGESTIVE SYSTEM



Function

- ✓ Breaks down food, absorbs nutrients, & eliminates waste
- ✓ Supports energy, growth, repair, immunity, and overall body function

Primary roles

- ✓ **Digestion:** mechanical & chemical breakdown of food
- ✓ **Absorption:** uptake of nutrients into the bloodstream
- ✓ **Immune response:** barrier defense and support of gut microbiota

BODY MASS INDEX (BMI)

$$\text{FORMULA} \rightarrow \text{BMI} = \frac{\text{WEIGHT (KG)}}{\text{HEIGHT (M}^2\text{)}}$$

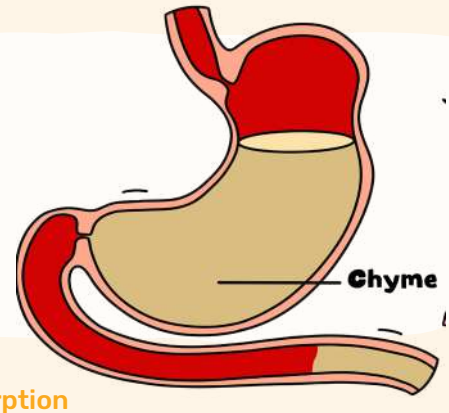
CLASSIFICATION

Underweight	< 18.5
Healthy	18.5-24.9
Overweight	25–29.9
Obesity (Class I)	30–34.9
Obesity (Class II)	35–39.9
Obesity (Class III)	≥ 40

METABOLISM

Digestion

- ✓ **Mouth (oral cavity):** chewing (mastication) forms food bolus
- ✓ **Pharynx & esophagus:** peristalsis propels bolus to stomach
- ✓ **Stomach:** gastric juices (HCl, pepsin) mix food to form **chyme**
- ✓ **Small intestine (duodenum):** chyme mixes with bile (fat emulsification) and pancreatic enzymes (digests carbs, fats, proteins)



Absorption

- ✓ **Small intestine:** villi/microvilli absorb proteins, carbs, fats, vitamins, & minerals ➔ support energy, metabolism, & repair
- ✓ **Large intestine:** absorbs water, electrolytes (Na, K), & vitamins from gut bacteria (vitamin K, some B vitamins) ➔ forms feces

Disorders of the digestive system can impair absorption, cause malnutrition, & increase risk for chronic diseases (obesity, cardiovascular disease, type 2 diabetes, & certain cancers)

ENERGY

ENERGY FROM MACRONUTRIENTS

✓ **Energy in:** calories consumed

✓ **Energy out:** calories used (work, heat, storage)

✓ **Balance outcomes:**

- In = Out ➔ weight maintenance
- In > Out ➔ weight gain (fat storage)
- In < Out ➔ weight loss (glycogen/fat use)

Maintaining energy balance supports metabolic health and overall well-being!

KEY CONCEPTS

CALORIES: energy unit (1 kcal = energy to raise 1 kg of water by 1°C) ➔ in nutrition, "calories" refer to kilocalories (kcal)

BASIC METABOLIC RATE (BMR)

What is BMR?

✓ Minimum energy needed at rest to sustain life (breathing, circulation, temperature regulation, hormone secretion)

Men: 1 kcal/kg/hr

Women: 0.9 kcal/kg/hr

BMR helps determine daily energy needs and guides nutrition/weight management

What increases BMR?

✓ Growth, infection/fever, stress, extreme temps, physical activity, thyroid hormones, male sex hormones

What decreases BMR?

✓ Aging, fasting/starvation, sleep deprivation

ESSENTIAL NUTRIENTS: A SUMMARY

WHAT-ARE-THEY?

Nutrients are **substances the body needs to function properly, grow, & maintain health**. They are divided into **macronutrients** (needed in large amounts) and **micronutrients** (needed in small amounts).

	MACRONUTRIENTS	MICRONUTRIENTS
WHAT ARE THEY?	Nutrients required in **large amounts**	Nutrients required in **small amounts**
FUNCTION	Provide energy, build/repair tissues	Regulate metabolism, support cellular & physiological functions
PROVIDE ENERGY?	Yes	No
EXAMPLES	Carbohydrates, proteins, fats	Vitamins (A, C, D, E, K, B-complex), minerals (iron, calcium, zinc)
DAILY REQUIREMENT	Grams per day	Milligrams (mg) or micrograms (µg) per day
DEFICIENCY IMPACT	Impaired energy, growth, organ function	Specific disorders (anemia, rickets, scurvy)
FOOD SOURCES	Grains, meats, dairy, oils, legumes, vegetables, fruits	Fruits, vegetables, dairy, meats, nuts, fortified foods

MACRONUTRIENTS OVERVIEW

MACRONUTRIENT	FUNCTION	ENERGY	RECOMMENDED DAILY INTAKE
CARBOHYDRATES	Main energy source	4 kcal/g	45-65% of total daily calories
PROTEINS	Growth, repair, tissue maintenance, immune function, fluid balance	4 kcal/g	10-35% of total daily calories
FATS	Long-term energy storage, insulation, organ protection, vitamin absorption	9 kcal/g	20-35% of total daily calories

Carbohydrates are the body's preferred and most efficient energy source. During prolonged fasting or starvation, when carbohydrate stores are depleted, the body begins breaking down protein and fat for energy. Ensuring a balanced intake of complex carbohydrates, lean proteins, and healthy fats supports steady energy levels, preserves muscle mass, and promotes overall metabolic health.

MICRONUTRIENTS OVERVIEW

MICRONUTRIENT	WHAT ARE THEY?	EXAMPLES	FUNCTION	DAILY REQUIREMENT
VITAMINS	Organic compounds essential for metabolic functions; classified by solubility	**Water-soluble:** B-complex (B1–B12), vitamin C **Fat-soluble:** A, D, E, K	Immune support, antioxidant roles, bone health, blood clotting	µg or mg (depending on vitamin)
MINERALS	Inorganic elements for structure, fluid balance, nerve/ muscle activity	**Macrominerals:** Ca, Mg, Na, K, Phos, Cl, S **Trace minerals:** Fe, Zn, Cu, Se, I, Mn, F, Cr, Mo	Bone/teeth structure, fluid balance, oxygen transport, antioxidant defense, hormone production	**Macrominerals:** 100s of mg/day **Trace minerals:** µg–low mg/day

Macrominerals are needed in **larger amounts** to maintain key body functions such as bone strength, muscle contraction, nerve signaling, and fluid balance. These include calcium, phosphorus, magnesium, sodium, potassium, chloride, and sulfur. Trace minerals, though required only in **small amounts**, are just as essential – supporting enzymes, oxygen transport, hormone balance, and immune function. Even slight deficiencies can impact overall health.

MACRONUTRIENTS

CARBOHYDRATES

WHAT-ARE-THEY?

- **Primary role:** main source of energy for the body (4 kcal/gram)
- Types: **simple & complex carbohydrates**
- Broken down into **glucose**, which fuels cells, tissues, & organs
- Help regulate **blood glucose levels** by working with **insulin**
- **Spare protein & fat** from being used for energy when intake is sufficient
- Provide **dietary fiber**, supporting digestion, bowel regularity, & cholesterol control

SIMPLE CARBOHYDRATES

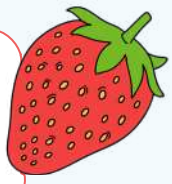
WHAT ARE THEY?

Sugars with one or two units, including **monosaccharides** (glucose, fructose) and **disaccharides** (sucrose, lactose). They are quickly digested & absorbed, causing rapid blood glucose spikes and short-term energy, which may be followed by a crash.

TYPE OF SIMPLE CARBOHYDRATE	DESCRIPTION	DIGESTION	GLYCEMIC INDEX	ENERGY	FOOD SOURCES
MONOSACCHARIDES MEMORY TRICK ("MONO" = ONE) KEY CONCEPTS **GLUCOSE** - main blood sugar and energy source **FRUCTOSE** - fruit sugar; found in fruits & honey **GALACTOSE** - dairy sugar; combines with glucose to form lactose	Single sugar molecules (glucose, fructose, galactose)	Absorbed directly	High	Immediate energy	Fruits, honey, vegetables
DISACCHARIDES MEMORY TRICK ("DI" = TWO)	Two linked monosaccharides (sucrose, lactose, maltose)	Broken down by enzymes (lactase, sucrase) in small intestine	Moderate-high	Rapid but short-lived energy	Table sugar, dairy, malted foods, beer

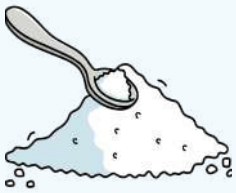
KEY CONCEPTS

GLYCEMIC INDEX (GI): ranks foods by how quickly they raise blood glucose, using glucose or white bread as the reference point with a GI of 100. Low-GI foods help stabilize blood sugar, provide lasting energy, & lower metabolic risk. Patients with diabetes should prioritize low to moderate GI choices, such as oats or lentils, to avoid sharp glucose spikes.



KEY CONCEPTS

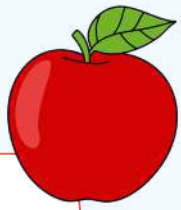
SUCROSE - table sugar; glucose + fructose
LACTOSE - milk sugar; glucose + galactose
MALTOSE - malt sugar; glucose + glucose, from starch digestion



COMPLEX CARBOHYDRATES

WHAT ARE THEY?

Long chains of sugars, including **polysaccharides** & **fiber**, that digest slowly to provide sustained energy and stable blood glucose. They also support metabolic health by improving insulin sensitivity and lowering the risk of metabolic disorders.

TYPE OF COMPLEX CARBOHYDRATE	DESCRIPTION	DIGESTION	GLYCEMIC INDEX	ENERGY	FOOD SOURCES
POLYSACCHARIDES  ("POLY" = MANY)	Long chains of monosaccharides (starch, glycogen, cellulose)	Digested by amylase enzymes	Prolonged energy	Immediate energy	Whole grains, legumes, starchy vegetables 
FIBER (COMPLEX CARB NOT ABSORBED)	Indigestible; aids digestion	Not digested; soluble vs insoluble fiber	Moderate-high	No direct energy; supports gut & glucose regulation	**Soluble:** Oats, barley, apples, legumes **Insoluble:** whole wheat, vegetables, nuts 

KEY CONCEPTS

STARCH - plant glucose storage; energy source

GLYCOGEN - animal glucose storage; quick energy

CELLULOSE - plant fiber; supports digestion

KEY CONCEPTS

SOLUBLE FIBER
➔ Dissolves in water; forms gel-like substance
➔ Slows digestion, stabilizes blood glucose, & lowers cholesterol

INSOLUBLE FIBER
➔ Does not dissolve in water; adds bulk to stool
➔ Promotes regular bowel movements & prevents constipation

KEY CONCEPTS

GLYCOGEN: stored form of glucose in the liver & muscles; provides quick energy during fasting or exercise
GLYCOLYSIS: breakdown of glucose to produce ATP; essential for all cells, especially the brain and red blood cells
GLYCOGENOLYSIS: breakdown of glycogen to release glucose; maintains blood sugar between meals or during exercise

NURSING CARE

- Emphasize complex carbohydrates (whole grains, vegetables, legumes) for sustained energy and stable blood sugar levels
- Educate patients on simple sugars (candy, sugary drinks) causing rapid spikes and crashes in blood glucose; limit intake
- Reinforce that carbohydrates spare protein and fat from being used as energy when intake is adequate
- Encourage dietary fiber intake to promote bowel regularity, cholesterol control, & blood sugar management
- Teach patients with diabetes to monitor carbohydrate intake and choose low-GI foods for better glycemic control
- Advise balancing carbohydrate intake with physical activity to maintain energy balance and healthy weight
- Educate that insufficient carbohydrate intake can lead to fatigue, ketosis, & muscle breakdown over time

PROTEINS

WHAT ARE THEY?

- **Primary role:** build, repair, & maintain **tissues** (muscles, skin, organs, enzymes, hormones, immune cells)
- Provide **energy (4 kcal/gram) if carbohydrate/fat** intake is inadequate
- Help maintain **fluid** and **acid-base balance**
- **Transport molecules** (ex. hemoglobin transports oxygen)

Protein intake is essential for health. Deficiency can lead to muscle wasting, poor wound healing, & edema due to low albumin, while excess protein (particularly in patients with kidney disease) can increase renal workload and worsen kidney function. Encouraging a balanced protein intake is crucial for overall health, with adjustments as needed for medical conditions such as renal or hepatic disease to reduce stress on the kidneys or liver.

KEY CONCEPTS

AMINO ACIDS
➔ **building blocks of protein:**

- **Essential amino acids:** must be obtained from diet (leucine, lysine, methionine)
- **Nonessential amino acids:** can be synthesized by the body
- **Conditionally essential:** needed in illness/stress (e.g., arginine, glutamine)

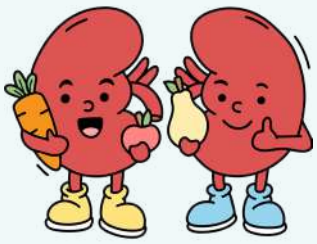
TYPES OF PROTEINS

PROTEIN TYPE	DESCRIPTION	DIGESTION	FOOD SOURCES
COMPLETE PROTEINS	Contain all 9 essential amino acids 	Digested into amino acids in the stomach & small intestine	**Animal sources** (meat, fish, poultry, eggs, dairy); soy, quinoa
INCOMPLETE PROTEINS	Lack one or more essential amino acids 	Same digestion process	**Plant sources** (grains, legumes, nuts, seeds, vegetables)

KEY CONCEPTS

COMPLEMENTARY PROTEINS ➔ formed by combining two incomplete protein sources to provide all essential amino acids
Examples: beans with rice, hummus with pita, peanut butter with whole wheat bread, corn tortillas with black beans, tofu with brown rice

- Encourage patients to consume complete proteins (animal sources or soy) to meet essential amino acid needs
- Pair incomplete plant proteins to ensure intake of all essential amino acids
- Advise patients with renal or hepatic disease to follow modified protein intake as prescribed to reduce organ stress
- Reinforce the importance of balanced protein intake in combination with carbohydrates & fats for overall energy and tissue repair
- Promote adequate hydration when increasing protein intake to support renal function

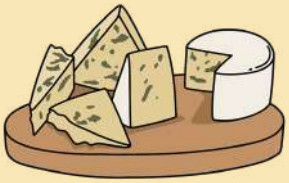
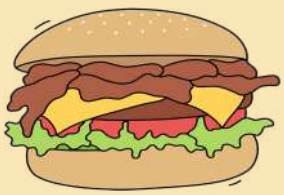


FATS (LIPIDS)

WHAT-ARE-THEY?

- Provide **long-term energy (9 kcal/gram)**
- Support **cell membrane structure, hormone production, insulation,** & **organ protection**
- Aid in absorption of **fat-soluble vitamins (A, D, E, K)**

TYPES OF PROTEINS

LIPID TYPE	DESCRIPTION	HEALTH IMPACT	FOOD SOURCES
SATURATED FATS 	Solid at room temperature; no double bonds	↑ LDL cholesterol = ↑ heart disease risk	Red meat, butter, cheese, coconut oil
MONOUNSATURATED FATS 	Liquid at room temperature; one double bond	Heart-protective; may lower LDL and maintain HDL	Olive oil, avocados, nuts, peanut butter
POLYUNSATURATED FATS 	Liquid at room temperature; multiple double bonds	Heart-protective; supports brain function; includes omega-3 & omega-6	Fatty fish, flaxseeds, walnuts, sunflower oil
TRANS FATS 	Hydrogenated oils; found in processed foods	↑ LDL, ↓ HDL = strongly linked to heart disease	Fried foods, margarine, baked goods
CHOLESTEROL 	Waxy lipid used for hormone & cell membrane synthesis	LDL = ↑ heart disease risk; HDL = protective	Egg yolks, shellfish, meat, dairy

OMEGA-3 FATTY ACIDS

- Type of polyunsaturated fat; anti-inflammatory
- Support heart & brain health; improve lipid profile
- Food sources: salmon, flaxseeds, walnuts, chia seeds

Unlike other lipids, cholesterol is not used for energy!

LOW-DENSITY LIPOPROTEIN CHOLESTEROL (LDL) → "BAD CHOLESTEROL IS LAME"

HIGH-DENSITY LIPOPROTEIN CHOLESTEROL (HDL) → "GOOD CHOLESTEROL IS HIP"

- Emphasize that fats are essential for absorption of fat-soluble vitamins (A, D, E, K)
- Teach patients to limit saturated & trans fats to reduce cardiovascular risk
- Explain the importance of omega-3 fatty acids for anti-inflammatory effects and brain/cardiovascular support

- Encourage unsaturated fats (olive oil, avocado, nuts, fatty fish) for heart health
- Advise moderation in total fat intake to maintain healthy body weight
- For patients with gallbladder disease, discuss possible fat intake restrictions to prevent symptoms
- Educate about reading nutrition labels to identify hidden sources of unhealthy fats in processed foods

MICRONUTRIENTS

VITAMINS

SAY-WHAT?

Organic compounds essential for **normal metabolic function**

Malabsorption syndromes (cystic fibrosis, celiac, Crohn's) ➔ higher deficiency risk

FAT-SOLUBLE

VITAMIN	FUNCTIONS	DEFICIENCY	EXCESS	SOURCES	NURSING CONSIDERATIONS
A (RETINOL, BETA-CAROTENE)	Vision, skin, immune function	Night blindness, dry skin, ↑ infection risk	Liver toxicity, teratogenic in pregnancy	Liver, dairy, carrots, leafy greens	Monitor for toxicity; avoid excess in pregnancy
D (CALCIFEROL)	Calcium absorption, bone health	Rickets (children), osteomalacia (adults), hypocalcemia	Hypercalcemia, kidney damage	Sunlight, fortified milk, fatty fish	Needed for bone healing, fracture prevention; supplement in limited sun exposure
E (TOCOPHEROL)	Antioxidant, protects RBCs	Hemolytic anemia, neuropathy (rare)	Bleeding risk (↑ with anticoagulants)	Vegetable oils, nuts, seeds, greens	Monitor bleeding risk if on warfarin or aspirin
K Antidote to warfarin overdose	Blood clotting, bone health	Bleeding, bruising, hemorrhage	Rare (can interfere with anticoagulants)	Green leafy vegetables, gut bacteria synthesis	Monitor levels if on anticoagulants; newborns need vitamin K injection to prevent hemorrhage

WATER-SOLUBLE

VITAMIN	FUNCTIONS	DEFICIENCY	EXCESS	SOURCES	NURSING CONSIDERATIONS
B1 (THIAMINE)	Carb metabolism, nerve function	Beriberi, Wernicke-Korsakoff	Rare	Whole grains, pork, legumes	Give before glucose in alcohol withdrawal
B2 (RIBOFLAVIN)	Energy metabolism, skin/eyes	Cheilitis, glossitis	None	Milk, eggs, greens	Protect supplements/IV fluids from light
B3 (NIACIN)	Energy, DNA repair	Pellagra: dermatitis, diarrhea, dementia, death	Flushing, liver damage	Poultry, peanuts, grains	Pretreat flushing with aspirin
B6 (PYRIDOXINE)	Protein metabolism, hemoglobin	Microcytic anemia, seizures, neuropathy	Neuropathy	Bananas, poultry, cereals	Give with isoniazid (TB) to prevent neuropathy
B9 (FOLATE)	DNA, RBC formation	Megaloblastic anemia, neural tube defects	Masks B12 deficiency	Leafy greens, beans, citrus	Supplement in pregnancy (400 mcg/day) for fetal neural tube development
B12 (COBALAMIN)	Nerves, RBCs	Pernicious anemia, neuropathy	Rare	Meat, dairy, eggs	Needs intrinsic factor; deficiency in vegans, gastric bypass
VITAMIN C	Collagen, wound healing, iron absorption	Scurvy (bleeding gums, poor healing)	GI upset, kidney stones	Citrus, peppers, tomatoes	Take with iron to ↑ absorption

Alcoholics are at high risk for B-vitamin deficiencies

REMEMBER THE 4 Ds! MEMORY TRICK

Water-soluble vitamins are not stored in the body, require daily intake, & excess is excreted in urine (toxicity uncommon)

MINERALS

SAY-WHAT?

Inorganic elements essential for **structure, enzyme function, fluid balance, nerve & muscle activity**

MACROMINERALS

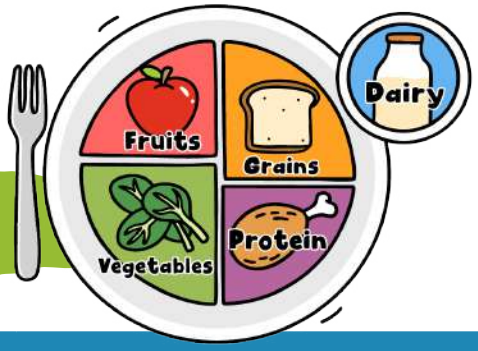
MINERAL	FUNCTIONS	DEFICIENCY	EXCESS	SOURCES	NURSING CONSIDERATIONS
CALCIUM (CA)	Bone/teeth health, muscle contraction, clotting	Osteoporosis, tetany	Kidney stones, constipation	Dairy, leafy greens, fortified foods	Give with Vit D; monitor in thyroid/parathyroid disorders
MAGNESIUM (MG)	Nerve/muscle function, enzyme activity	Tremors, arrhythmias, seizures	Hypotension, respiratory depression	Nuts, whole grains, green veggies	Monitor in renal failure; IV Mg used in preeclampsia
SODIUM (NA)	Fluid balance, nerve impulses	Confusion, seizures	Edema, hypertension	Table salt, processed foods	Restrict in heart failure, hypertension; monitor with diuretics
POTASSIUM (K)	Muscle/nerve function, heart rhythm	Arrhythmias, weakness	Cardiac arrest	Bananas, potatoes, tomatoes	Monitor ECG with abnormal K; use caution in diuretics or renal failure. Never give IV push.
PHOSPHORUS (P)	Bone/teeth, energy metabolism (ATP)	Weakness, bone pain	Hypocalcemia, soft tissue calcification	Dairy, meat, legumes	Inverse relationship with calcium; monitor in renal disease

TRACE MINERALS

MINERAL	FUNCTIONS	DEFICIENCY	EXCESS	SOURCES	NURSING CONSIDERATIONS
IRON (FE)	Hemoglobin synthesis (O_2 transport)	Anemia, fatigue, pallor	Organ damage, constipation	Red meat, beans, fortified cereals	Take with Vit C; avoid dairy/antacids & use straw with liquid form to prevent staining teeth
ZINC (ZN)	Wound healing, immune function	Poor wound healing, impaired immunity	Nausea/ vomiting, immune suppression	Meat, seafood, whole grains	Key for post-op tissue repair
IODINE (I)	Thyroid hormone production	Goiter, hypothyroidism	Hyperthyroidism, thyroid dysfunction	Iodized salt, seafood	Essential in pregnancy for fetal development
SELENIUM (SE)	Antioxidant, thyroid function	Muscle weakness, cardiomyopathy	Hair/nail loss, GI upset	Brazil nuts, seafood	Monitor in thyroid disorders

NUTRITIONAL GUIDELINES

DIETARY RECOMMENDATIONS



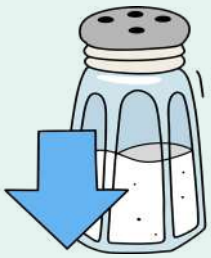
FOOD GROUP	RECOMMENDED INTAKE (ADULTS)	SOURCES	DIETARY GUIDANCE	BIOAVAILABILITY NOTES
PROTEIN	≈ 0.8 G/KG BODY WEIGHT/DAY	Lean meats, poultry, fish, eggs, legumes, tofu, nuts, seeds	Emphasize animal- and plant-based proteins; limit processed/high-fat options	**Animal proteins:** higher bioavailability, higher digestibility, & complete amino acid profile **Plant proteins:** lower bioavailability, lower digestibility, & may need combining for completeness
VEGETABLES	2-3 CUPS/DAY	Leafy greens, broccoli, carrots, tomatoes, beans, peas, squash	Encourage a variety of colors & types; fresh, frozen, or low-sodium canned are all acceptable	Fat-soluble vitamins (A, D, E, K) require dietary fat. Plant iron is less bioavailable than heme iron.
GRAINS	6-8 OZ/DAY	Whole wheat bread, oats, quinoa, brown rice, barley, corn tortillas	Prioritize whole grains; reduce refined/sugar-added products	Phytates may inhibit mineral absorption (iron, zinc); cooking/soaking reduces this effect
FRUITS	1-2 CUPS/DAY	Berries, apples, bananas, citrus, melons, dried fruits	Focus on whole fruits; limit juice and sweetened products	Vitamins & antioxidants highly bioavailable. Vitamin C enhances absorption of plant-based iron.
DAIRY	3 CUPS/DAY	Milk, yogurt, cheese, fortified soy/plant alternatives	Choose low-fat/fat-free; ensure alternatives provide calcium & vitamin D	Dairy calcium & vitamin D are highly bioavailable. Plant alternatives vary by fortification.

Heme iron and vitamin B12 are found only in animal-based foods. Vegetarians & vegans may require supplementation to prevent deficiencies.

NUTRITIONAL STATUS: INFLUENCING FACTORS

FACTOR	DESCRIPTION	EXAMPLES & IMPLICATIONS
PHYSIOLOGICAL	Body processes that affect appetite, digestion, & absorption	Age, metabolic rate, dentition, dysphagia, GI inflammation
GENDER	Sex-specific needs	**Males:** ↑ protein/calorie needs **Females:** ↑ iron during reproductive years
CULTURAL & RELIGIOUS	Beliefs shape diet	Kosher, Halal, vegetarianism, fasting. Always assess individual preferences.
ECONOMIC RESOURCES	Financial ability to access healthy foods	Limited income - ↑ risk of calorie-dense, nutrient-poor diet. Support with SNAP, WIC, Meals on Wheels.
MEDICATIONS	Can alter absorption & metabolism	PPIs - ↓ B12. Opioids - ↓ appetite. Monitor interactions.
SURGERY	Alters GI function	Bariatric surgery, bowel resection → impaired absorption, ↑ needs
ALTERED METABOLIC STATES	Illness changes nutrient demands	Cancer, AIDS, burns, hyperthyroidism - ↑ metabolic needs. Diabetes - altered nutrient metabolism.
ALCOHOL/DRUGS	Displace food intake, damage organs	Alcohol - ↓ thiamine, folate, B12 absorption
PSYCHOLOGICAL	Mental health affects appetite	Stress, depression, eating disorders, medications

- Educate on balanced, nutrient-rich diets
- Encourage long-term healthy eating habits
- Provide patient-specific strategies
- Address poor appetite, nausea, altered intake
- Identify nutritional deficits early
- Monitor for swallowing difficulties & request swallow studies as appropriate to prevent aspiration pneumonia
- Recognize psychosocial risks (food insecurity, isolation)
- Modify diet to support healing
- Teach therapeutic diets:
  - ✓ **Low carb** → diabetes
  - ✓ **Low fat/low sodium** → cardiovascular disease
- Refer to dietitians, speech-language pathologists, & social services

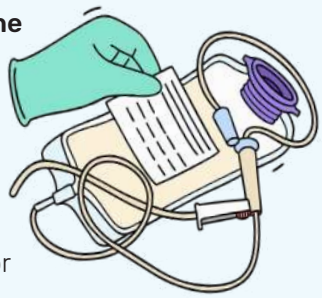


ENTERAL AND PARENTERAL NUTRITION

ENTERAL NUTRITION

WHAT IS IT?

A method of delivering nutrients **directly into the gastrointestinal tract** via a feeding tube. It is used when a patient has a functioning digestive system but cannot meet nutritional needs orally or cannot swallow safely.



PROS

- Supports & maintains normal **GI tract function**
- Closely mimics the **natural physiological process** of eating & digestion
- **Reduces aspiration risk** in patients with impaired swallowing (dysphagia)
- Helps **preserve immune function** by maintaining gut integrity & microbiome balance

CONS

- Risk of **skin irritation or breakdown** at the tube insertion site
- **Aspiration** can occur if feeding is too rapid, tube is dislodged, or incorrectly placed
- **Dumping syndrome** may occur, especially with bolus feeds into the small intestine
- Can cause **diarrhea** or GI intolerance if not well-tolerated

INDICATIONS

- Enteral nutrition is indicated for patients who:
  - ➡ Are unable to consume adequate calories or nutrients orally, **or**
  - ➡ Are unable to swallow safely due to neurological, structural, or critical illness-related conditions
- Enteral nutrition is indicated for a patient who has a functioning gut, but is:
  - ➡ Not able to consume enough calories to meet their nutritional needs, **or**
  - ➡ Not able to swallow safely

- Enteral nutrition is often required for patients with conditions that impair oral intake but allow for GI function, including:

✓ **Mechanical ventilation or heavy sedation** – patient unable to eat independently

✓ **Coma or altered level of consciousness** – unable to protect airway or self-feed

✓ **Neurological disorders** – e.g. stroke, Parkinson's disease, multiple sclerosis, ALS

✓ **Severe malnutrition** – unable to meet nutritional needs through oral intake alone

✓ **Head & neck cancers** – obstructed or painful swallowing

✓ **Severe burns** – increased metabolic demand &/or impaired oral intake

✓ **Upper GI obstruction** – prevents normal passage of food but allows distal feeding

TYPES OF ENTERAL TUBES

NON-SURGICAL (TRANSNASAL OR TRANSORAL):

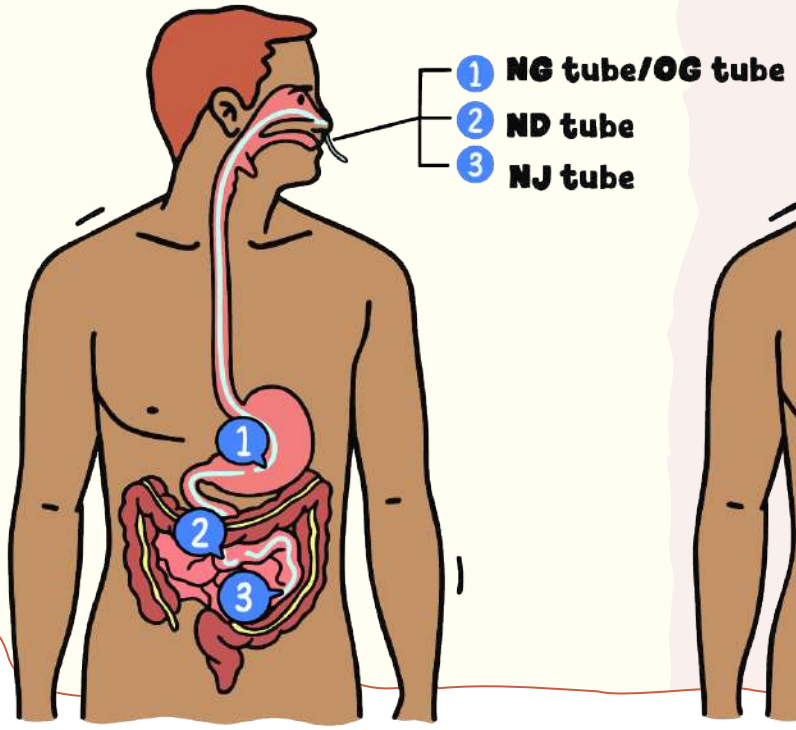
linserted through the nose or mouth and advanced through the GI tract:

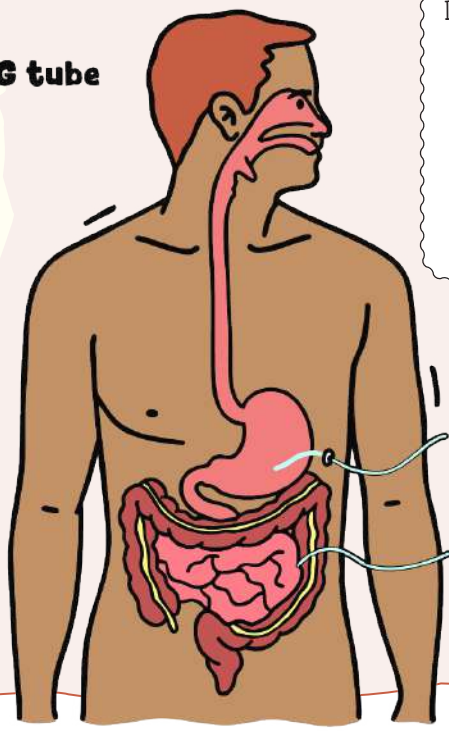
- ➔ **N**aso**g**astric (**NG**) /**o**rogastric **(OG**) tube
- ➔ **N**asoduodenal (**ND**) tube
- ➔ **N**aso**j**ejunal (**NJ**) tube

SURGICALLY-PLACED TUBES:

linserted directly through the abdominal wall into the GI tract:

- ➔ **P**ercutaneous **e**ndoscopic **g**astrostomy (**PEG**) tube
- ➔ **P**ercutaneous **e**ndoscopic **j**ejunostomy (**PEJ**) tube





If a patient is expected to require enteral nutrition for more than 3-4 weeks, a percutaneous feeding tube (e.g. PEG or PEJ) is typically recommended

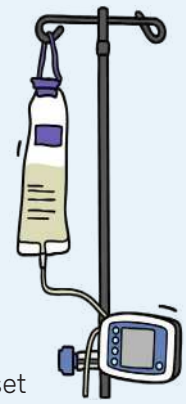
FEEDING METHODS

CONTINUOUS FEEDING

Delivered at a set rate via a pump (e.g. 30–150 mL/hr)

Advantages:

- ✔ Reduced aspiration risk
- ✔ Improved tolerance & absorption
- ✔ Less gastrointestinal upset and glucose fluctuations



BOLUS FEEDING

Larger volumes (200-300 mL) given over 10-15 minutes at scheduled intervals

Advantages:

- ✔ Mimics natural eating patterns
- ✔ Enhances GI motility and protein synthesis
- ✔ No pump required (increased patient mobility)

More commonly used for stable patients who can tolerate larger volumes over shorter periods

TYPES OF ENTERAL FORMULAS

STANDARD (POLYMERIC)

MOST COMMON!

✔ Contains intact proteins, carbohydrates, & fats

✔ Suitable for patients with normal digestion & absorption

Examples:

- Replete
- Nutren
- Isosource

PEPTIDE-BASED (SEMI-ELEMENTAL)

✔ Partially hydrolyzed proteins for easier digestion

✔ Suitable for mild to moderate GI dysfunction (i.e., irritable bowel syndrome, pancreatitis, or gastroparesis)

Examples:

- Impact peptide
- Peptamen

ELEMENTAL

✔ Contains fully hydrolyzed proteins (free amino acids)

✔ Used in moderate to severe GI malabsorption or digestive compromise (e.g. chronic pancreatitis, severe IBD, Celiac disease, & liver failure)

Examples:

- Tolerex
- Vivonex
- Neocate

SPECIALIZED

✔ Formulated for specific medical conditions (can be polymeric, semi-elemental, or elemental)

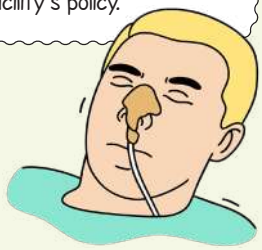
Examples:

- Diabetisource (diabetes)
- Novasource renal (kidney disease)
- Fibersource (malnourished/high protein needs)

NURSING CARE

In intubated patients, the orogastric (OG) tube is sometimes secured to the endotracheal tube; however, this practice is not universally recommended. Always follow your facility's policy.

TUBE PLACEMENT

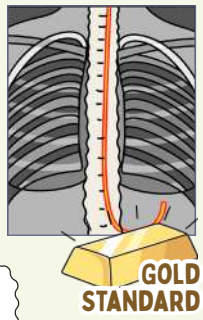


- Secure tube with tape or a commercial device
- Confirm placement before initiating feeding:

It is important to secure the device **before** checking placement

✔ Chest X-ray (the only **definitive** confirmation that the tube is in the stomach)

Instilling air and auscultating over the stomach is no longer considered a reliable method for confirming enteral tube placement and is **not recommended**



A pH of 1-5 indicates gastric acidity and suggests correct tube placement in the stomach

✔ PH testing of gastric aspirate can be used for ongoing verification

- Mark & measure external tube length (in cm) to monitor for displacement

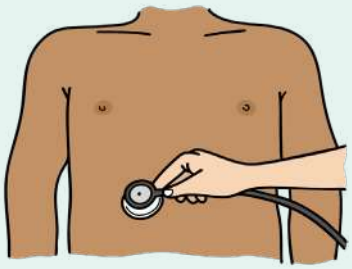
ASPIRATION PREVENTION

If the patient is at high risk for aspiration, it may be more appropriate for a duodenal or jejunal tube

- Maintain the head of the bed in a semi-Fowler's position (30–45°) during feedings and for at least one hour afterward

NURSING CARE

ASPIRATION PREVENTION



- Confirm bowel sounds are present before initiating feeds
- Verify tube placement regularly by measuring and documenting the external length (cm) of the tube every 4 hours
- Advance feeding rate slowly (typically 10–30 mL/hr increments) to promote tolerance
- Check **g**astric **r**esidual **v**olume (**GRV**):
  - ✔ Every 4–6 hours for continuous feeds
  - ✔ Before each bolus feed
- Monitor for oversedation, which increases aspiration risk

- Assess for nausea, which may indicate feeding intolerance

GASTRIC RESIDUAL VOLUME (GRV) GUIDELINES

Hospital protocols and Provider preferences may vary regarding GRV management. However, common practice includes:

If GRV > 500 mL or 1.5–2X the hourly feeding rate:

➔ **Hold tube feeds** and **do not return** the aspirated volume. Notify the Provider.

If GRV < 500 mL or less than 1.5–2X the hourly rate:

➔ **Return the residual** to the patient and continue with feeds as ordered

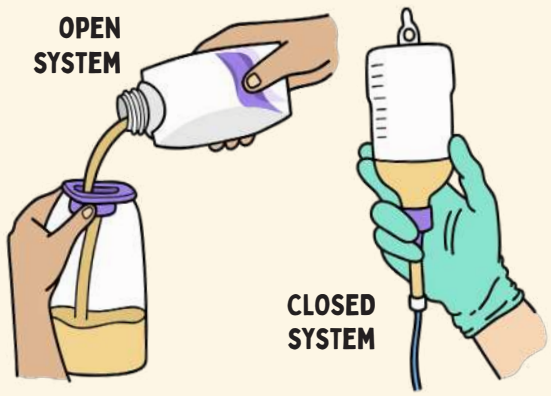
TUBE FEED ADMINISTRATION

Optimal nutrition is essential for healing & recovery. Whenever possible, enteral feeding should be initiated within **24 hours of hospital admission** to support metabolic needs and promote positive outcomes.

- Initiate enteral nutrition as early as safely possible for patients with a functioning GI tract

Remember, always flush the tube with 15-20 mL of water between each medication to prevent drug interactions or clogging. Do not mix medications with enteral feeds - administer each drug separately to ensure safe and effective delivery.

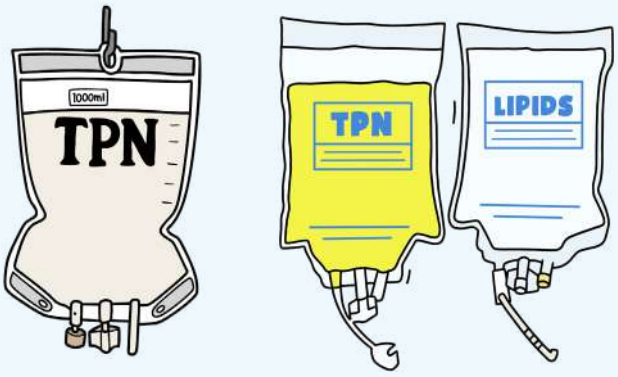
- Flush the tube with 30 mL of water before & after administering feeds or medications to maintain patency
- Closely monitor respiratory status - signs like desaturation, coughing, shortness of breath, or wheezing may indicate aspiration
- Inspect the tube insertion site regularly for signs of skin irritation, breakdown, or infection
- Change administration sets:
  - ✔ Every **24 hours** for **open systems**
  - ✔ Every **48 hours** for **closed systems**



PARENTERAL NUTRITION

WHAT IS IT?

Delivers nutrients **directly into the bloodstream**, bypassing the gastrointestinal tract. It provides macronutrients (carbohydrates, proteins, fats) & micronutrients (electrolytes, vitamins, and trace elements). Lipids may be infused separately or combined in a **t**otal **n**utrient **a**dmixture (**TNA**).



PROS

- Provides **essential nutrition** when the GI tract is non-functional or contraindicated
- **Eliminates aspiration risk**, making it safe for patients with severe dysphagia or high aspiration risk
- Delivers **precisely tailored nutrient formulations** to meet individual needs

CONS

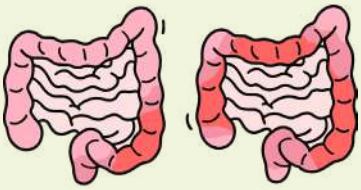
- Increased risk of **central line-associated bloodstream infections (CLABSI)** or **phlebitis (with PPN)**
- Does **not support GI tract integrity** or **microbiome health**
- Greater risk of **electrolyte imbalances** and **fluid shifts**
- May cause **blood glucose fluctuations**, including hyperglycemia or rebound hypoglycemia
- Requires **strict monitoring**, sterile technique, & specialized equipment

Enteral nutrition is always preferred over parenteral nutrition when the gastrointestinal tract is functional

INDICATIONS

Parenteral nutrition is used when enteral feeding is not possible, inadequate, or contraindicated, including:

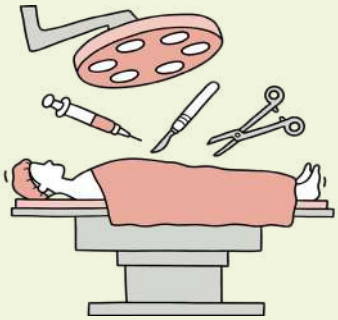
- Severe nausea, vomiting, or diarrhea unresponsive to treatment
- GI malabsorption:
  - Short bowel syndrome
  - Radiation enteritis
  - Crohn's disease
  - Ulcerative colitis



Short bowel syndrome is a condition condition where a significant portion of the small intestine is missing (either surgically removed or congenitally absent), resulting in reduced surface area for nutrient absorption

Radiation enteritis occurs when the intestinal lining is damaged due to radiation therapy, leading to inflammation and impaired nutrient absorption

- Mechanical obstruction of the GI tract
- Paralytic ileus
- Need for bowel rest:
  - Postoperative bowel surgery



  - Severe inflammatory bowel disease
  - Critical illness with severe malnutrition

May be given alongside enteral feeds (called **supplemental parenteral nutrition**) when enteral intake alone is insufficient to meet the patient's full nutritional requirement

TYPES OF PARENTERAL NUTRITION

TOTAL PARENTERAL NUTRITION (TPN)

✔ Formulated to meet **100% of a patient's nutritional needs**

- Carbohydrates (dextrose)
- Proteins (amino acids, vitamins, minerals, electrolytes, H_2O)
- Fat (emulsified lipids)

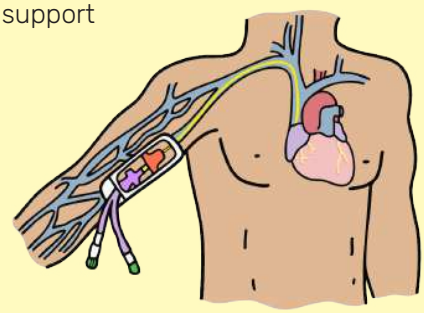
✔ Calorie-dense & contains all macronutrients

includes glucose, amino acids, electrolytes, vitamins, trace elements, & lipids

✔ Requires central venous access

✔ Used for long-term support (> 2 weeks)

For long-term parenteral nutrition, a PICC line is often placed, especially if the patient will be continuing TPN at home



PARTIAL PARENTERAL NUTRITION (PPN)

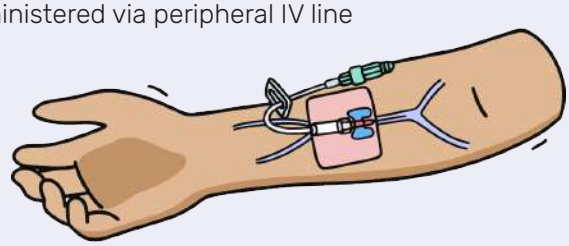
✔ Provides **partial nutritional support**

✔ Less concentrated and may not include all macronutrients

Often given alongside oral intake or enteral tube feeds to help meet increased nutritional needs

✔ Suitable for short-term use (< 2 weeks) and patients with mild to moderate malnutrition

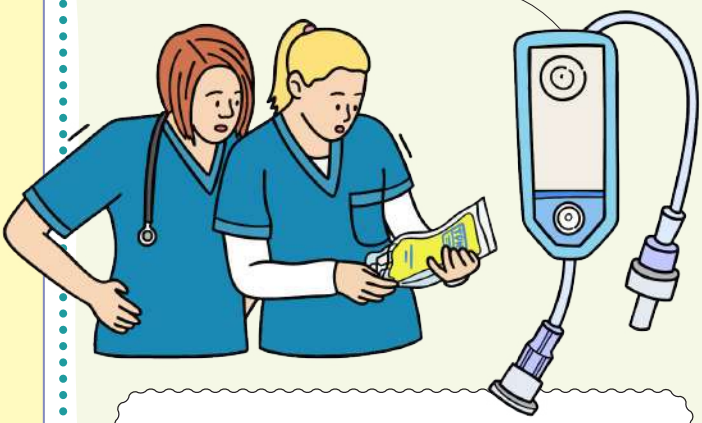
✔ Administered via peripheral IV line



NURSING CARE

ADMINISTRATION

- Always double-check the PN solution with a second nurse
- Infuse on a pump at the prescribed rate
- Change bag & tubing every 24 hours to prevent infection
- Use a 1.2-micron inline filter



If lipids are infused separately, connect them to the main parenteral line **below the in-line filter** to prevent occlusion

MONITORING

- Electrolytes & blood glucose (especially for hyperglycemia)
- Daily weights to assess fluid status and nutritional progress
- **L**iver **f**unction **t**ests (**LFT**s) during long-term TPN
- Intake & output

The fats in TPN can overload the liver over time, leading to "parenteral nutrition-associated liver disease"

SCOPE OF PRACTICE

NURSING PROFESSIONALS

RNS & LVNS/LPNS

	REGISTERED NURSE (RN)	LICENSED VOCATIONAL NURSE (LVN) / LICENSED PRACTICAL NURSE (LPN)
EDUCATION	Graduate of an **ADN** (**A**ssociate **D**egree in **N**ursing) or **BSN** (**B**achelor of **S**cience in **N**ursing) program and has passed the **NCLEX-RN** exam 	Completes a **Practical Nursing Program** and has passed the **NCLEX-PN** exam 
TYPES OF PATIENTS	▶ Cares for **stable** & **unstable** patients **Unstable patients** may include those with: ✔ **Abnormal or fluctuating vitals** (e.g. hypotension, tachycardia, desaturation) ✔ **Critical lab values** (e.g. severe electrolyte imbalances, elevated troponin, low hemoglobin) ✔ **Uncontrolled blood glucose** (e.g. frequent hypoglycemia or DKA) ✔ **Complex clinical conditions** requiring **frequent assessment or titration** of medications (e.g. vasopressors, insulin drips, sedation, or pain management) 	▶ Cares for **stable** patients only **LVNs/LPNs** can perform **focused assessments** (e.g. auscultating lung, heart, & bowel sounds, checking for edema, skin integrity, etc.), but this differs from the **comprehensive, contextualized assessment** performed by the **RN**, which involves clinical judgment, interpretation, & integration of data to guide the nursing process and plan of care 
ASSESSMENT RESPONSIBILITIES	Performs **initial**, **comprehensive** assessments and ongoing evaluations	**Monitors & collects** data, reports significant changes to the RN or Provider
NURSING PROCESS	**Leads** & implements the full nursing process: **ADPIE** (**A**ssessment, **D**iagnosis, **P**lanning, **I**mplementation, **E**valuation)	**Supports** the nursing process by collecting data and performing interventions as directed

	REGISTERED NURSE (RN)	LICENSED VOCATIONAL NURSE (LVN) / LICENSED PRACTICAL NURSE (LPN)
SCOPE OF PRACTICE	The scope of practice for RNs and LVN/LPNs can vary by state based on each state's Nurse Practice Act and Board of Nursing regulations. Always consult your state guidelines and facility policies to determine what tasks are permitted in your location. **BROAD SCOPE** • **Initiates & manages** blood transfusions • Administers **IV push meds** • Manages **titrated drips** (e.g. vasopressors, sedation) • Administers **high-risk IV meds** (e.g. TPN, chemo, potassium via central line) • Prepares & administers **intubation/ paralytic meds** In some states, LVNs/LPNs are permitted to administer IV push medications as well	**NARROW SCOPE** • **Monitors** blood transfusions • Administers most **stable medications** (PO, IM, IV) • Performs **standard sterile procedures** (e.g. catheterization, trach care, NG tube insertion) • Administers **enteral feeds** & **meds** • Performs **oral/nasal suctioning** Exceptions: first dose of an antibiotic & IV narcotics should be administered by the RN only
PATIENT EDUCATION	Provides **initial teaching**, including new diagnoses, procedures, & **discharge education**	**Reinforces** education previously provided by the RN

UNLICENSED ASSISTIVE PERSONNEL (UAP) /CERTIFIED NURSE ASSISTANT (CNA)

AKA "nurse's aide", "nursing assistant", or "nursing tech"

WHAT ARE THEY?

Individuals who have completed a minimum of 75 hours of combined classroom & practical training and have successfully passed a certification exam, enabling them to provide basic patient care, including assistance with **a**ctivities of **d**aily **l**iving (**ADL**s)

It is important to remember that UAPs should only perform care tasks when it is safe to do so. For example, they should not assist with feeding patients who are at high risk for aspiration, nor should they ambulate patients who are hypotensive or otherwise medically unstable.

WHAT IS THEIR SCOPE OF PRACTICE?

Vital signs (routine, stable patients)

I&Os`

Transfers (to & from) commode, bed, stretcher, gurney, chair, or wheelchair

ADLS (bathing, feeding, washing, ambulating)

Linen changes

Hygiene

Express concern (when there is a physical or mental change in the patient)

Log/chart care, vitals, I&Os

Positioning/turns

DELEGATION

5 RIGHTS OF DELEGATION

✓ RIGHT TASK

Ensure the task falls within the scope of practice of the individual, in accordance with state laws and institutional policies

Even when a task is delegated, **the accountability & ultimate responsibility for that task remain with the RN. Delegation does not absolve the RN** from ensuring that the task is completed safely, accurately, & in a timely manner.

✓ RIGHT CIRCUMSTANCE

Confirm the patient's condition is stable and that the person you are delegating to can safely & effectively perform the task given their current workload & responsibilities

✓ RIGHT PERSON

Verify that the individual is competent, trained, & comfortable performing the assigned task

DON'T DELEGATE IF IT REQUIRES TAPE!

TEACHING
ASSESSMENT
PLANNING
EVALUATING

✓ RIGHT DIRECTION/COMMUNICATION

Clearly & effectively communicate the task, including specific instructions, expected outcomes, & deadlines for reporting back

✓ RIGHT SUPERVISION/EVALUATION

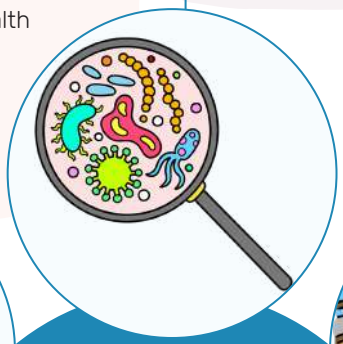
Provide appropriate oversight as needed and ensure the task is completed accurately & safely

PRO TIPS FOR DELEGATION

1. Always delegate tasks respectfully & kindly to promote collaboration and morale
2. Avoid ambiguity by setting clear expectations about what needs to be done, the desired outcomes, & timelines for reporting
3. Monitor progress and provide guidance or mentorship if the individual lacks experience or expertise
4. Offer meaningful, constructive feedback to support professional growth
5. Express genuine appreciation for the contributions of those you delegate to

INFECTION CONTROL

CHAIN OF INFECTION



AGENT: microorganism capable of causing disease (pathogen):
- ✔ Virus
- ✔ Bacteria
- ✔ Parasite
- ✔ Prion

- ✔ Prompt identification of the organism
- ✔ Early treatment (antibiotics, antivirals, antiparasitics, etc.)

SUSCEPTIBLE HOST: a person who is at risk of infection
- ✔ Immunocompromised individuals or those on immunosuppressive therapy
- ✔ Individuals with poor nutrition, multiple chronic conditions, or poor general health
- ✔ Burn patients

- ✔ Identify high-risk patients early and implement protective measures (e.g. reverse isolation)
- ✔ Treat & manage underlying health conditions
- ✔ Ensure vaccinations are up to date

RESERVOIR: the natural environment where pathogens live, grow, & reproduce

- ✔ Humans
- ✔ Animals
- ✔ Food
- ✔ Water
- ✔ Soil

Inanimate objects ("**fomites**")

PORTAL OF ENTRY: the route through which pathogens enter the new host
- ✔ Mucous membranes (eyes, nose, mouth, rectum)
- ✔ Broken skin (wounds, surgical sites, burns)
- ✔ Respiratory tract
- ✔ Gastrointestinal tract

- ✔ Use aseptic techniques during procedures
- ✔ Maintain wound & catheter care
- ✔ Ensure early removal of unnecessary invasive devices (IVs, catheters, tubes)
- ✔ Provide regular oral care (especially for ventilated patients)
- ✔ Promote good personal hygiene

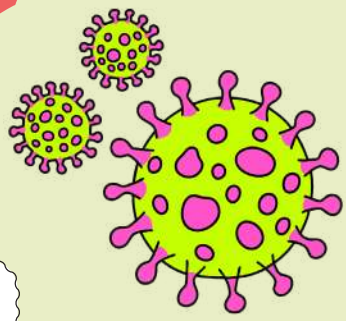
PORTAL OF EXIT: the route by which a pathogen leaves its reservoir
- ✔ Vomit
- ✔ Saliva & secretions
- ✔ Open skin & blood
- ✔ Excretions (urine & stool)

- ✔ Perform hand hygiene
- ✔ Use appropriate PPE – masks, gloves, gowns
- ✔ Control excretions & secretions (e.g. cover coughs, contain waste)
- ✔ Dispose of trash and bodily fluids safely & properly

MODE OF TRANSPORTATION: how the pathogen travels from one host to another
- ✔ **Direct:** person-to-person contact (touching, kissing, sexual contact, bites, needlesticks, droplets, airborne)
- ✔ **Indirect:** contact with contaminated food, water, equipment, or medications (e.g. multi-use vials)

- ✔ Consistent & effective hand hygiene
- ✔ Proper food preparation, storage, & handling
- ✔ Use PPE when indicated
- ✔ Implement appropriate isolation precautions
- ✔ Disinfect & sterilize equipment and surfaces

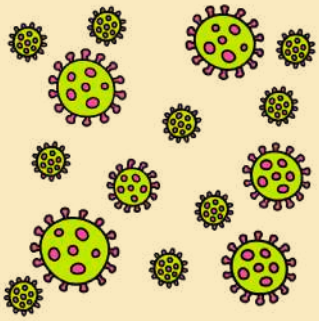
5 STAGES OF INFECTION



1. INCUBATION

- Time between pathogen exposure and the onset of symptoms
- Pathogens begin to replicate, but **no symptoms are present**
- Patient is often unaware of infection

The **incubation period** can vary significantly in duration depending on the specific disease and the individual's immune status



2. PRODROMAL

- Begins with increased pathogen replication and ends with the onset of specific symptoms
- Mild, vague symptoms (e.g. fatigue, malaise) may appear
- **Individual is infectious during this stage**

"I just feel off" or "I have no idea why I am so tired"

3. ILLNESS

- Clinical symptoms become apparent and more severe (e.g. fever, cough, inflammation)
- **Disease is fully developed**
- Patient is clearly ill and highly contagious

The illness stage is when diagnosis is usually made, since hallmark symptoms are most recognizable to Providers

4. DECLINE

- Immune system begins to gain control, decreasing pathogen load
- Symptoms begin to improve, but **patient may still be infectious**
- Immune system is temporarily weakened ➔ increased risk of **secondary infections**

The length of the convalescence phase correlates with the severity & duration of the disease

5. CONVALESCENCE

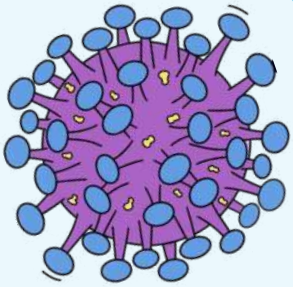
- Recovery & return to baseline health
- Lingering symptoms may persist in some cases
- Chronic complications or organ damage may develop depending on the illness
- Infectiousness varies (some pathogens still shed)

Although the patient's symptoms have resolved, they may still carry enough of the infectious agent to transmit the disease to others

TYPES OF INFECTIONS

1 VIRAL

Microorganisms composed of either DNA or RNA, enclosed within a protein coat

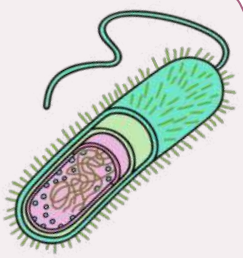


▶ **Examples:**
HIV, influenza, hepatitis

▶ **How does it cause infection?**
Viruses attach to host cells and inject their genetic material, hijacking the host's cellular machinery to replicate. As viral replication increases, the infected cell swells and eventually bursts, releasing new viral particles that go on to infect surrounding cells.

2 BACTERIAL

Single-celled organisms that exist in various environments. While some bacteria (e.g. gut flora) are beneficial, others are pathogenic.



▶ **Examples:** Clostridium difficile (C. diff), Chlamydia trachomatis, & Escherichia coli (E. coli)

▶ **How does it cause infection?**
- ✔ Multiply rapidly, outcompeting healthy cells
- ✔ Release harmful toxins that damage host tissues
- ✔ Directly destroy cellular structures and interfere with normal function

3 PARASITIC

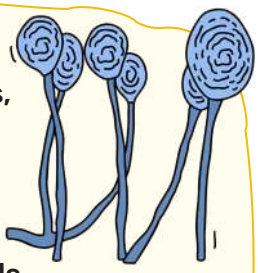
Organisms that live on or inside a host, relying on the host for survival. This category includes protozoa (single-celled) and helminths (multi-celled worms).

▶ **Examples:** Malaria, scabies, lice

▶ **How does it cause infection?**
- ✔ Invade host cells, replicate, & cause cell lysis (like viruses)
- ✔ Release toxins & enzymes that damage tissues (similar to bacteria)

4 FUNGAL

Includes yeasts, molds, mildews, and mushrooms. Some fungi are part of the normal flora but can become pathogenic in immunocompromised individuals.



▶ **Examples:** Athlete's foot, aspergillosis, oral thrush

▶ **How does it cause infection?**
Fungi can invade tissues, disrupt normal cellular function, & release enzymes and toxins that impair host defense mechanisms

"Mycosis" refers to any disease caused by a fungal infection

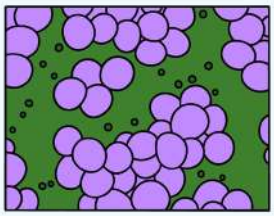
NOSOCOMIAL INFECTIONS

AKA "healthcare-associated infections" or "hospital-associated infections"

WHAT ARE THEY?

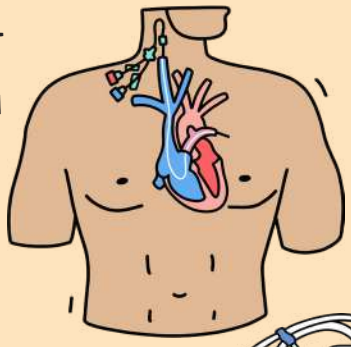
Infections that develop during a hospital stay or healthcare encounter, typically **48 hours or more after admission** and not present at the time of admission

Most common causative organism: *Methicillin-resistant Staphylococcus aureus* (MRSA)

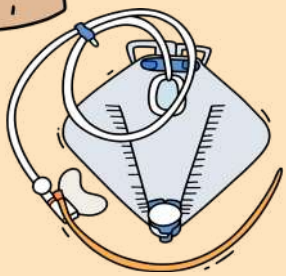


COMMON TYPES

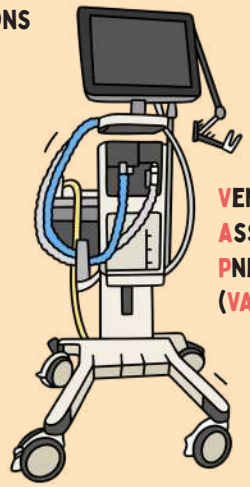
CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTIONS (CLABSI)



CATHETER-ASSOCIATED URINARY TRACT INFECTIONS (CAUTI)



SURGICAL SITE INFECTIONS (SSI)



VENTILATOR-ASSOCIATED PNEUMONIA (VAP)

PREVENTION STRATEGIES

→ Strict hand hygiene before & after patient contact

→ Disinfect & sterilize the environment and all reusable medical equipment

→ Use PPE appropriately

→ Maintain aseptic technique during procedures (e.g. dressing changes, catheter insertions)

→ Encourage & assist with patient hygiene (oral care, handwashing, daily bathing if appropriate)

If the patient is unable to perform these hygiene tasks independently, it is the nurse's responsibility to ensure they are completed

Perform chlorhexidine baths for bed-bound patients

→ Prompt removal of invasive devices (catheters, IVs, central lines, ET tubes, etc.) when no longer medically necessary

→ Avoid placing soiled items on the floor and do not shake out linens

→ Maintain short, clean fingernails; avoid artificial or gel nails in clinical areas

→ Keep long hair tied back or covered to reduce contamination

→ Practice good antimicrobial stewardship by avoiding unnecessary antibiotic use to reduce resistance

While prescribing antibiotics is the responsibility of the Provider, it is crucial for nurses to understand the implications. Overprescribing antibiotics contributes significantly to the emergence and spread of multi-drug-resistant organisms.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

COMMON ITEMS

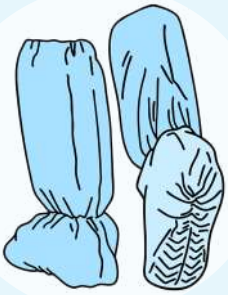
GOGGLES

N95 MASK

GLOVES

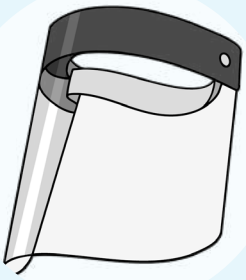
SHOE COVERS

HAIR NET



LEG COVERS

GOWN



FACE SHIELD

DONNING & DOFFING

DONNING PPE

1. HAND HYGIENE

- ✔ Wash hands thoroughly for at least 20 seconds (singing "Happy Birthday" twice)
- ✔ Clean wrists, backs of hands, between fingers, & under nails

WHEN YOU DON, YOU PUT IT ON!

MEMORY TRICK

2. MASK/RESPIRATOR

- ✔ Cover nose & mouth fully
- ✔ Pinch nose band to seal
- ✔ Fit test required for respirators (N95)

Different brands can fit slightly differently

3. GOWN

- ✔ Insert arms into sleeves
- ✔ Fasten ties at neck & waist

4. GOGGLES/ FACE SHIELD

- ✔ Adjust for snug, comfortable fit

5. GLOVES

- ✔ Pull gloves over gown cuffs for complete coverage

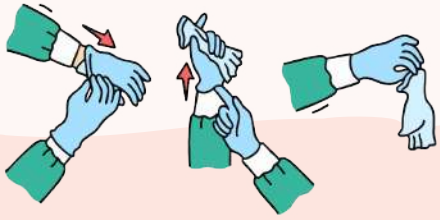
DOFFING PPE

1. GLOVES

- ✔ Peel one glove off by the cuff, avoiding skin contact
- ✔ Hold removed glove in gloved hand, slide fingers under other glove cuff and peel off over the first glove
- ✔ Discard gloves properly
- ✔ Sanitize hands

WHEN YOU DOFF, YOU TAKE IT OFF!

MEMORY TRICK



2. GOGGLES/FACE SHIELD

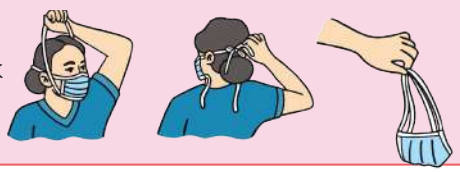
- ✔ Remove by handling headband (face shield) or lateral temples (goggles), avoiding contact with face
- ✔ Disinfect reusable equipment or discard disposable properly

3. GOWN

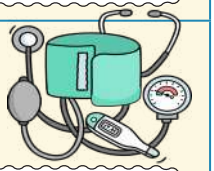
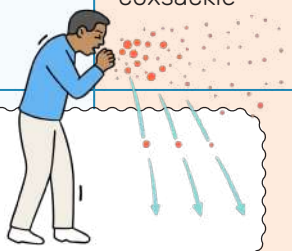
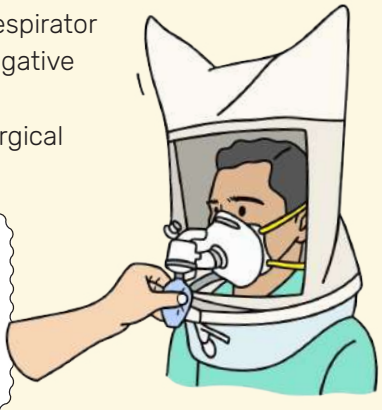
- ✔ Untie or tear ties at neck & waist
- ✔ Pull gown off by touching only the inside, rolling it into a ball
- ✔ Discard appropriately

4. MASK/RESPIRATOR

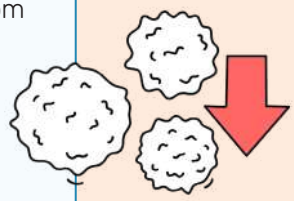
- ✔ Remove elastic bands from bottom, then top, or untie carefully
- ✔ Discard mask properly



INSOLATION TYPES

PRECAUTION	WHAT IS IT?	COMMON EXAMPLES	KEY GUIDELINES
STANDARD PRECAUTIONS 	Universal infection control practices used with **all patients** to reduce the risk of infection	All patients 	✔ Perform hand hygiene before entering the room ✔ Practice respiratory/cough etiquette ✔ Use additional PPE (gown, mask, goggles) based on exposure risk ✔ Wear gloves when touching patients or body fluids ✔ Follow safe injection & sharps practices  **Example:** If a patient is experiencing profuse diarrhea, in addition to wearing gloves, it would be appropriate to don a gown to protect against potential exposure to infectious bodily fluids
CONTACT/ ENTERIC PRE-CAUTIONS 	Prevent the spread of infection through **direct contact** (e.g. skin, surfaces)	MRSA, VRE, HSV, scabies, lice, C. diff, rotavirus, chickenpox 	✔ Wear gown & gloves upon room entry ✔ Use dedicated patient equipment (e.g. stethoscope, thermometer)  ✔ Perform hand hygiene with soap and water (especially for C. diff) ✔ Clean and disinfect equipment thoroughly after use  Hand sanitizer alone is insufficient. These pathogens are resistant to alcohol-based hand sanitizers and require thorough handwashing with soap & water to ensure physical removal of the spores. Wear a mask & eye protection if there is a risk of exposure to respiratory secretions or other potentionally infectious body fluids
DROPLET PRECAUTIONS 	Prevent infections spread by **respiratory droplets** (within ≈ 6 feet)	Influenza A/B, pertussis, rhinovirus, rubella, mumps, coxsackie 	✔ Place a mask on the patient if leaving their room ✔ Wear a surgical mask while in the room ✔ Use a private room if possible  Minimize the amount of time the patient spends outside the room while the infection is active to reduce transmission risk Droplet size: > 5 microns Airborne particle size: ≤ 5 microns Droplet distance: ≤ 6 feet Airborne particle distance: > 6 feet
AIRBORNE PRECAUTIONS 	Prevent infection via **airborne particles** (> 6 feet range, remain suspended)	Tuberculosis, SARS, rubeola (measles), varicella (chickenpox)	✔ Wear a fit-tested N95 respirator ✔ Patient must be in a negative -pressure room (AIIR) ✔ Patient must wear a surgical mask if transported  If an airborne infection isolation room is not available, the patient should be placed in a private room with the door kept closed as much as possible

INSOLATION TYPES

PRECAUTION	WHAT IS IT?	COMMON EXAMPLES	KEY GUIDELINES
NEUTROPENIC PRECAUTIONS/ REVERSE ISOLATION 	Protect **immuno-compromised** patients from outside infections	Patients with **neutropenia** (low WBC count)  **Conditions commonly associated with neutropenia:** Cancer (leukemia), chemotherapy/ radiation, sepsis, lupus, B12 deficiency, HIV, hepatitis, & bone marrow disorders	✔ Perform hand hygiene before entering Because these patients are at exceptionally high risk for infection, hand sanitizer alone is not sufficient ✔ Wear mask, gown, gloves inside room ✔ Keep door closed ✔ Patient must wear a mask when not alone ✔ No fresh fruits, vegetables, or flowers ✔ All food must be thoroughly cooked ✔ No sick staff or visitors allowed  Visitors & family members must also strictly adhere to these precautions to help protect the patient

DISINFECTION

GENERAL RULES

✔ Clean all reusable equipment between each use

✔ Use enough disinfectant wipes to keep surfaces visibly wet for the full recommended contact time 

✔ Wipe in one direction only - **do not wipe back & forth!**

Contact time is the minimum amount of time the disinfectant must remain wet on a surface to effectively kill all the microorganisms listed on the product label

COMMON EQUIPMENT NURSES REGULARLY CLEAN

✔ **GLUCOMETER**
✔ **VITAL SIGNS MACHINES**
✔ **ECG MACHINES**
✔ **IV POLES**
✔ **BEDSIDE COMMODES**
✔ **STETHOSCOPES**
✔ **VEIN FINDERS**
✔ **BLADDER SCANNERS**
✔ **ULTRASOUND MACHINES**
✔ **PERSONAL WORKSTATIONS**

Reusable equipment can quickly become a source of cross-contamination, especially high-touch devices used across multiple patients. Consistent cleaning between each use is essential to prevent the spread of infection.

COMMON DISINFECTANTS

DISINFECTANT COLOR	CONTACT TIME	EFFECTIVE AGAINST
PURPLE TOP	2 MINUTES	Candida auris, Monkeypox, C. difficile, COVID-19
GRAY TOP	3 MINUTES	Monkeypox, COVID-19, Klebsiella pneumoniae, MRSA
ORANGE TOP	4 MINUTES	Norovirus, Monkeypox, C. difficile, COVID-19
GREEN TOP	5 MINUTES	Monkeypox, C. difficile, COVID-19

Does **not** kill C. Diff

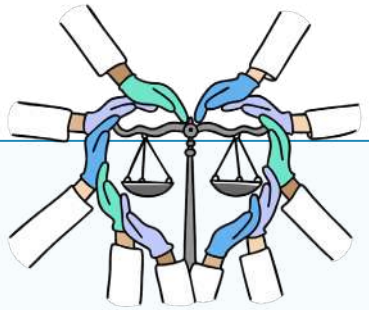
ETHICS & LEGAL ISSUES IN NURSING

PATIENT BILL OF RIGHTS

A PATIENT HAS THE RIGHT TO:

- ✔ Receive respectful & safe care
- ✔ Full privacy & confidentiality regarding their medical information
- ✔ Know the members of their healthcare team and the roles they play in their care
- ✔ Have all medical information explained in understandable terms, including any planned treatments, as well as the associated risks and benefits
- ✔ Refuse treatment or participation in procedures (with an understanding of potential consequences)
- ✔ Have pre-existing chronic conditions managed appropriately during their hospitalization
- ✔ Be informed of the financial implications of any procedures or treatments they receive
- ✔ Create & maintain advance directives (e.g. DNR/DNI orders, living wills, durable power of attorney, or healthcare proxy)
- ✔ Be transferred to another facility if it is safe & practical to do so
- ✔ Be informed of any partnerships or business relationships that may affect their care
- ✔ Refuse participation in research studies or experimental procedures
- ✔ Receive appropriate continuity of care, including adequate information & resources for follow-up care after discharge
- ✔ Understand the hospital's policies related to patient advocacy, including how to file complaints, disputes, or grievances

TORTS



WHAT ARE THEY?

A **tort** in healthcare refers to an act, either **intentional or unintentional**, that **violates a patient's rights** and results in **harm or injury**

INTENTIONAL TORTS

➡ **These are deliberate actions that cause harm or injury to a patient**

ASSAULT: threatening a patient in a way that causes fear of imminent harm

***Example**: Telling a patient, "If you don't behave, I'll tie you down"*

BATTERY: the intentional act of physically harming a patient

***Example**: Striking a patient or performing a procedure without consent*

INVASION OF PRIVACY: violating a patient's right to confidentiality or exposing personal information without consent

***Example**: Sharing a patient's medical information with a nurse who is not assigned to the patient*

FALSE IMPRISONMENT: unjustly restricting a patient's freedom of movement, typically through inappropriate use of restraints

Remember, restraints can be either physical or chemical

***Example**: Using four-point restraints on a confused elderly patient because there are no sitters available*

DEFAMATION OF CHARACTER: making malicious statements about a patient that damage their reputation

***Example 1**: Slander (spoken defamation): saying a patient is "faking" their pain*

***Example 2**: Libel (written defamation): posting on social media about a patient's appearance or personal hygiene*

UNINTENTIONAL TORTS

➡ **These occur when there is a failure to meet the expected standard of care, leading to patient harm**

NEGLIGENCE: failure to meet the minimum standard of care, causing harm to the patient

***Example**: Failing to check on a patient after administering medication, resulting in a fall*

Other common examples

- ✔ Improper use of medical equipment
- ✔ Medication errors
- ✔ Failure to follow Provider orders

MALPRACTICE: a form of negligence specific to healthcare professionals, where actions or inactions fall below the expected standard of practice for the profession

***Example**: Administering the wrong medication or failing to monitor a patient for complications after surgery*

ABANDONMENT: when a nurse deserts or neglects a patient they were responsible for

***Example:** Leaving a patient alone in an emergency situation without ensuring someone else is available to care for them*

NURSES & HIPAA

WHAT IS IT?

The **H**ealth **I**nsurance **P**ortability and **A**ccountability **A**ct, enacted in 1996, is a federal law designed to protect personal medical information. It ensures that health data is not disclosed without a patient's knowledge or consent.

MAIN PROVISIONS

1. PRIVACY PROTECTION

- All medical information must remain confidential
- Patients have the right to:
  - ✔ Access and review their health records
  - ✔ Request corrections
  - ✔ Know who has received their information

2. SECURITY

- Requires safeguards to protect electronic health information:
  - ✔ **Administrative:** policies and staff training
  - ✔ **Technical:** secure software and access controls
  - ✔ **Physical:** protected devices (e.g. password-protected computers)

3. DATA BREACH NOTIFICATION

- Patients must be notified if their data is compromised
- A HIPAA violation occurs if any of these 18 identifiers are shared without authorization:

NAME

ADDRESS

DATES (BIRTH, ADMISSION, DISCHARGE)

TELEPHONE NUMBER

FAX NUMBER

EMAIL ADDRESS

MEDICAL RECORD NUMBER (MRN)

SOCIAL SECURITY NUMBER

HEALTH PLAN BENEFICIARY NUMBER

ACCOUNT NUMBERS

VEHICLE IDENTIFIERS

DEVICE IDENTIFIERS

CERTIFICATE/ LICENSE NUMBERS

URLS

IP ADDRESSES

BIOMETRIC IDENTIFIERS (FINGER, RETINAL, OR VOICE)

FACIAL IMAGES

ANY OTHER IDENTIFYING NUMBERS OR CODES

NURSES & HIPAA

TIPS TO AVOID HIPAA VIOLATIONS

- ✔ Use privacy screens on monitors
- ✔ Shred or dispose of sensitive documents properly
- ✔ Log out of devices when not in use (make sure they are password-protected)
- ✔ Don't leave charts unattended or discuss patient details with uninvolved staff

- ✔ Only access charts for patients under your care
- ✔ Share information only with those authorized by the patient
- ✔ Never post anything patient-related on social media

MANDATED REPORTING

WHAT IS IT?

The **legal obligation** of healthcare professionals, including nurses, to **report any known or suspected instances of abuse, neglect,** or **exploitation** involving **vulnerable individuals** such as children, elderly adults, or dependent adults

COMMON SIGNS OF ABUSE

▶ Unexplained injuries

Contusions, lacerations, bite marks, burns

▶ Abusive partner or caregiver behavior

An abusive partner or parent who tries to dominate the conversation and speak for the patient

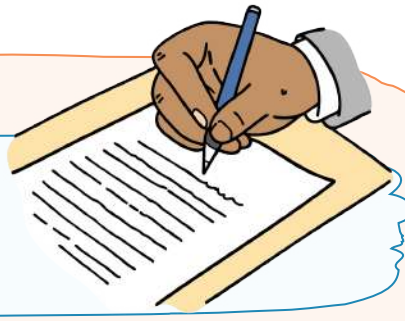
▶ Recurrent emergency room visits

Multiple visits for injuries that seem to be similar or fall within a pattern, suggesting the possibility of ongoing abuse

INFORMED CONSENT

WHAT IS IT?

Informed consent is a medical ethics principle which means that a **patient has received** and **fully understands all relevant information** about a **proposed procedure or treatment** - and **voluntarily agrees to proceed**



WHEN IS IT REQUIRED?

Informed consent is needed for treatments or procedures with significant risk, including:

- ✔ Invasive diagnostics or therapies (e.g. colonoscopy, device implants)
- ✔ Surgery or biopsy
- ✔ Anesthesia or sedation
- ✔ Chemotherapy or radiation
- ✔ Blood transfusions

INFORMED CONSENT

CONDITIONS FOR VALID CONSENT

Before care begins, the following must be met:

- ✔ Patient is 18+ or legally exempt (e.g. emancipated, married/divorced minors, minors with children, active military)
- ✔ Patient is mentally competent & capable of decision-making
- ✔ Information is presented clearly and in language the patient can understand (no unnecessary medical jargon)

Consent must be obtained in the patient's spoken language using a qualified medical interpreter. Family members, staff (unless certified), & translation apps are **not acceptable substitutes**.

Some treatments allow minors to consent without a parent or guardian, including:

- Sexually transmitted infection (STI) treatment
- Medical exams following abuse or sexual assault
- Drug & alcohol abuse treatment
- Pregnancy care & contraception

Patients are not considered mentally competent if they are:

- Disoriented
- Under the influence of drugs or alcohol
- Receiving medications that impair comprehension (e.g. opioids, benzodiazepines sedatives)
- Affected by cognitive disorders (e.g. dementia, Alzheimer's)
- Living with intellectual disabilities (e.g. Down syndrome)

ROLES & RESPONSIBILITIES

Providers must

- ✔ Explain the procedure's purpose, risks, benefits, and recovery process
- ✔ Offer alternative treatments with their risks/benefits
- ✔ Answer all questions before & after consent

Nurses must

- ✔ Witness the patient's signature and confirm it's voluntary
- ✔ Ensure the patient is competent & informed
- ✔ Advocate for the patient and document consent accurately
- ✔ Notify the Provider if new questions arise

RIGHT TO REFUSE

Patients not legally committed have the right to refuse care & leave - known as "leaving **a**gainst **m**edical **a**dvice (**AMA**)"

Nursing responsibilities:

- ✔ Request AMA form signature (document if refused)
- ✔ Remove medical devices safely
- ✔ Provide discharge instructions and contact info
- ✔ Ensure patient has belongings and help with transport if needed

ADVANCE DIRECTIVES

WHAT ARE THEY?

Advance directives are **legal documents** that provide **instructions for medical care** if a person becomes **unable to communicate.** They also designate **who can make healthcare decisions** on their behalf.

TYPES OF ADVANCE DIRECTIVES

DNR/DNI (DO NOT RESUSCITATE / DO NOT INTUBATE)

- Indicates the patient does not want CPR or intubation in the event of cardiac arrest or critical illness

Sometimes, a patient may choose one form of intervention but not the other. For example, they may agree to CPR but decline intubation, or vice versa. It is important to ensure this is clearly documented when determining a patient's code status on admission to the hospital.

LIVING WILL

- Details the treatments a patient does or does not want, such as:
  - ✔ Chemical resuscitation (e.g. vasopressors, inotropes)
  - ✔ Feeding tubes or enteral nutrition
  - ✔ Comfort care measures only

AKA "Health care proxy"

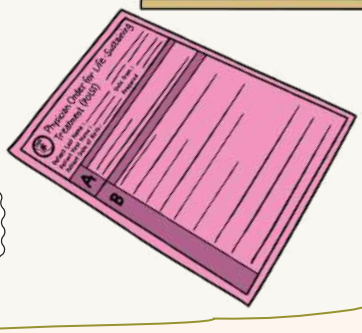
DURABLE POWER OF ATTORNEY (DPOA)

- A legal document naming a person to make medical decisions if the patient becomes incapacitated

PHYSICIAN'S ORDERS FOR LIFE SUSTAINING TREATMENT (POLST)

- A medical order outlining specific treatment preferences, including:
  - ✔ DNR/AND (Allow Natural Death) status
  - ✔ Preferences during coma or vegetative states
  - ✔ Organ & tissue donation wishes

AKA "Health care instructions"



NURSING CARE

- Confirm & document the patient's advance directive and code status on admission
- Ensure the patient knows their right to provide written care instructions
- Notify the Provider and care team of the patient's documented wishes
- Update whiteboards, charts, & electronic health records with the patient's directive and code status

When giving report on a patient, their code status should always be one of the first details communicated to the oncoming nurse

5 STEP NURSING PROCESS (ADPIE)

MEMORY TRICK

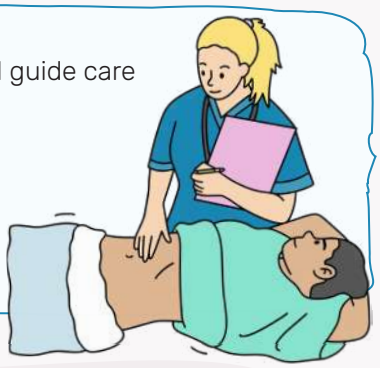
DON'T FORGET TO ADPIE!

ASSESSMENT

WHAT IS IT?

An **ongoing, dynamic process** of collecting **patient data** to form a baseline and guide care

Most data should come from direct observation of the patient, but additional sources can provide valuable insight, including: family members, other healthcare professionals (e.g. physicians, therapists, dietitians), medical records, & current scientific or medical literature



TYPES OF DATA

1. OBJECTIVE DATA

Information obtained through observation and measurable sources

- **Physical traits** (skin color, posture, ethnicity)
- **Appearance** (hygiene, dress)
- **Behavior** (LOC, temperament, speech)
- **Vital signs** (HR, BP, RR, temperature, pain)
- **Measurements** (height, weight, BMI)
- **Diagnostics** (labs, imaging results)
- **Observable symptoms**
(bleeding, vomiting, coughing, diarrhea)
- **Information from medical history & healthcare team**
(nurses, Providers, RTs, PT/OTs, dietitians, social workers)

USE YOU USE YOUR OBSERVATION SKILLS TO GAIN OBJECTIVE DATA!

MEMORY TRICK

We gather most of this information using **head to toe assessment techniques - inspection, auscultation, percussion, & palpation**

SUBJECTIVE DATA CAN ONLY BE ATTAINED & VALIDATED BY THE SUBJECT (PATIENT) THEMSELVES

MEMORY TRICK

2. SUBJECTIVE DATA

Patient-reported information including sensations, feelings, & personal health history

- **Personal details**
(name, age, occupation, religion, address)
- **Physical symptoms**
- **Personal and family health history**
(as described by the patient)

Symptoms are the physical & psychological changes experienced and reported by the patient, while **signs** are objective findings that healthcare professionals can directly observe or measure

When charting subjective data, use the patient's exact words as a direct quote.
Example: *Patient states he has been having "diarrhea that looks like tar."*

Assessment

Types of Assessment

1. Initial: comprehensive assessment done on admission

- ✓ Complete health history, including the chief complaint
- ✓ Head-to-toe physical exam and mental status exam
- ✓ Functional status and social history, including:
  - Ability to perform activities of daily living (ADLs)
  - Usual daily routine
  - Support system and living environment

All assessments include objective data, regardless of the type. Subjective data, however, depends on the patient's ability to self-report. If the patient is incapacitated (e.g. in a coma or under sedation), the assessment will rely more heavily on objective findings.

2. Problem-Focused: targeted assessment of a specific complaint or problem

- ✓ Assessment of the area or system in question should be *focused & thorough*
- ✓ Patient with shortness of breath
- ▶ **Objective:** SpO_2 = 88%, RR = 30, pale & diaphoretic skin, bilateral crackles, CHF history noted
- ▶ **Subjective:** *"I feel like I can't catch my breath," "It gets worse when I lie down," "I ran out of my water pills last week"*

We determine our focused assessment based on the findings from the initial assessment. It helps us narrow in on specific concerns that require further evaluation.

3. Time-Lapsed (Ongoing): repeated at intervals to monitor progress & intervention effectiveness

- ✓ More frequent reassessments for areas related to chief complaint
- ▶ **Example:** Check pain 15 minutes after IV meds, 30 minutes after PO meds
- ▶ **Example:** Hourly neurological exams for head injury; once per shift for UTI

4. Emergency: rapid assessment of vital functions (ABCs) in critical situations

- ✓ Cardiac or respiratoty arrest, unresponsive patients, choking

Diagnosis

What is it?

Clinical **nursing judgment** about a patient's **response** to a **medical condition** or **life process**

➡ **Purpose:** forms the basis of the nursing care plan by identifying problems to address with nurse-driven interventions

➡ **NANDA-I:** standardized list of accepted nursing diagnoses for clear communication and improved outcomes

The problem may be **actual** or **potential**. If the problem is actual, such as a patient experiencing high anxiety before surgery, **immediate interventions** can be implemented, including guided imagery, calming music, or the use of anxiolytics. If the problem is potential, for example a risk of disturbed body image following a planned amputation, **proactive strategies** can be used to help reduce its impact. These may include connecting the patient with amputee support groups, providing educational materials on adaptive fitness, or sharing information about the Paralympic Games.

Diagnosis

Types of Nursing Diagnoses

1. Problem-Focused: based on current S&S

▶ **Examples:** ineffective airway clearance, ineffective breathing pattern, impaired physical mobility

2. Health Promotion: focused on improving health status

▶ **Examples:** readiness for enhanced comfort, readiness for enhanced knowledge, readiness for enhanced nutrition

Requires the patient's willingness to commit to positive lifestyle changes

3. Risk: identifies potential future problems

▶ **Examples:** risk for aspiration, risk for falls, risk for impaired skin integrity

4. Syndrome: clusters related diagnoses treated similarly

▶ **Examples:**

- Frail elderly syndrome (risk for falls, decreased activity tolerance, & impaired physical mobility)
- Post-trauma syndrome (grieving, fear, & hopelessness)
- Chronic pain syndrome (impaired comfort, acute pain, & chronic pain)

Nursing & medical diagnoses are not the same thing - they serve different purposes and are used by different professionals

1 Classification System

Medical diagnoses: use the ICD (International Classification of Diseases) system

Nursing diagnoses: use the NANDA-I taxonomy

2 Focus

Medical diagnoses: focus on identifying a specific disease or pathology

Nursing diagnoses: focus on the patient's response to that disease, condition, or life circumstance

3 Associated Professionals

Medical diagnoses: made by physicians, nurse practitioners (NPs), & physician assistants (PAs)

Nursing diagnoses: made by registered nurses (RNs) and advanced practice RNs (APRNs) such as NPs & CRNAs

Planning

What is it?

The process of setting clear goals & outcomes for patient care

Establish **short-term goals** (achievable quickly) & **long-term goals** (achievable over time)

▶ **Example short-term:** "Patient will have pain ≤ 3/10 within 30 minutes"

▶ **Example long-term:** "Patient will have A1C < 6% in 3 months"

When establishing goals of care, consider **Maslow's Hierarchy of Needs** to guide prioritization, ensuring that the most fundamental physiological and safety needs are addressed before higher-level psychosocial goals

Use SMART Goals:

Specific – clear & unambiguous

Measurable – quantifiable to track progress

Achievable – realistic & attainable

Relevant – aligned with patient's condition and health goals

Time-bound – with deadlines

PLANNING

▶ Example: SMART goal

"For the next 3 days, patient will use incentive spirometer 5x per hour while awake"

▶ Example: not-so-SMART goal

"Patient will use incentive spirometer frequently"

To achieve meaningful improvements in patient outcomes, care plans must be grounded in clearly defined & highly detailed goals

IMPLEMENTATION

WHAT IS IT?

Putting the **care plan** into action with **evidence-based interventions**

TYPES OF INTERVENTIONS

▶ Independent

Nurse-initiated without Provider orders

Example: Teaching the patient to monitor their own vitals

▶ Dependent

Require the authorization of a Provider

Example: Inserting a Foley catheter on the nurse practitioner's order

▶ Collaborative:

Performed with other healthcare team members

Example: Performing range of motion exercises guided by the physical therapist

EVALUATION

WHAT IS IT?

Assessing the **effectiveness** of nursing **interventions** & **goal achievement**

STEPS

▶ Determine if goals were met, partially met, or unmet

▶ If goals are unmet, revise the care plan accordingly

The first question to ask is, "Why were the goals not met?"

▶ If goals are met, document successful completion of care plan

When goals are met, thorough documentation ensures the entire care team recognizes the patient's progress and can adjust future goals appropriately

FOUNDATIONS OF NURSING

HISTORICAL NURSING THEORIES

FLORENCE NIGHTINGALE - ENVIRONMENTAL THEORY (1860)

Nightingale emphasized that a patient's environment significantly impacts their ability to recover from illness. Key environmental factors include clean water, fresh air, warmth, natural light, clean bedding, & proper nutrition.

Florence Nightingale, often regarded as the most influential nurse in history, is recognized as the founder of modern professional nursing. While serving during the Crimean War in the 1850s, she identified a strong connection between poor environmental conditions and the spread of preventable diseases. Her pioneering work in sanitation, hospital design, and data-driven healthcare laid the groundwork for modern epidemiology and public health. In 1860, she further advanced the profession by founding the first formal school of nursing at St. Thomas' Hospital in London, setting enduring standards for nursing education & practice.

HILDEGARD PEPLAU - THEORY OF INTERPERSONAL RELATIONS (1952)

Peplau's theory focuses on the therapeutic relationship between the nurse and the patient. The nurse assumes various roles, such as teacher, counselor, & resource person throughout the interaction. These roles support improved communication, trust, & ultimately better patient outcomes.

VIRGINIA HENDERSON - NURSING NEEDS THEORY (1955)

Henderson proposed that the primary goal of nursing is to assist individuals in meeting their basic health needs, regardless of their condition. For some, this may involve supporting the highest level of independence; for others, it may involve providing comfort and facilitating a dignified, peaceful death.

DOROTHEA OREM SELF-CARE DEFICIT THEORY (1971)

Orem's theory centers on the idea that patients recover more effectively when they are supported in performing their own self-care activities. Nursing is required when individuals are unable to meet their self-care needs, and the nurse's role is to guide, support, or provide care until the patient can do so independently.

STANDARDS OF PRACTICE

WHAT ARE THEY?

Comprehensive guidelines that define the level of **competent care expected from nursing professionals**. These standards serve as a framework for delivering **safe**, **ethical**, & **effective care** across diverse clinical settings.

These standards were developed by the American Nurses Association (ANA), the largest professional nursing organization in the world

AN OVERVIEW OF COMPETENT PRACTICE EXPECTED OF THOSE IN THE NURSING PROFESSION

ASSESSMENT
The systematic process of collecting both objective & subjective data to understand the patient's condition

DIAGNOSIS
The development of nursing diagnoses approved by NANDA-I, based on the assessment findings

OUTCOME IDENTIFICATION
The ability to identify & formulate measurable, patient-centered outcomes that guide care planning

PLANNING
Strategizing interventions & care activities designed to achieve the identified outcomes

IMPLEMENTATION
Executing the care plan by performing interventions aimed at achieving the desired health outcomes

EVALUATION
Continuously assessing the patient's progress toward goals and modifying the care plan as needed

ETHICS
Adherence to the nursing code of ethics, ensuring integrity, accountability, & patient-centered care

ADVOCACY
Consistently acting in the best interest of patients, ensuring their voices are heard and rights protected

RESPECTFUL & EQUITABLE PRACTICE
Delivering compassionate, unbiased care to all patients, regardless of race, culture, background, or beliefs

COMMUNICATION
Demonstrating effective communication skills with patients, families, & the interdisciplinary healthcare team

COLLABORATION
Working in partnership with patients and other health professionals to deliver coordinated & holistic care

LEADERSHIP
Exhibiting leadership behaviors and influencing positive change in the healthcare environment

EDUCATION
Actively pursuing continuing education through certifications, courses, & advanced degrees to enhance knowledge and skills

SCHOLARLY INQUIRY
Integrating current, evidence-based research into nursing practice to improve patient outcomes

QUALITY OF PRACTICE
Committing to excellence by consistently delivering high-quality, safe, & patient-focused care

PROFESSIONAL PRACTICE EVALUATION
Engaging in self-reflection and peer review to assess & improve the quality and professionalism of nursing practice

RESOURCE STEWARDSHIP
Making informed decisions to use healthcare resources wisely, ensuring cost-effective & safe patient care

ENVIRONMENTAL HEALTH
Promoting and practicing environmental sustainability within healthcare to support public & planetary health

NURSING CODE OF ETHICS

PRINCIPLE	WHAT IS IT?	EXAMPLE
VERACITY 	Being honest with the patient without giving false hope or withholding important information	A patient with a devastating spinal injury asks if they will ever walk again. A nurse practicing **veracity** communicates the neurosurgeon's poor prognosis with empathy & care.
FIDELITY 	Remaining faithful to your professional responsibilities -carrying out your duties with skill, competence, & compassion	A patient with a pelvic fracture rates their pain as 9/10. The night resident physician dismisses the pain. A nurse practicing **fidelity** advocates to the attending physician for appropriate pain management.
JUSTICE 	Providing equitable care to all patients regardless of insurance status, race, religion, etc. 	Caring for two patients (one wealthy donor and one uninsured, homeless patient) - the nurse practices **justice** by spending more time with the sicker homeless patient, allocating care based on acuity rather than social status or wealth
BENEFICENCE 	Always doing good for your patient through kindness & compassion	A patient is anxious about a lumbar puncture. While one nurse assists with positioning, another nurse practices **beneficence** by holding the patient's hand and playing their favorite music to provide comfort.
NONMALEFICENCE 	Avoid causing harm to your patient	Before transfusing blood, a nurse practices **beneficence** by double-checking all patient details with another licensed nurse to prevent errors, ensuring patient safety and avoiding harm
AUTONOMY 	Using critical thinking to take direct action for the patient's benefit	A COPD patient experiences shortness of breath before the Provider arrives. The nurse demonstrates **autonomy** by independently raising the patient upright, applying oxygen, and titrating to the appropriate SpO_2 range (88–92%).
ACCOUNTABILITY 	Accepting responsibility for your actions and their outcomes	After administering 4 units of insulin instead of 3, a nurse self-reports the error and documents it properly, exemplifying **accountability** in clinical practice

REGULATORY AGENCIES

BOARD OF NURSING (BON)

- A state-level regulatory body responsible for establishing and enforcing rules & regulations governing the nursing profession within that specific state
- Charged with upholding the **Nurse Practice Act**, as enacted by the state legislature, to ensure safe & competent nursing care

Establish standards of nursing practice:

- ✔ Setting educational standards for approved nursing programs
- ✔ Defining licensure & renewal requirements for all levels of nursing
- ✔ Outlining scope of practice for RNs, LPNs, & APRNs
- ✔ Enforcing disciplinary actions for violations of the Nurse Practice Act

THE JOINT COMMISSION (TJC)

- An independent, non-profit organization that evaluates healthcare organizations based on established standards of patient care & safety
- Provides accreditation to facilities that meet these standards and offers guidance for continuous improvement in care quality & safety

CENTERS FOR MEDICARE & MEDICAID SERVICES (CMS)

- A federal agency that sets and enforces regulatory standards healthcare facilities must meet to qualify for Medicare & Medicaid reimbursement
- If facilities fail to meet key standards (such as maintaining acceptable levels of healthcare-associated infection rates), CMS may withhold funding

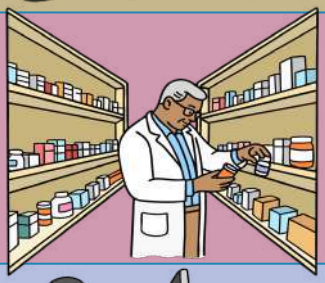
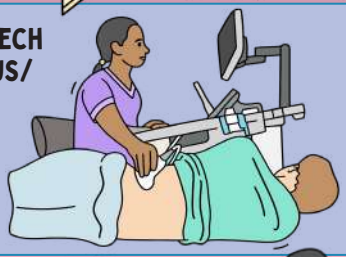
OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

- A federal agency that establishes & enforces workplace safety standards to protect healthcare workers
- Covers areas such as emergency preparedness, personal protective equipment usage, and safe patient handling & transfer procedures

THE HEALTHCARE TEAM

MEMBER	PRIMARY ROLE	EXAMPLES OF TASKS
HEALTHCARE PROVIDER (MD, DO, APRN, PA-C) 	➡ Diagnose & treat illness	▶ Prescribe medications ▶ Order interventions ▶ Perform procedures/surgeries
NURSE (RN, LPN/LVN) 	➡ Provide direct patient care and carry out Provider orders	▶ Assess patients ▶ Educate patients ▶ Administer medications ▶ Start IVs Assessment & education ➔ RNs only!
RESPIRATORY THERAPIST (RT) 	➡ Treat respiratory conditions per Provider orders	▶ Manage CPAP/BiPAP/high-flow O_2 ▶ Ventilator management ▶ Assist with intubation/bronchoscopies ▶ Administer breathing treatments
PHYSICAL THERAPIST (PT) 	➡ Improve musculoskeletal function through exercise therapy	▶ Assist with mobility & strengthening exercises ▶ Educate on home exercises & assistive devices
OCCUPATIONAL THERAPIST (OT) 	➡ Improve ability to perform daily living activities	▶ Train in tasks like dressing, hygiene, and grooming ▶ Address memory, planning, & problem-solving
SPEECH-LANGUAGE PATHOLOGIST 	➡ Treat speech & swallowing disorders	▶ Assess swallowing and recommend diets ▶ Treat speech disorders like slurring or stuttering
SOCIAL WORKER 	➡ Support patients & families by connecting them to resources	▶ Provide counseling ▶ Refer to social services (e.g. food, housing, rehab) ▶ Address abuse concerns

THE HEALTHCARE TEAM

MEMBER	PRIMARY ROLE	EXAMPLES OF TASKS
DIETICIAN 	➡ Manage nutritional needs based on medical status	▶ Create individualized nutrition plans and diets
PHARMACIST 	➡ Prepare, dispense, & ensure safe use of medications	▶ Ensure correct dosing ▶ Collaborate with Providers on drug selection
IMAGING TECH (CT/MRI/US/ X-RAY) 	➡ Operate diagnostic imaging equipment	▶ Perform scans (e.g. X-rays, MRIs) ▶ Prepare patients and transmit images for interpretation
NURSING ASSISTANT (CNA, UAP) 	➡ Assist with basic patient care and activities of daily living (ADLs)	▶ Help with toileting, feeding, bathing, dressing, ambulating ▶ Take vital signs

LEVELS OF HEALTHCARE

PREVENTATIVE: Education & prevention of illness or injury before it occurs. This level promotes healthy behaviors and reduces risk factors that lead to disease.

Examples:

✔ Government-sponsored public health campaigns

✔ Education on nutrition, exercise, smoking cessation, safe sex, helmet safety, & immunizations

PRIMARY: General health maintenance, wellness, and early detection. Typically involves long-term relationships between patients & primary care providers.

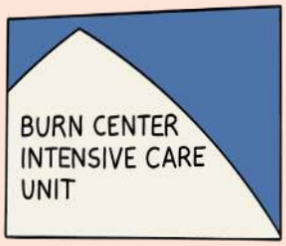
Examples:

- ✓ Routine physical exams, health screenings, & immunizations
- ✓ Management of chronic illnesses (e.g. hypertension, diabetes)
- ✓ Prenatal & pediatric care
- ✓ Provided in clinics, physician offices, & community health centers

SECONDARY: Specialized acute care typically provided in a hospital setting. Patients are usually referred to secondary care by a primary care provider.

Examples:

- ✓ Hospital-based care for sudden or severe illness or injury
- ✓ Specialist services (e.g. cardiology, oncology, general surgery)
- ✓ Units such as emergency departments, telemetry, & intensive care



TERTIARY: Highly specialized care for complex or rare conditions. Often provided in specific facilities equipped with specialized staff & technology.

Examples:

- ✓ Burn centers, organ transplant units, & specialized cancer treatment centers
- ✓ Cardiothoracic & neurosurgery services
- ✓ Long-term acute care hospitals

RESTORATIVE: Rehabilitation & recovery after an acute illness or surgery. Helps patients regain function and return to their highest level of independence.

Examples:

- ✓ Home health care
- ✓ Physical, occupational, & speech therapy
- ✓ Outpatient & inpatient rehabilitation programs

CONTINUING CARE: Long-term or end-of-life care for individuals with chronic health needs or terminal illness. Supports quality of life, comfort, & assistance with daily activities.

Examples

- ✓ Nursing homes and assisted living facilities
- ✓ Adult day care services
- ✓ Hospice & palliative care programs

DISASTER TRIAGE

WHAT IS IT?

A system used during **mass casualty incidents (MCIs)** to rapidly assess & categorize patients based on the severity of their injuries and their **likelihood of survival**

➡ **Primary goal:** maximize survival by allocating limited medical resources to those most likely to benefit

➡ The most widely used system in emergency settings is **START** (**S**imple **T**riage **a**nd **R**apid **T**reatment)

- ✔ Natural disasters (wildfires, hurricanes, tornadoes, earthquakes, & floods)
- ✔ Motor vehicle collisions
- ✔ Mass shootings
- ✔ Explosions
- ✔ Terrorism & bioterrorism
- ✔ Structural collapses

In mass casualty situations, the number of ill or injured individuals exceeds the available medical resources. As a result, **prioritizing patients with the greatest chance of survival** is essential to maximize the number of lives saved.

START TRIAGE

Designed for quick, on-scene evaluation

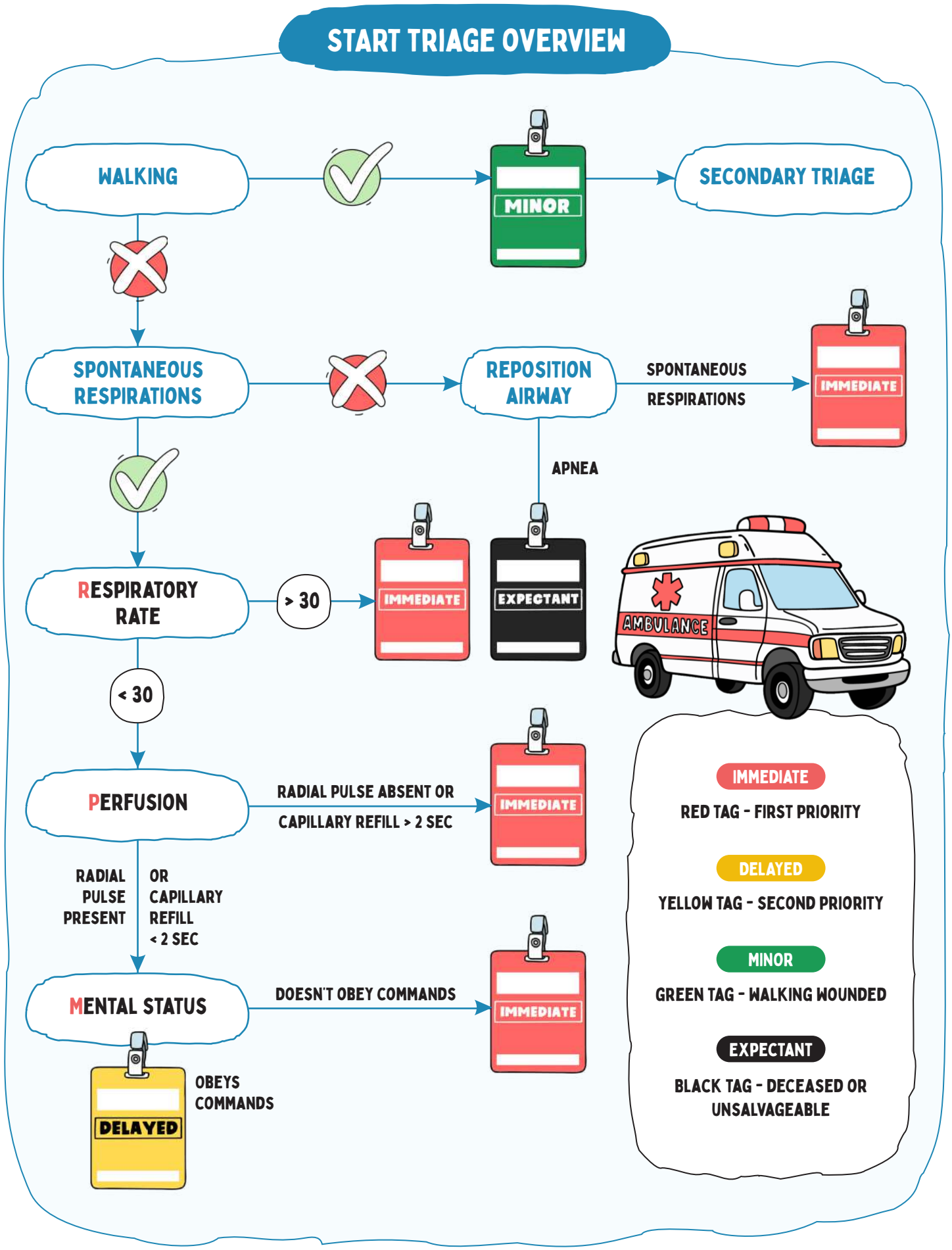
- Each patient is assessed in under 30 seconds
- Patients are assigned a color-coded tag based on three key criteria, evaluated in this order:

ALWAYS CHECK YOUR **RPMS!**

MEMORY TRICK

1. **R**ESPIRATIONS
2. **P**ERFUSION (CIRCULATION)
3. **M**ENTAL STATUS

START TRIAGE OVERVIEW



START TRIAGE OVERVIEW

IMMEDIATE

Condition:

➡ Life-threatening injuries requiring immediate intervention for survival - **require care before all others**

Action:

➡ **Stabilize airway, breathing, & circulation (ABCs)** until definitive care becomes available

Examples:

✔ Severe hemorrhage
✔ Extensive burns
✔ Respiratory distress
✔ Tension pneumothorax
✔ Altered mental status (e.g. not following commands)

A red tag is assigned to patients with compromised mental status or airway, breathing, & circulation (ABCs):

- **Mental Status:** Not following commands
- **Airway:** Unable to protect airway
- **Breathing:** Respiratory rate greater than 30 breaths per minute
- **Circulation:** Prolonged capillary refill time or absent radial pulse

The objective is to initiate life-saving interventions within the first 60 minutes, and ideally much sooner

DELAYED

Condition:

➡ Serious injuries that require medical attention, but ABCs are stable and there is no **immediate** risk of death

Action:

➡ Provide care as soon as possible, but **after red tag patients**

Examples:

✔ Fractures
✔ Serious wounds without active hemorrhage
✔ Spinal cord injuries with stable ABCs

These patients can obey commands and are hemodynamically stable

The objective is to provide necessary medical care **within 4 hours**, with less than 2 hours being ideal

MINOR

Condition:

➡ **Minor injuries** with a low risk of deterioration

Action:

➡ Treatment & transport can be **delayed**

Examples:

✔ Sprains
✔ Minor cuts or abrasions
✔ Bruises
✔ Emotional distress without physical injury

Patients are ambulatory & stable ("**walking wounded**") - these patients may be able to assist with their own care/first aid

Resources should be prioritized for more critical patients & reassessments should occur as resources allow

START TRIAGE OVERVIEW

EXPECTANT

Condition:

➡ Deceased or patients with catastrophic injuries who have a low likelihood of survival given available resources

Action:

➡ Provide palliative care and comfort measures as appropriate

Examples:

✔ Obvious death
✔ Penetrating head wounds (e.g. gunshot)
✔ Crushing chest injuries

In mass-casualty settings, these patients are not candidates for resuscitation due to injury severity and resource limits

GRIEF, DEATH, & DYING

GRIEF

WHAT IS IT?

Grief is **deep anguish** experienced after a personal loss, typically the **loss of a loved one**

TYPES OF GRIEF

ACUTE GRIEF	▶ Occurs immediately following devastating news; the most intense phase characterized by profound sadness, shock, & denial. Usually resolves within 6 months.
ANTICIPATORY GRIEF	▶ Felt before the actual loss, such as when a loved one is diagnosed with a terminal illness. The loss has not yet occurred, but the individual grieves the impending loss.
INTEGRATED GRIEF	▶ The period of adjustment where emotional stability returns, though intermittent grieving continues (6 months to 2 years)
COMPLICATED GRIEF	▶ Prolonged grief lasting more than 2 years that significantly impairs functioning
DISENFRANCHISED GRIEF	▶ Grief that is not publicly acknowledged or socially supported, often due to stigma or taboo (e.g. a mother grieving a son imprisoned for murder)

5 STAGES OF GRIEF (KÜBLER-ROSS)

WHAT IS IT?

A model developed by psychiatrist Elisabeth Kübler-Ross to describe **the process people often go through when facing loss or terminal illness**

1. DENIAL

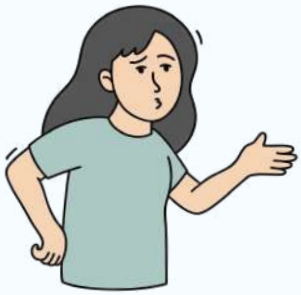
- **The initial reaction to devastating news, characterized by shock, numbness, & disbelief**

Example: John refuses to accept his terminal brain cancer diagnosis and seeks multiple opinions to disprove it

2. ANGER

- **The individual experiences rage and may blame others or circumstances**

Example: Yvonne, frustrated with slow nurse response after her daughter's paralysis, lashes out in anger



3. BARGAINING

- **Attempts to "make a deal" with a higher power, seeking more time or a miracle to reach personal milestones**

Example: Mark promises to donate all his money to charity if he can live to see the Superbowl

4. DEPRESSION

- **A deep sense of hopelessness and emptiness, loss of interest in life, & possible suicidal ideation**

Example: Sarah, grieving her father's suicide, isolates herself, loses weight, & drinks heavily

5. ACCEPTANCE

- **Coming to terms with the reality of loss or illness, acknowledging the situation without necessarily moving on fully**

Example: Juan, after losing his arm, begins to engage in rehabilitation and adjust to his new reality

DEATH & DYING

PALLIATIVE VS. HOSPICE CARE

PALLIATIVE CARE

▶ A specialized medical approach aimed at enhancing the quality of life for individuals facing serious or life-threatening illnesses. It can be provided alongside curative treatments and focuses on:

- ✔ Pain management
- ✔ Symptom control
- ✔ Emotional & psychological support
- ✔ Counseling and support groups
- ✔ Assistance with advance directives

It's important to understand that palliative care can be provided at any stage of a serious illness. It is not limited to end-of-life care and is appropriate for patients of any age or diagnosis.

HOSPICE CARE

▶ Hospice care is a type of palliative care provided to individuals with a terminal diagnosis, typically with a prognosis of **six months or less** to live. Unlike palliative care, hospice care does **not** include curative treatments and is centered entirely on comfort, dignity, & quality of life during the final stages.

Choosing to stop curative treatments does not mean that all medical care is discontinued. For example, a cancer patient entering hospice may decide to forgo chemotherapy & radiation therapy, but will continue to receive treatments that support comfort & quality of life (blood pressure medications, antibiotics, or medications for pain & symptom relief).

MOURNING & BEREAVEMENT

MOURNING

▶ Mourning refers to the **external expression of grief** following the loss of a loved one. The way individuals mourn is influenced by personal disposition, cultural background, & religious beliefs.

Common mourning practices include:

- ✔ Wakes
- ✔ Funerals
- ✔ Eulogies
- ✔ Wearing black attire
- ✔ Offering flowers
- ✔ Fasting
- ✔ Wailing or crying
- ✔ Singing
- ✔ Prayer or meditation

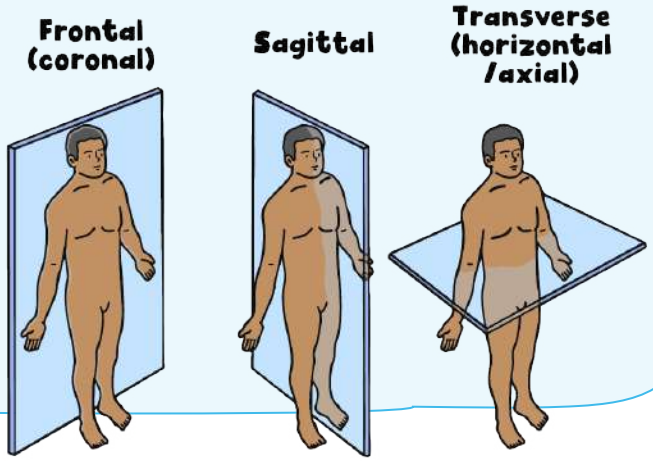
BEREAVEMENT

▶ Bereavement encompasses both the **internal experience of grief** and its external manifestations following a significant loss. It is a deeply personal process, and the duration & expression of bereavement vary widely among individuals. While bereavement is a natural part of life, **prolonged or complicated grief** can negatively affect emotional, physical, & psychological well-being.

POSITIONS

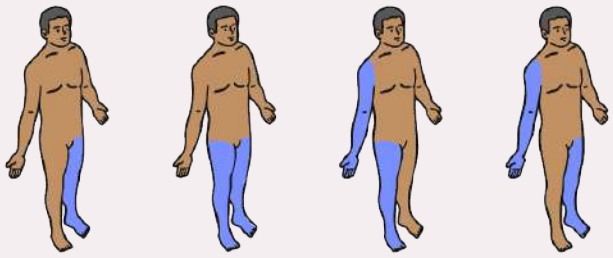
ANATOMICAL PLANES

- **Frontal (coronal):** divides the body into front (anterior) and back (posterior) sections
- **Sagittal:** divides the body into left & right sides
- **Transverse (horizontal/axial):** divides the body into upper (superior) and lower (inferior) parts

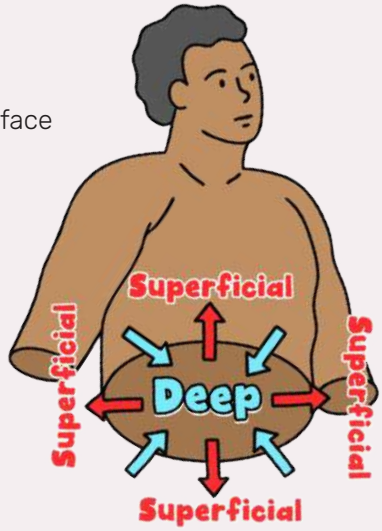


DIRECTIONAL TERMS

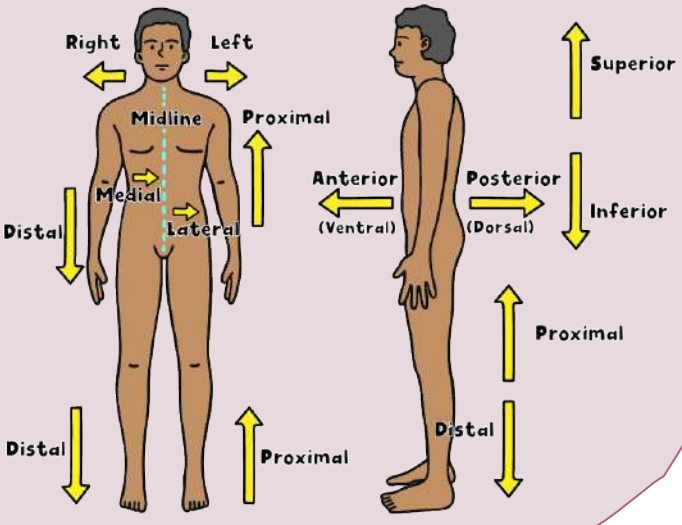
- **Unilateral:** occurring on one side only
- **Bilateral:** occurring on both sides
- **Ipsilateral:** on the same side of the body
- **Contralateral:** on opposite sides of the body



- **Superficial:** closer to the surface of the body
- **Deep:** further from the surface, toward the interior

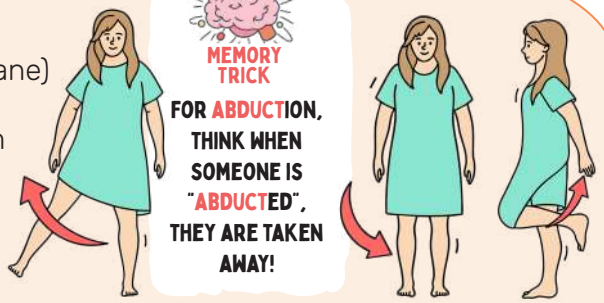


- **Superior (cranial):** toward the head / above
- **Inferior (caudal):** toward the feet / below
- **Anterior (ventral):** toward the front of the body
- **Posterior (dorsal):** toward the back of the body
- **Distal:** closer to the point of origin or trunk
- **Proximal:** farther from the point of origin or trunk
- **Medial:** toward the midline of the body
- **Lateral:** away from the midline
- **Intermediate:** between two structures



COMMON TERMS OF MOVEMENT

- **Abduction:** movement away from the body (frontal plane)
- **Adduction:** movement toward the body's midline from the abducted position
- **Flexion:** movement that decreases the angle of a joint

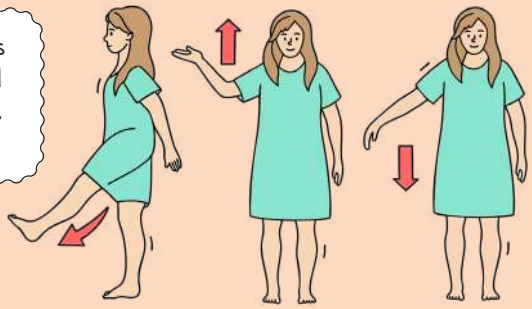


MEMORY TRICK

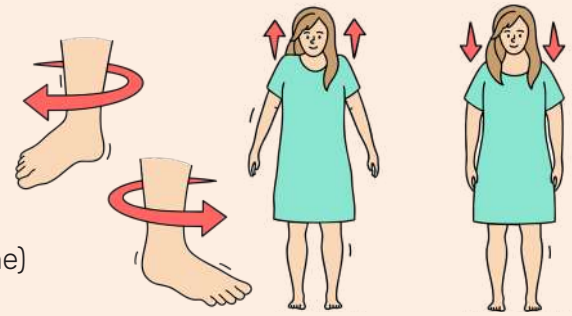
FOR ABDUCTION, THINK WHEN SOMEONE IS "ABDUCTED", THEY ARE TAKEN AWAY!

- **Extension:** movement that increases the angle of a joint, returning it to 180°
- **Supination (wrist & forearm):** positioning so the palm faces upward
- **Pronation (wrist & forearm):** positioning so the palm faces downward

Hyperextension occurs when a joint is extended beyond its normal range, exceeding 180°



- **Eversion (foot):** turning the sole of the foot outward
- **Inversion (foot):** turning the sole of the foot inward
- **Elevation:** raising a body part vertically (frontal plane)
- **Depression:** lowering a body part vertically (frontal plane)



COMMON PROCEDURES/POSITIONS

TRENDELENBURG (DORSAL DECLINE)

POSITION

- Patient lies flat on back with feet elevated above the head

SUPPORT

- Pillow behind head, neck, bony prominences, & behind calves

INDICATIONS

- ✓ Abdominal or gynecological surgery
- ✓ Central line placement or removal (prevents air embolism)

CAUTIONS

- ✓ Can increase intracranial pressure (contraindicated in high-risk patients)
- ✓ Risk of airway edema if prolonged
- ✓ Increased aspiration risk

MEMORY TRICK

TRENDELENBURG = TOES IN THE AIR!

No longer recommended for acute hypotension, as it does not increase cardiac output!

COMMON PROCEDURES/POSITIONS

SUPINE (DORSAL DECUBITUS)

POSITION
- Patient lies flat on their back

SUPPORT
- Pillow behind head & neck
- Pillows under bony prominences & behind calves ("float the heels")

MEMORY TRICK

IF YOU ARE SUPINE, YOU'RE ON YOUR SPINE!

Depending on the clinical situation, patients may not be permitted to use positioning aids, such as in cases involving strict spinal precautions or other contraindications. Always verify Provider orders before applying any supportive devices.

COMMON POSITIONING AIDS

- **Pillows:** used to support the head, neck, limbs, or back and to relieve pressure on bony prominences
- **Foam wedges:** provide firm, stable support for maintaining side-lying or elevated positions
- **Rolled towels or blankets:** help support joints, maintain alignment, or prevent contractures in specific body areas

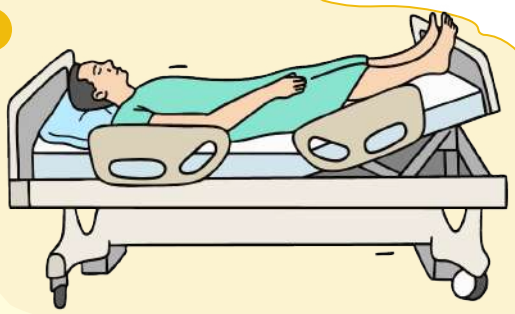
INDICATIONS
- ✓ Position of comfort for sleep
- ✓ Nursing assessment
- ✓ Cardiac, cranial, thoracic, abdominal procedures & surgeries
- ✓ Post-procedure (cardiac catheterization, lumbar puncture)

If a catheter is placed through the groin the patient is kept in a supine position for 2-6 hours post-procedure to reduce the risk of bleeding or hematoma formation

CAUTIONS
- ✓ Risk for pressure injuries, especially on or around bony prominences (elbows, sacrum, heels)
- ✓ Foot drop
- ✓ Postural hypotension
- ✓ Respiratory complications (e.g. shortness of breath, pneumonia)

The abdominal organs can push upward against the diaphragm, limiting lung expansion and reducing respiratory efficiency

MODIFIED TRENDELENBURG



POSITION
- Head & torso flat; feet elevated at a slight angle

SUPPORT
- Same as supine

MEMORY TRICK

MODIFIED TRENDELENBURG: MIDSECTION FLAT, TOES UP!

INDICATIONS
- ✓ Improves brain & vital organ perfusion in hypotensive patients
- ✓ Passive leg raise test

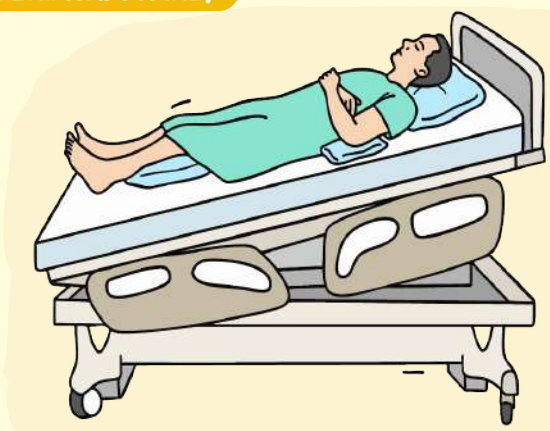
The patient is placed in the modified Trendelenburg position to temporarily enhance venous return. A significant improvement in blood pressure during this maneuver may indicate a fluid volume deficit, suggesting the patient could benefit from volume replacement (e.g. IV fluids or blood products).

CAUTIONS
- ✓ Prolonged use can cause hypoperfusion to lower extremities

Carries the same risks as the Trendelenburg position, though typically to a lesser degree

COMMON PROCEDURES/POSITIONS

REVERSE TRENDELENBURG (PRO-TRENDELENBURG SUPINE)



POSITION

- Patient lies flat on back with head elevated above feet

SUPPORT

- Same as supine

MEMORY TRICK

REVERSE TRENDELENBURG = RAISED HEAD, TOES DOWN!

INDICATIONS

- ✓ Reduces **i**ntra**c**ranial **p**ressure (**ICP**) in spinal injury patients
- ✓ Surgery involving head, neck, upper abdomen (↓ blood loss)
- ✓ Facilitates gastric emptying and reduces GERD symptoms

CAUTIONS

- ✓ Promotes pooling of blood - increased risk of clot formation
- ✓ Shearing forces can cause skin breakdown

Reverse Trendelenburg elevates the head without bending at the waist, helping maintain spinal alignment in trauma patients. It also avoids increasing intrathoracic pressure that can occur with semi-Fowler positioning.

PRONE (FACE-DOWN POSITION)

POSITION

- Patient lies flat on stomach with head neutral or turned side to side

SUPPORT

- Pillow under head and pelvis
- Pillow under shins ("float the feet")

INDICATIONS

- ✓ Colorectal, spinal, or vascular surgeries
- ✓ **A**cute **r**espiratory **d**istress **s**yndrome (**ARDS**)

CAUTIONS

- ✓ Risk of suffocation
- ✓ Dislodgement of critical lines (central or arterial)
- ✓ Accidental extubation
- ✓ Brachial plexus injury

If a patient is expected to remain in the prone position for an extended period (e.g. while intubated & sedated), foam dressings should be applied to bony prominences to provide additional protection and reduce the risk of pressure injuries

Prone positioning decreases pressure on the lungs and promotes a more even distribution of blood flow & ventilation, leading to improved gas exchange

MEMORY TRICK

PRONE → "YOU ARE LYING ON YOUR STOMACH!"

COMMON PROCEDURES/POSITIONS

LATERAL RECUMBENT (SIDE LYING POSITION)

POSITION

- Patient lies on side with top leg bent at hip & knee

SUPPORT

- Pillow supporting head & neck
- Pillow between legs
- Pillow for elevated arm (prevents shoulder hyperextension)
- Wedge or pillows behind back if patient cannot maintain position

INDICATIONS

- ✓ Postictal state (helps drain secretions, prevents aspiration)
- ✓ Surgery: retroperitoneal, thoracic, kidney, hips
- ✓ Procedures: lumbar puncture, nerve blocks

CAUTIONS

- ✓ Risk of brachial plexus injury
- ✓ Reduced lung capacity (bottom lung may not fully expand)
- ✓ Venous pooling and risk of clotting

MEMORY TRICK

LATERAL RECUMBENT = LYING ON YOUR LEFT OR RIGHT SIDE!

SIMS (LEFT-LATERAL DECUBITUS)

POSITION

- Patient lies on left side, halfway between lateral and prone with right hip & knee flexed

SUPPORT

- Pillow under head
- Pillow under right arm (prevents internal rotation)
- Pillow under right leg
- Wedge/pillows behind back to maintain position as needed

INDICATIONS

- ✓ Enemas/suppositories
- ✓ Rectal exams
- ✓ Vaginal exams (e.g. vaginal wall prolapse)
- ✓ Foley catheter insertion if unable to tolerate supine

CAUTIONS

- ✓ Risk of nerve injuries
- ✓ Spinal misalignment
- ✓ Contraindicated in patients with pelvic or spinal fractures

MEMORY TRICK

WHEN YOU ARE IN SIMS POSITION, YOU ARE IN AN "S" SHAPE!

COMMON PROCEDURES/POSITIONS

FOWLERS POSITIONS

POSITION

- Patient lies flat on back with HOB elevated at various angles

SUPPORT

- Pillow behind head & neck
- Pillow under elbows

WHEN YOU PLACE A PATIENT IN A FOWLER'S POSITION YOU ARE FACILITATING OXYGENATION!

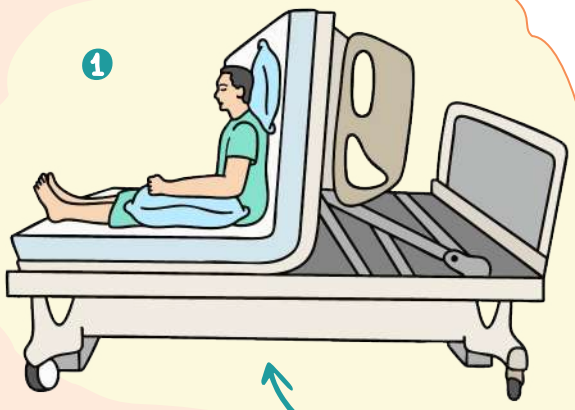
MEMORY TRICK

TYPES & INDICATIONS

1 High Fowler's (60-90°)

- ✓ Eating & drinking
- ✓ X-rays
- ✓ Dyspnea
- ✓ Promotes digestion
- ✓ Nasogastric tube insertion
- ✓ Neurosurgery patients (lowers intracranial pressure)
- ✓ Post-op abdominal or lung surgery

The diaphragm is pulled downward, allowing for greater lung expansion and improved respiratory function



MEMORY TRICK

HIGH FOWLER'S = HEAD OF BED FULLY ELEVATED

2 Fowlers (45-60°) & semi-Fowler's (30-45°)

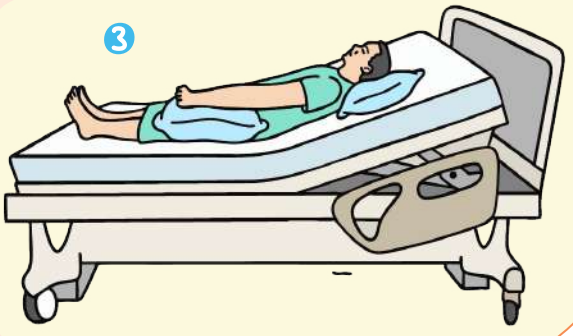
- ✓ Dyspnea
- ✓ Ventilated patients
- ✓ Respiratory treatments
- ✓ Childbirth

Helps drain secretions, reduces the risk of ventilator-associated pneumonia (VAP), and is ideal for airway suctioning

Fowler's & semi-Fowler's are often preferred over high Fowler's for patients experiencing shortness of breath, as they tend to be more comfortable

3 Low Fowler's (15-30°)

- ✓ Rest/sleep
- ✓ Position of comfort for lower back pain
- ✓ **G**astro**e**sophageal **r**eflux **d**isease (**GERD**)



MEMORY TRICK

LOW FOWLERS = LAY FLAT (HEAD JUST A LITTLE UP)

CAUTION

- ✓ Decreased venous return may increase risk of clots/emboli

COMMON PROCEDURES/POSITIONS

ORTHOPNEIC (TRIPOD)

POSITION

- The patient is seated in high Fowler's position while leaning forward on a bedside table with pillows for support. Alternatively, the patient may sit on the edge of the bed and lean forward with their elbows resting on their knees.

SUPPORT

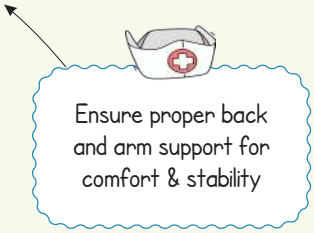
- Several pillows or a table for the patient to lean on

INDICATIONS

- ✓ Shortness of breath or dyspnea (enhances chest/lung expansion)

CAUTIONS

- ✓ Risk of brachial plexus injury

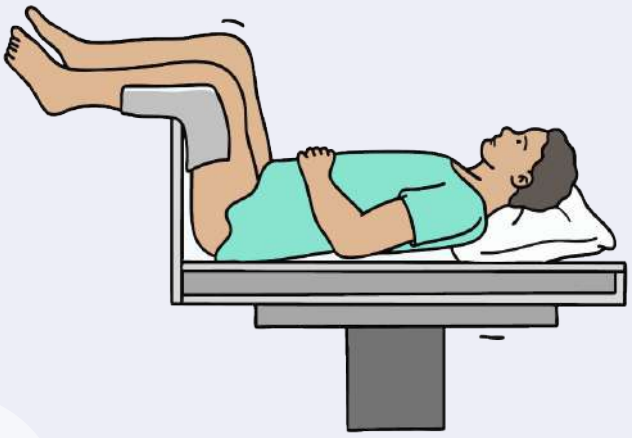


TRIPOD POSITION = TILTED FORWARD ON PILLOWS!

LITHOTOMY

POSITION

- Patient lies flat on back with legs in stirrups at 90° angle



SUPPORT

- Pillow behind head & neck

INDICATIONS

- ✓ Surgery: colorectal, urethral, bladder, prostate
- ✓ Childbirth
- ✓ Vaginal ultrasound

CAUTIONS

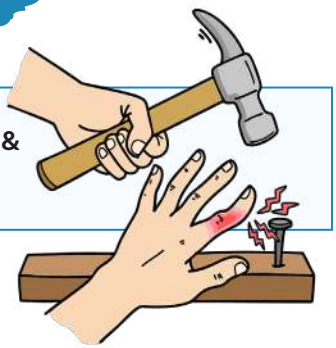
- ✓ Acute compartment syndrome
- ✓ Nerve damage (femoral, sciatic, & common peroneal nerves)

LITHOTOMY POSITION = LEGS PROPPED!

PAIN MANAGEMENT

WHAT IS IT?

Pain is a **complex, individualized experience** that involves **emotional, psychological, & physical responses** to an **actual or perceived** unpleasant sensory stimulus



TYPES OF PAIN

NOCICEPTIVE

- Caused by activation of **nociceptors** (pain receptors) in tissue
- Often described as **sharp, cramping, aching, or throbbing**

TYPES OF NOCICEPTIVE PAIN

Somatic pain: affects bones, muscles, skin, or joints

COMMON CAUSES

- ✓ Trauma (cuts, sprains, fractures)
- ✓ Osteoporosis
- ✓ Cancer
- ✓ Surgery
- ✓ Infections

Nociceptors act as the body's biological warning system, alerting the individual to potential or actual harm. This sensory response prompts the person to react and modify their behavior in order to protect themselves from further injury.

Visceral pain: originates from internal organs (GI tract, bladder, reproductive organs, heart, lungs)

COMMON CAUSES

- ✓ Bowel obstruction
- ✓ Appendicitis
- ✓ Myocardial infarction (heart attack)
- ✓ Endometriosis
- ✓ UTI
- ✓ Inflammatory bowel disease

Cutaneous pain: arises from skin or mucous membranes

COMMON CAUSES

- ✓ Lacerations, burns, surgical incisions
- ✓ Shingles, dermatitis, eczema
- ✓ Infections, allergic reactions

OTHER COMMON TYPES OF PAIN

Mixed pain

A combination of both nociceptive & neuropathic components - pain originates from tissue damage & nerve involvement

Examples:

- ✓ Cancer pain
- ✓ Osteoarthritis
- ✓ Post-operative pain
- ✓ Migraine headaches

Idiopathic pain

Pain with no identifiable physical or organic cause - the exact source of pain is unknown, but the experience of pain is real & often chronic

Examples:

- ✓ Fibromyalgia
- ✓ Irritable bowel syndrome
- ✓ Migraines

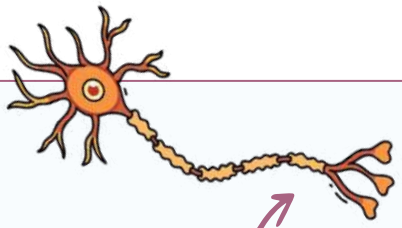
Psychogenic pain

Pain that is primarily influenced by psychological or emotional factors in the absence of physical injury - can be just as intense & disabling and often associated with stress, anxiety, or depression

Examples:

- ✓ Chronic back pain
- ✓ Stomach aches
- ✓ Tension headaches

NEUROPATHIC



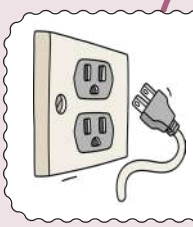
- Caused by damage or dysfunction of the nerves
- Often described as **burning, tingling, or shooting**

AKA "nerve pain"

COMMON CAUSES

- ✔ Diabetic neuropathy
- ✔ Phantom limb pain
- ✔ Postherpetic neuralgia
- ✔ Chemotherapy
- ✔ Guillain-Barré Syndrome
- ✔ Vitamin deficiencies

These conditions cause nerve damage

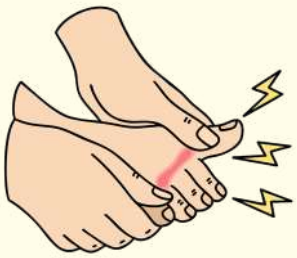


Patients often describe this type of pain as feeling like an electric shock

PAIN LOCATION

LOCALIZED: CONFINED TO ONE AREA OF THE BODY

- Examples – laceration, fracture, toothache, burn, sprain/strained muscle

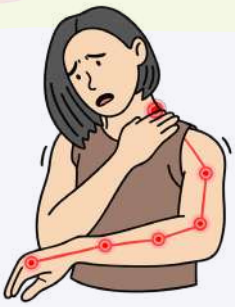


DIFFUSE: WIDESPREAD PAIN

- Examples – rheumatoid arthritis, ankylosing spondylitis, fibromyalgia

RADIATING: STARTS IN ONE AREA AND TRAVELS

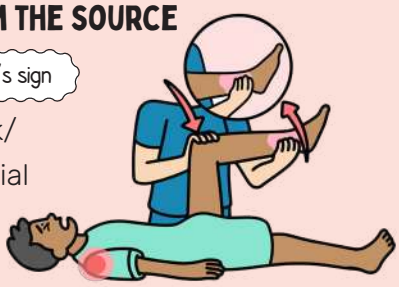
- Examples – myocardial infarction/angina, sciatica, carpal tunnel syndrome, shingles



REFERRED: FELT IN AN AREA DISTANT FROM THE SOURCE

- Examples - ruptured spleen (left shoulder), kidney stones (lower back/abdominal), pancreatitis (back), myocardial infarction (shoulder/jaw)

Kehr's sign



S&S

Most reliable indicator of pain!

- ✔ **Self-report**
- ✔ Tachycardia
- ✔ Hypertension
- ✔ Tachypnea
- ✔ Diaphoresis
- ✔ Dilated pupils
- ✔ Pallor or flushing
- ✔ Hyperglycemia
- ✔ Muscle tension

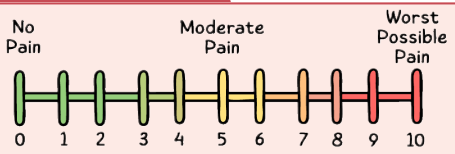
As nurses, it is our ethical and professional responsibility to believe patients when they report pain!

ACUTE VS CHRONIC PAIN

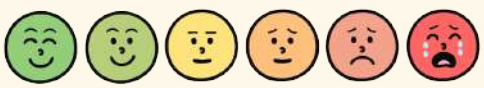
CATEGORY	ACUTE PAIN	CHRONIC PAIN
TIMING	▶ **SUDDEN ONSET: TEMPORARY: TYPICALLY LASTS LESS THAN 3 MONTHS** 	▶ **PERSISTENT OR RECURRENT: LASTS LONGER THAN 3 MONTHS** 
TREATMENT FOCUS	▶ Curative - aims to treat the underlying cause	▶ Symptom management -focuses on improving function and quality of life
RESOLUTION	▶ Linked to a specific injury or illness and resolves with healing	▶ Persists beyond healing of initial injury or illness
SYMPATHETIC NERVOUS SYSTEM (SNS)	▶ Activates the SNS - may result in increased heart rate, blood pressure, or other visible physical signs	▶ SNS response may be diminished - fewer or no visible physical signs
FINAL NOTES	▶ Acts as a biological protective mechanism, prompting the person to seek help	▶ Can significantly impair quality of life, contributing to depression, immobility, & insomnia
EXAMPLES	• Childbirth • Fractures • Sprains & strains • Burns • Toothaches • Kidney stones Acute pain generally responds well to standard analgesics and short-term therapies	• Arthritis • Chronic back or neck pain • Cancer pain • Fibromyalgia **Breakthrough pain** is a sudden, intense flare-up of pain that occurs despite ongoing management of chronic pain. It typically "breaks through" a patient's baseline level of pain control and is often treated with fast-acting opioids or other rescue medications.

COMMON PAIN SCALES

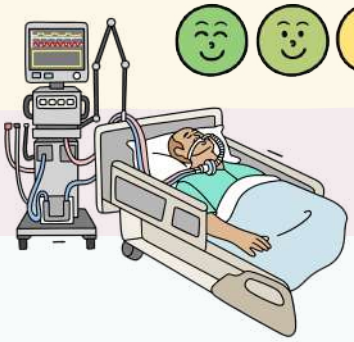
▶ **NUMERIC (0-10):** for alert, oriented adults



▶ **FACES SCALE:** for children age 3+ or adults with communication difficulties



▶ **FLACC/CPOT:** for non-verbal or sedated patients



▶ **CRIES:** neonatal pain scale (infants < 6 months)

"OPQRST" ASSESSMENT

OPQRST

ONSET

- When did the pain begin?
- What were you doing when it started?

PROVOCATION & PALLIATION

- What caused the pain to start?
- Is there anything that makes it better or worse?

QUALITY

- How would you describe the pain? (e.g. sharp, dull, throbbing, burning, cramping)

REGION & RADIATION

- Can you show me where the pain is?
- Does the pain stay in one area or does it travel elsewhere?

SEVERITY

- On a scale of 0 to 10, where 0 means no pain and 10 is the worst pain imaginable, how would you rate your pain?

TIME

- How long have you had this pain?
- Is it constant or does it come and go?
- Have you experienced this kind of pain before?

PATIENT-CONTROLLED ANALGESIA (PCA)

WHAT IS IT?

A method of pain management that allows the **patient to self-administer intravenous pain medication** by pressing a programmed button

KEY FEATURES

- The PCA pump delivers medication via IV when the patient activates the button - hence the term "patient-controlled"
- The pump may also be programmed to deliver a basal (continuous) infusion, although this is used cautiously due to the increased risk of respiratory depression
- The pump is pre-programmed with:
  - Bolus doses (the amount delivered per activation)
  - Lockout intervals (minimum time between doses to prevent overdose)

For example, a patient may be prescribed 1 mg of hydromorphone per hour, with a **bolus dose** of 0.25 mg and a **lockout interval** of 15 minutes. This means the patient can administer 0.25 mg every 15 minutes by pressing the PCA button. If the patient does not press the button during a given interval, that dose is not saved or carried over (there is no "make-up" option). The lockout interval remains fixed, so the opportunity to receive a dose simply passes until the next window. To receive the maximum allowed bolus dose, the patient must actively press the button every 15 minutes. As such, the total amount of pain relief depends on the patient's active use of the PCA.

SAFETY CONSIDERATIONS FOR PATIENT-CONTROLLED ANALGESIA

- Continuous end-tidal CO_2 monitoring (capnography) is required to detect early signs of respiratory depression
- Two registered nurses (RNs) must verify the medication, bolus dose and lockout interval
- Only the patient is permitted to press the PCA button – no one else can activate it on the patient's behalf (known as "**PCA by proxy**")

While capnography is a valuable tool for detecting early signs of respiratory depression, it does not replace the need for in-person clinical assessments

Who can't hit the button?

- ✕ Nurse (you!)
- ✕ Provider
- ✕ Pharmacist
- ✕ Family
- ✕ Visitors
- ✕ Anyone other than the patient!

PAIN TREATMENT

PHARMACOLOGICAL INTERVENTIONS

▶ **Non-opioids** - mild to moderate pain (score: 3-4/10)

Non-opioids may be used in combination with opioids to treat severe pain

- ✔ Acetaminophen
- ✔ NSAIDS (ibuprofen, ketorolac, naproxen, ASA, diclofenac, celecoxib, meloxicam)

▶ **Opioids** - moderate to severe pain (score: 5-10/10)

- ✔ Morphine sulfate
- ✔ Oxycodone
- ✔ Fentanyl
- ✔ Hydromorphone
- ✔ Hydrocodone
- ✔ Meperidine
- ✔ Tramadol

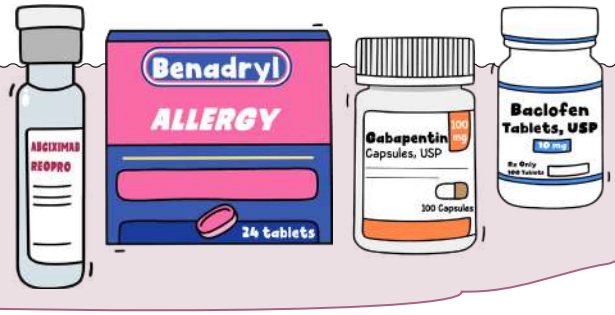
SERIOUS SIDE EFFECTS OF OPIOIDS

- **Respiratory depression**
  ↓ Slowed or shallow breathing; can be life-threatening
- **Sedation**
  ↓ Decreased alertness & drowsiness
- **Constipation**
  ↓ Slowed gastrointestinal motility
- **Hypotension**
  ↓ Low blood pressure, especially with IV administration

▶ **Adjuvants**

- ✔ **Anxiolytics:** diazepam (muscle spasms)
- ✔ **Antidepressants:** TCAs & SNRIs (neuropathic pain, fibromyalgia)
- ✔ **Antihistamines**: hydroxyzine, diphenhydramine (neuropathic/inflammatory pain)
- ✔ **Local anesthetics:** benzocaine, lidocaine, bupivacaine
- ✔ **Bisphosphonates:** alendronate, risedronate (bone pain)
- ✔ **Botulinum toxins (Type A):** migraines, spasms, arthritis
- ✔ **Anticonvulsants:** gabapentin, pregabalin (nerve pain)
- ✔ **Corticosteroids:** prednisone, dexamethasone (inflammatory pain)
- ✔ **Muscle relaxants:** baclofen, cyclobenzaprine

These are drugs that are not classified as traditional analgesics but have pain-relieving properties. They are often used in combination with opioids or non-opioid analgesics to enhance pain control, especially in cases of neuropathic or chronic pain.

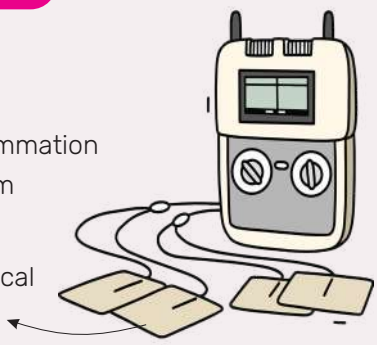


NON- PHARMACOLOGICAL INTERVENTIONS

▶ **Distraction:** engaging in activities that divert attention away from pain
- ✔ TV, podcasts, videogames, board games, & social interaction

▶ **Hot & cold therapy:** application of heat or cold to relieve pain & reduce inflammation
- ✔ Cold packs, ice packs, ice baths, fans, air conditioning, heating pads, warm compresses, saunas, Jacuzzis, & heaters

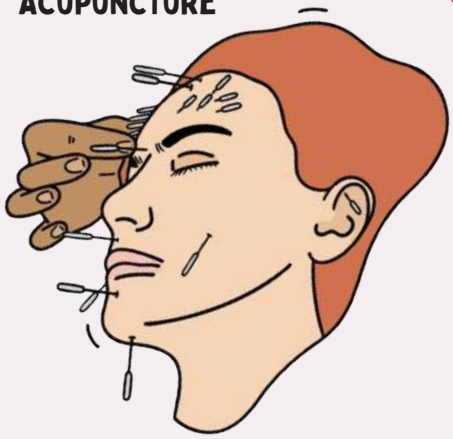
▶ **Transcutaneous electrical nerve stimulation (TENS):** a low-voltage electrical therapy that interrupts pain signals before they reach the brain



NON- PHARMACOLOGICAL INTERVENTIONS

- **Positioning:** use of ergonomic furniture and supportive devices to promote physical comfort
  - ✔ Supportive mattresses, recliners, pillows, & wedges to optimize body alignment
- **Acupuncture:** a traditional Chinese practice involving the insertion of thin needles into specific body points to restore the flow of energy (qi) and alleviate pain
- **Exercise:** physical movement to improve circulation, flexibility, & endorphin release
  - ✔ Walking, swimming, cycling, yoga, stretching, Tai Chi
- **Meditation:** a mindfulness-based practice that enhances mental clarity & emotional regulation through focused awareness
- **Breathwork:** controlled breathing techniques used to regulate the nervous system and manage stress
  - ✔ Diaphragmatic breathing, deep breathing, & conscious breathing exercises
- **Guided imagery:** a cognitive technique that encourages the visualization of calming and positive images to reduce pain perception
- **Biofeedback:** use of real-time monitoring devices to help individuals gain voluntary control over physiological functions such as heart rate, blood pressure, respirations, temperature, & brainwaves
- **Massage therapy:** manual manipulation of soft tissues and joints to promote relaxation & pain relief
- **Aromatherapy:** the therapeutic use of essential oils and pleasant scents to promote relaxation & emotional well-being
- **Music therapy:** listening to or engaging with music to provide emotional distraction and enhance mood
- **Pet therapy:** interaction with animals to provide comfort, companionship, & emotional support
  - ✔ Petting, walking, grooming, or playing with animals
- **Psychotherapy:** evidence-based psychological interventions to address the emotional & cognitive aspects of pain
  - ✔ **C**ognitive **b**ehavioral **t**herapy (**CBT**), **d**ialectical **b**ehavioral **t**herapy (**DBT**), and **a**cceptance & **c**ommitment **t**herapy (**ACT**)

ACUPUNCTURE



BREATHWORK

MUSIC THERAPY

PERIOPERATIVE CARE

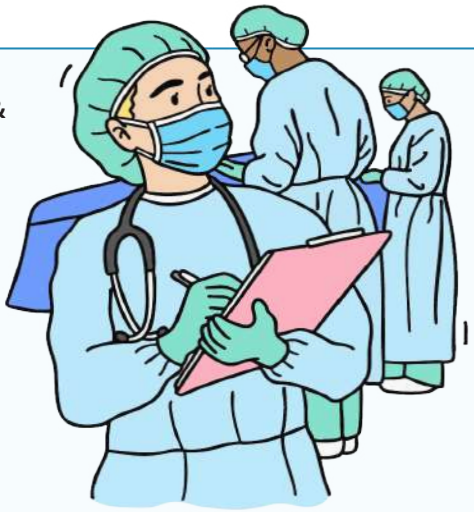
WHAT IS IT?

The **multidisciplinary approach** to caring for patients **before, during, & after surgery**. It is divided into three key phases:

➡ **Pre-operative phase:** care provided **before** the surgical procedure (e.g. patient education, assessment, preparation)

➡ **Intraoperative phase:** care provided **during** the surgery (e.g. anesthesia management, sterile technique, patient positioning)

➡ **Post-operative phase:** care provided **after** the surgery (e.g. pain control, monitoring for complications, recovery support)

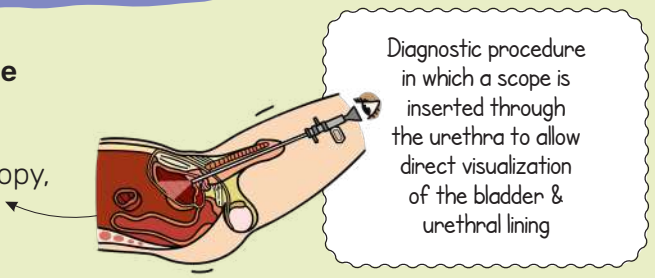


SURGERY CLASSIFICATION SYSTEMS

BASED ON PURPOSE OF SURGERY

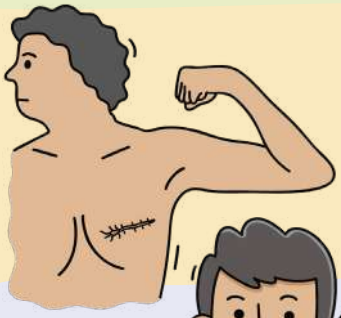
DIAGNOSTIC: performed to determine or confirm the presence of a medical condition

▶ **Examples:** exploratory laparotomy ("ex lap"), cystoscopy, biopsy



CURATIVE: aimed at removing all diseased tissue with the intent to cure the condition

▶ **Examples:** cholecystectomy (gallstones), mastectomy (breast cancer), appendectomy (appendicitis)



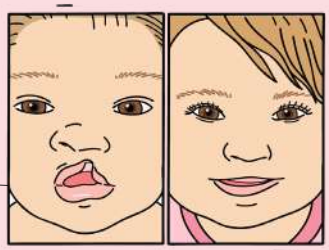
PALLIATIVE: focuses on relieving symptoms rather than curing the underlying condition

▶ **Examples:** tumor debulking, PEG tube placement, amputations (for pain or infection control)

BASED ON PURPOSE OF SURGERY

RECONSTRUCTIVE **involves repairing damaged or abnormal tissue to restore function or appearance**

- **Examples:** breast reconstruction post-mastectomy, cleft lip/palate repair, skin grafts

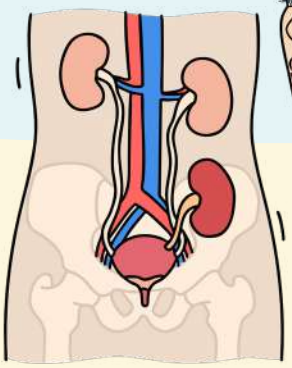


COSMETIC **intended to enhance appearance by altering otherwise healthy tissue**

- **Examples:** breast augmentation, facelift, rhinoplasty

TRANSPLANT **involves replacing a failing organ with a healthy donor organ**

- **Examples:** heart, liver, & kidney transplants



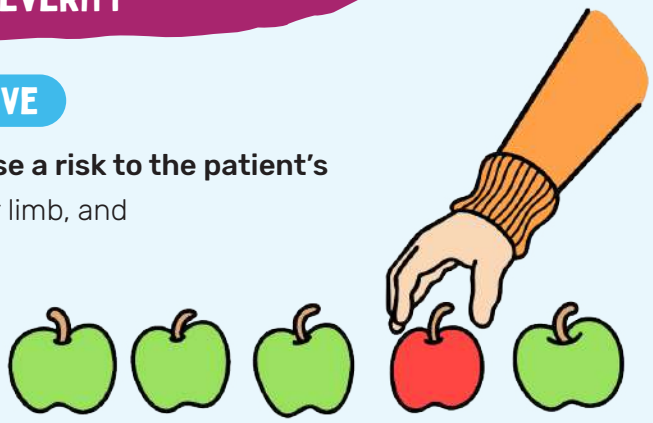
BASED ON DEGREE OF INVASIVENESS

	MINIMALLY INVASIVE SURGERY	MAJOR SURGERY
EXTENT	Involves small incisions; uses specialized instruments (e.g. cameras, catheters, scopes) to access surgical sites without opening large body compartments 	Requires large incisions and direct access to internal organs, bones, or tissues 
RISK OF COMPLICATIONS	Lower risk of post-operative complications	Higher risk of complications such as infection, bleeding, & blood clots
PAIN LEVEL	Typically mild; may not require opioids for pain control	Usually moderate to severe; often requires opioid analgesia
SETTING	Can often be performed in outpatient surgical centers or hospital settings	Typically performed in a hospital operating room
RECOVERY TIME	Shorter recovery period; patients often resume normal activities more quickly	Longer recovery time with extended hospital stays or rehabilitation
EXAMPLES	Heart catheterization, **v**ideo-**a**ssisted **t**horacic **s**urgery (**VATS**), knee arthroscopy	Open-heart surgery, Cesarean section, total hip or knee replacement

BASED ON SEVERITY

ELECTIVE

Surgery that is planned in advance and **does not pose a risk to the patient's current or future health**. There is no threat to life or limb, and delaying the procedure will not result in harm.



- **Examples:**
- ✓ Cosmetic surgeries
- ✓ Joint replacement or reconstruction
- ✓ Cataract surgery

EXPEDITED

Surgery that should occur **within days to weeks** to prevent deterioration, complications, or reduced quality of life. While **not immediately life- or limb-threatening**, delaying may lead to worse outcomes.

- **Examples**
- ✓ Malignant tumor removal
- ✓ Heart valve replacement
- ✓ Hernia repair

The patient has some time to prepare & plan for this type of surgery

URGENT

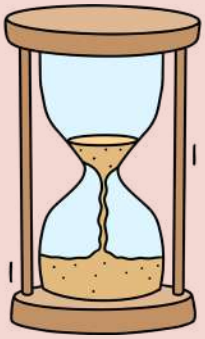
Surgery that must occur **within hours** due to a **probable threat to life or limb** if left untreated. Delay may result in serious health complications or death.

- **Examples**
- ✓ Appendectomy
- ✓ Cholecystectomy
- ✓ Long bone fracture repair

Urgent cases often allow brief stabilization and pre-operative assessment, but delaying surgery beyond that window significantly increases risk

EMERGENT

Surgery that must be performed **immediately** to prevent death or irreversible damage. These are true medical emergencies.



- **Examples**
- ✓ Ruptured aortic aneurysm
- ✓ Compartment syndrome
- ✓ Acute myocardial infarction (STEMI) requiring surgical intervention

PERIOPERATIVE PHASES

PRE-OPERATIVE PHASE

The duration of the pre-operative phase varies significantly depending on the urgency of the surgery

WHAT IS IT?

Begins when the decision for surgery is made and ends when the patient is transferred to the operating room

The decision to proceed with surgery may be made by the patient, their family, or the Provider, depending on the specific circumstances

KEY FEATURES

- Confirm patient identity using two unique identifiers
- Verify compliance with preoperative instructions:
  - NPO for 6–8 hours
  - Bowel preparation (if required)

This instruction is implemented to prevent aspiration

- Ensure all necessary medications are withheld (e.g. blood thinners, metformin)
- Confirm emergency contact information is available
- Confirm patient identity using two patient identifiers
- Review allergies, anesthesia history, and prior surgical complications
- Check vital signs and baseline labs for perioperative risk
- Confirm blood products are available if indicated
- Remove prosthetics, jewelry, and personal items
- Provide brief education on procedure and post-op expectations

There are two separate consents required prior to surgery:

- **Surgery consent:** signed after the surgeon has thoroughly explained the procedure, including all associated risks, benefits, & alternative treatment options
- **Anesthesia consent**: signed after the anesthesia Provider has reviewed the risks, benefits, & alternatives related to anesthesia

KEY FEATURES

HEALTH HISTORY

Medical history: hypertension, heart failure, asthma, COPD, kidney disease

Surgical history: prior procedures, anesthesia reactions, family/personal history of malignant hyperthermia

ALLERGIES

- Document allergies to medications, latex, iodine, & contrast agents

CURRENT MEDICATIONS

- Review blood thinners, antihypertensives, herbal supplements

SUBSTANCE USE

- Assess for alcohol, methamphetamine, fentanyl, or other substance use

In addition to the physical assessment, it is important to evaluate the patient's level of anxiety. Some patients may require anxiolytic medication to help them remain calm prior to the procedure.

PHYSICAL ASSESSMENT

- Vital signs
- Head to toe exam
- Focused assessment related to planned surgery

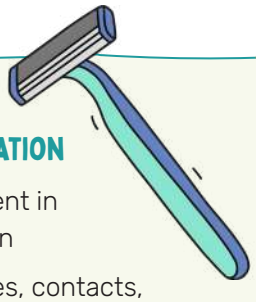
LABS

- **C**omplete **b**lood **c**ount (**CBC**)
- Electrolytes
- Coagulation studies
- Blood type & crossmatch

IMAGING

- CT/MRI
- X-ray
- Ultrasound

PRE-OPERATIVE PHASE



PATIENT PREPARATION

- Dress the patient in a hospital gown
- Remove glasses, contacts, hearing aids, dentures, jewelry, makeup, & nail polish
- Place at least one intravenous line (20 gauge or larger)
- Remove hair from the surgical site and cleanse with chlorhexidine

PRE-OP EDUCATION

- Explain the surgical process, recovery expectations, & rehabilitation needs
- Teach incentive spirometry use
- Demonstrate splinting techniques
- Inform about potential throat irritation if intubation will be used
- Instruct on deep breathing & coughing techniques
- Educate on sequential compression devices

INTRA-OPERATIVE PHASE

WHAT IS IT?

Begins when the patient enters the operating room and ends upon admission to the **P**ost-**A**nesthesia **C**are **U**nit (**PACU**)

KEY ROLES

1 Providers

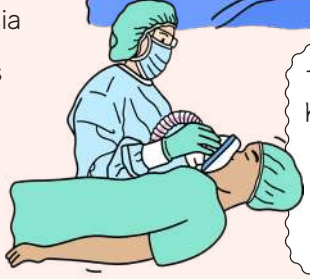
▶ **Surgeon**

- Performs surgery
- Leads the surgical team and directs care

▶ **Anesthesia Provider (anesthesiologist or CRNA)**

- Administers anesthesia
- Manages medications & blood products
- Monitors & maintains hemodynamics

Certain surgeries may require the involvement of additional Providers, such as an assisting surgeon, physician assistant, or nurse practitioner



This practice helps prevent **r**etained **s**urgical **i**tem (**RSI**) incidents

2 Nurses

▶ **Scrub nurse**

- **Works within the sterile field**

These nurses 'scrub in,' meaning they perform a thorough surgical scrub of their hands & forearms using antimicrobial soap, and don sterile attire -including a mask, gown, & gloves - to maintain aseptic technique within the sterile field

- Prepares sterile instruments, sutures, & sponges
- Maintains sterility
- Assists with draping & instrument handling

In addition to their defined roles, perioperative nurses must be prepared to recognize & respond to life-threatening complications, including:

✓ **Malignant hyperthermia:** a rare but serious reaction to anesthesia, characterized by rapid onset of severe hyperthermia & muscle rigidity

✓ **Anaphylaxis:** a severe allergic reaction that can result from exposure to anesthesia agents, medications, blood products, contrast media, or surgical materials such as latex, antimicrobials, or implants

✓ **Hemorrhage:** uncontrolled bleeding that may result from the surgical procedure or underlying injury

- Performs surgical counts

INTRA-OPERATIVE PHASE

Circulating nurse

- **Works outside the sterile field**
- Conducts the **surgical "time out"**
- Ensures safe patient positioning
- Documents interventions, blood loss, urine output, & specimens
- Ensures equipment availability
- Assists anesthesia with medications, fluids, & vitals
- Coordinates communication with family and receiving unit
- Controls room temperature & lighting

Surgical "Time Out"

A mandatory pause immediately before the procedure begins, during which the entire surgical team confirms the following:

1. Patient name & medical record number (MRN)
2. Planned surgical procedure
3. Correct surgical site and side of the body

Surgical tech

- Assists with sterile field setup
- Opens materials during surgery
- Holds instruments for the surgeon
- Manipulates tissues as directed
- Applies suction as needed

Surgical technologists and scrub nurses often have overlapping responsibilities, particularly in preparing and maintaining the sterile field, assisting the surgeon, and handling instruments during the procedure

POST-OPERATIVE PHASE

WHAT IS IT?

Begins upon admission to PACU and continues until full recovery, divided into three phases

PHASE 1: IMMEDIATE/POST-ANESTHETIC

- **Patient monitored in PACU**
- **Vital signs and neurological assessments** every 5–15 minutes for the first hour, then every 30 minutes for two hours

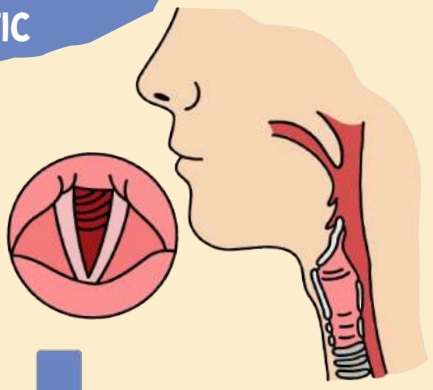
Following this phase, the frequency of vital sign monitoring is determined by the patient's level of acuity

- **Focus:** **a**irway, **b**reathing, **c**irculation (**ABCs**), consciousness, & pain management

PHASE 1: IMMEDIATE/POST-ANESTHETIC

AIRWAY

- Assess patency
- Interventions: stimulation, jaw thrust, suction, nasal/oral airway, & opioid reversal (naloxone) as needed



Signs of airway compromise may include:

- ✓ **Sonorous respirations** (low-pitched snoring sounds)
- ✓ **Gurgling** (indicative of secretions or obstruction)
- ✓ **Stridor** (high-pitched inspiratory sound suggesting upper airway obstruction)

BREATHING

- Assess rate, rhythm, depth, SpO_2, end-tidal CO_2
- Interventions: elevate head of bed, oxygen therapy, ventilation support (BVM)

If initial interventions are unsuccessful, activate a rapid response - the patient may require reintubation or advanced airway management

Signs of breathing complications may include:

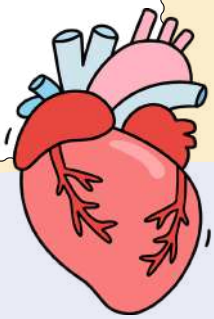
- ✓ **Bradypnea**
- ✓ **Irregular respiratory pattern**
- ✓ **Shallow respirations**
- ✓ **Decreased SpO_2**
- ✓ **Elevated $EtCO_2$**

CIRCULATION

- Monitor blood pressure, pulses, skin color, temperature
- Watch for hemorrhage signs
- Administer fluids, blood products, & vasopressors as needed

Signs of circulation complications may include:

- ✓ **Hypotension**
- ✓ **Thready or weak pulses**
- ✓ **Pallor**
- ✓ **Cool, diaphoretic skin**



▶ Level of consciousness

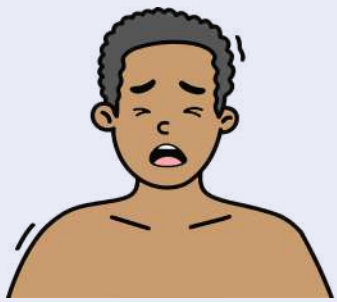
- Assess using AVPU or Glasgow Coma Scale

AVPU = Alert, Verbal, Painful response, Unresponsive

- Reorient patient as they wake
- Ensure **full consciousness** before PACU discharge

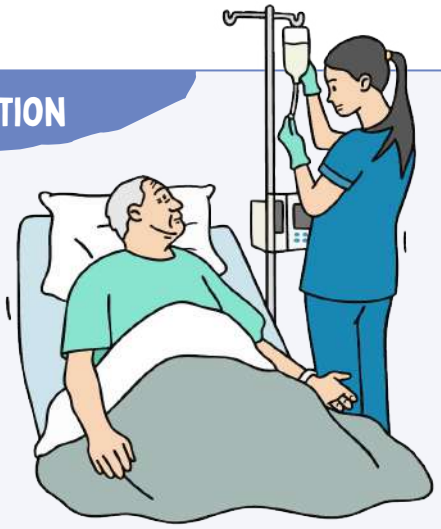
▶ Pain

- Assess using numeric, FACES, or CPOT scales
- Administer analgesics (opioids & non-opioids)
- Reposition for comfort
- Monitor for sedation & hypotension



PHASE 2: INTERMEDIATE/HOSPITALIZATION

- From PACU discharge until hospital discharge
- Focus on optimizing recovery



CARDIAC

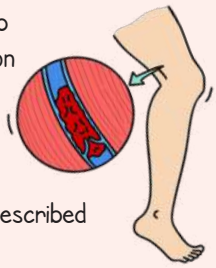
- ✓ Monitor heart rate, blood pressure, & rhythm
- ✓ DVT prophylaxis (anticoagulation, sequential compression devices, early ambulation)
- ✓ Monitor for bleeding

A DVT can dislodge and become an embolus, potentially leading to pulmonary embolism, myocardial infarction, or stroke

COMPLICATION: DEEP VEIN THROMBOSIS (DVT)

S&S:

- Cramping pain in the affected limb
- Hard, cord-like vein upon palpation
- Fever



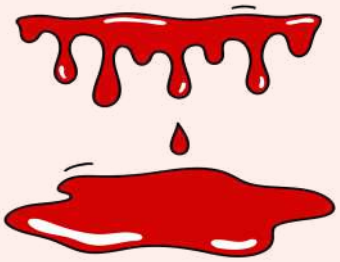
INTERVENTIONS:

- Administration of anticoagulants
- Use of thrombolytic agents as prescribed

COMPLICATION: POST-OPERATIVE HEMORRHAGE (SHOCK)

S&S:

- Obvious bleeding
- Hypotension
- Tachycardia
- Tachypnea
- Pallor



INTERVENTIONS:

- Apply direct pressure to the bleeding site
- Elevate legs (modified Trendelenburg position)
- Administer blood products, IV fluids, & colloids as prescribed

RESPIRATORY

- ✓ Elevate head of bed
- ✓ Frequent lung auscultation
- ✓ Encourage incentive spirometry and breathing exercises
- ✓ Suction and chest physiotherapy as needed

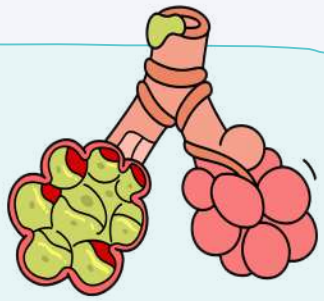
COMPLICATION: PNEUMONIA

S&S:

- Crackles on lung auscultation
- Elevated temperature (fever)
- Productive cough
- Chest pain

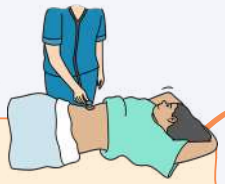
INTERVENTIONS:

- Administer supplemental oxygen as needed
- Initiate antibiotic therapy as prescribed
- Encourage continued deep breathing and coughing exercises, including the use of incentive spirometry



GASTROINTESTINAL

- ✓ Monitor bowel sounds and abdominal distention
- ✓ Manage nausea & vomiting
- ✓ Perform swallow screening and advance diet as tolerate



INTERVENTIONS:

- Encourage early mobilization
- Promote adequate fluid intake
- Administer stool softeners as prescribed
- Consider nasogastric (NG) tube insertion if indicated

COMPLICATION: CONSTIPATION & PARALYTIC ILEUS

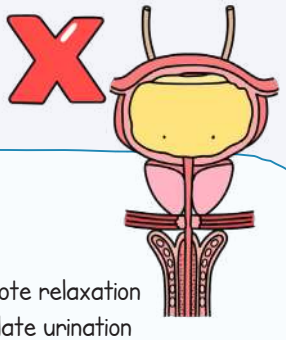
S&S:

- Absent or diminished bowel sounds
- Abdominal distention
- Nausea & vomiting

PHASE 2: INTERMEDIATE/HOSPITALIZATION

GENITOURINARY

- ✔ Monitor urinary output & retention
- ✔ Remove Foley catheter as soon as appropriate



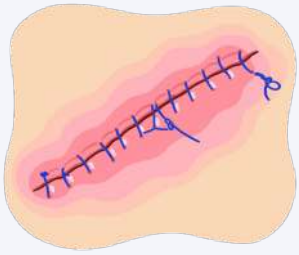
COMPLICATION: URINARY RETENTION

S&S:
- Little to no urine output
- Palpable distended bladder
- Retained urine volume greater than 400 mL as confirmed by bladder scan

INTERVENTIONS:
- Ensure privacy to promote relaxation
- Run tap water to stimulate urination
- Encourage placing the patient's hand in warm water
- Perform intermittent straight catheterization

INTEGUMENTARY

- ✔ Inspect surgical site for infection signs
- ✔ Change dressings per protocol
- ✔ Monitor and document surgical drains
- ✔ Assess wound integrity



COMPLICATION: SURGICAL SITE INFECTION (SSI)

S&S:
- Purulent discharge from the wound
- Erythema (redness) around the incision
- Induration (localized swelling or firmness)
- Increased pain at the surgical site

INTERVENTIONS:
- Administer antibiotics as prescribed
- Obtain wound cultures per Provider orders
- Perform dressing changes and wound irrigation as directed

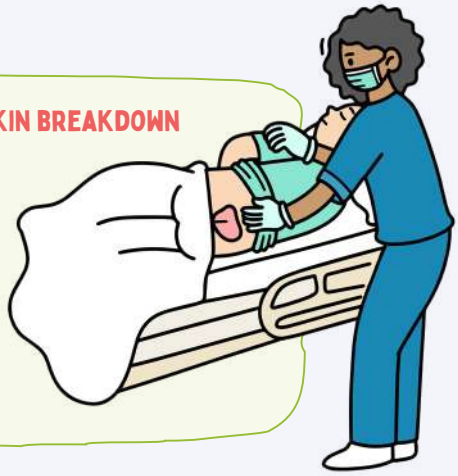
MUSCULOSKELETAL

- ✔ Encourage movement and early ambulation if appropriate
- ✔ Reposition every 2 hours if patient unable to move independently
- ✔ Perform range of motion exercises

COMPLICATIONS: DVT, PNEUMONIA, & SKIN BREAKDOWN

INTERVENTIONS:

Prevention is key. Encourage the patient to:
- Move frequently and as independently as possible
- Participate actively in physical &/or occupational therapy
- Avoid prolonged periods of immobility



PHASE 3: CONVALESCENT/ POST-DISCHARGE

▶ From hospital discharge to full recovery

DISCHARGE EDUCATION:

- **Medications:** dosing, administration, timing, side effects
- **Activity restrictions:** work, exercise, lifting, driving, sexual activity

- **Wound care:** dressing changes, infection signs, showering instructions
- **Follow-up:** appointments 1-2 weeks post-op; suture/staple removal
- **Home care:** community resources, physical/occupational therapy, transportation, assistance with medication and wound care as needed