Poisoning & Toxicology

APPROACH • TOXIDROMES • ANTIDOTES • SPECIFIC POISONINGS

1. GENERAL APPROACH & TOXIDROMES

Toxidrome	Vitals	Pupils	Key Features	Common Causes
Cholinergic	Bradycardia, Bronchorrhea	Miotic (constricted)	SLUDGE: Salivation, Lacrimation, Urination, Defecation, GI distress, Emesis	Organophosphates, Carbamates
Anticholinergic	Tachycardia, Hyperthermia, HTN	Mydriatic (dilated)	Mad as hatter, Blind as bat, Red as beet, Hot as hare, Dry as bone	Atropine, TCA, Antihistamines
Sympathomimetic	HTN, Tachycardia, Hyperthermia	Dilated	Agitation, Diaphoresis, Tremors, Seizures	Cocaine, Amphetamines, MDMA
Opioid	Bradypnea, Hypotension	Pinpoint	CNS depression, Respiratory depression, Hypothermia	Heroin, Morphine, Fentanyl
Sedative-Hypnotic	Normal or decreased	Normal or dilated	CNS depression, Ataxia, Respiratory depression	Benzodiazepines, Barbiturates, EtOH

MCQ GOLD: DUMBELS = Diarrhea, Urination, Miosis, Bronchorrhea, Bradycardia, Emesis, Lacrimation, Salivation (Cholinergic)

🚨 ALWAYS give Thiamine BEFORE Glucose in malnourished/alcoholic patients to prevent Wernicke encephalopathy

2. ANTIDOTES TABLE (MCQ GOLD)

Poison	Antidote	Dose/Notes
Acetaminophen	N-Acetylcysteine (NAC)	150mg/kg IV over 1h, then 50mg/kg over 4h, then 100mg/kg over 16h. Most effective within 8h
Opioids	Naloxone	0.4-2mg IV q2-3min. May need repeat doses for long-acting opioids
Benzodiazepines	Flumazenil	0.2mg IV over 30sec, repeat up to 1mg. CAUTION: Risk of seizures
Organophosphates	Atropine + Pralidoxime (2-PAM)	Atropine 2-5mg IV q3-5min until dry secretions. 2-PAM 1-2g IV over 15-30min
Carbon Monoxide	100% O2 (Hyperbaric if severe)	Reduces half-life from 4-6h to 40-80min. HBOT if CO >25%, pregnancy, neuro symptoms
Methanol/Ethylene Glycol	Fomepizole (or Ethanol)	Loading 15mg/kg, then 10mg/kg q12h. Inhibits alcohol dehydrogenase
Beta-blockers	Glucagon	5-10mg IV bolus, then infusion. High-dose insulin + glucose also effective
Calcium Channel Blockers	Calcium Gluconate	1g IV, repeat. Add high-dose insulin, lipid emulsion if severe
Digoxin	Digoxin-specific Fab	Indications: K >5, life-threatening arrhythmia, ingestion >10mg
Iron	Deferoxamine	15mg/kg/h IV. "Vin rose" urine color indicates chelation working
Lead	EDTA, Dimercaprol, Succimer	CaNa2EDTA + BAL if encephalopathy. Succimer for children
Cyanide	Hydroxocobalamin or Nitrites + Thiosulfate	Hydroxocobalamin preferred (forms cyanocobalamin). 5g IV over 15min
Methemoglobinemia	Methylene Blue	1-2mg/kg IV over 5min. Contraindicated in G6PD deficiency
Snake Bite (Viper)	Polyvalent Anti-snake Venom	8-10 vials initially. Skin test first. Indications: Systemic signs, coagulopathy

3. SPECIFIC POISONINGS

Poisoning	Key Clinical Features	Diagnostic Clues	Management

Acetaminophen	Asymptomatic 0-24h; RUQ pain, vomiting 24-72h; Peak hepatotoxicity 72-96h	Rumack-Matthew Nomogram (4h level >150mcg/mL = toxic). AST/ALT rise	NAC within 8h (nearly 100% protection). King's College criteria for transplant
Organophosphates	SLUDGE symptoms, muscle fasciculations, weakness, respiratory failure	↓RBC cholinesterase activity. Garlic odor	Atropine (titrate to dry secretions), 2-PAM within 24-48h, decontamination
Carbon Monoxide	Headache, dizziness, nausea, cherry-red skin (late), confusion, syncope	Elevated COHb. PaO2 normal but O2 saturation low (co-oximetry)	100% O2. HBOT if: CO >25%, pregnancy >15%, loss of consciousness, neuro deficits
Methanol	Blurred vision, "snowfield" vision, optic disc hyperemia, metabolic acidosis	↑ Osmolar gap, ↑ Anion gap metabolic acidosis. Formic acid level	Fomepizole or ethanol, folic acid, hemodialysis if severe
Ethylene Glycol	CNS depression, ATN, hypocalcemia, calcium oxalate crystals in urine	↑ Osmolar gap, ↑ Anion gap. Calcium oxalate crystals (envelope-shaped)	Fomepizole, thiamine, pyridoxine, hemodialysis
Iron	Stage 1: GI toxicity; Stage 2: Latent; Stage 3: Shock, acidosis; Stage 4: Hepatic failure	Serum iron >350mcg/dL at 4-6h. Abdominal X-ray: radiopaque tablets	Whole bowel irrigation, deferoxamine if severe. Chelation if iron >500
TCA Overdose	Anticholinergic effects, seizures, wide QRS (>100ms), hypotension, arrhythmias	ECG: Sinus tachycardia, prolonged PR/QRS/QT, terminal R wave aVR	Sodium bicarbonate (1-2mEq/kg) for QRS >100ms or arrhythmias. Alkalinization
Salicylates	Tinnitus, hyperventilation (respiratory alkalosis), metabolic acidosis, fever	↑ Anion gap, respiratory alkalosis + metabolic acidosis. Serum level >30mg/dL toxic	Urinary alkalinization (goal urine pH 7.5-8), hemodialysis if severe
Snake Bite (Viper)	Local: Pain, swelling, blistering. Systemic: Bleeding gums, hematuria, DIC, AKI	20-min Whole Blood Clotting Test (WBCT). Coagulopathy	Pressure bandage (NOT tourniquet), ASV if systemic signs/coagulopathy

💡 *Rumack-Matthew Nomogram: Single acetaminophen level at 4h post-ingestion. Treatment line at 150mcg/mL. Use ONLY for single acute ingestion*

MUDPILES for Anion Gap Metabolic Acidosis: Methanol, Uremia, DKA, Paraldehyde/Phenformin, Iron/INH, Lactic acidosis, Ethylene glycol/Ethanol, Salicylates

Environmental Emergencies

HEAT • COLD • DROWNING • ALTITUDE • DECOMPRESSION

1. HEAT-RELATED DISORDERS

Condition	Temp	CNS	Key Features	Treatment
Heat Cramps	Normal	Normal	Painful muscle spasms, Na+ loss from sweating	Rest, cooling, oral electrolytes
Heat Exhaustion	Normal or slightly elevated	Mild (fatigue, headache)	Heavy sweating, weakness, nausea, normal mental status	Cool environment, oral/IV fluids, rest
Heat Stroke	>40°C (104°F)	Altered (coma, seizures, delirium)	Hot dry skin (classic) or sweating (exertional), multi-organ failure	Rapid cooling (ice bath), ICU, supportive. Mortality 70% if untreated

🚨 Heat Stroke: COOLING is priority! Goal: Reduce core temp to 39°C within 30 min. Ice water immersion most effective. Stop cooling at 38-39°C to prevent hypothermia

2. HYPOTHERMIA

Stage	Temp	Clinical Features	Treatment
Mild	32-35°C	Shivering, tachycardia, tachypnea, confusion, poor judgment	Passive external: Remove wet clothes, warm blankets
Moderate	28-32°C	Shivering stops, bradycardia, hypotension, decreased reflexes, lethargy	Active external: Forced warm air, warm water immersion
Severe	<28°C	Coma, fixed dilated pupils, VF risk, apnea, areflexia	Active core: Warm IVF, gastric/bladder lavage, ECMO/bypass if unstable

"You're not dead until you're warm and dead" - Continue resuscitation until core temp >32°C. Check pulse for 60 seconds (slow pulse may be present). J-wave (Osborn wave) on ECG is pathognomonic

3. DROWNING & NEAR-DROWNING

Aspect	Freshwater	Saltwater
Mechanism	Hypotonic → rapid absorption → hemodilution, hemolysis, hyperkalemia	Hypertonic → draws fluid into alveoli → pulmonary edema, hemoconcentration
Clinical Distinction	Rarely matters clinically - both cause surfactant washout, alveolar collapse, V/Q mismatch	
Complications	Hypoxemia (primary), ARDS (delayed 24h), cerebral edema, arrhythmias, secondary drowning (2-24h post)	
Management	ABCs, 5 initial rescue breaths (hypoxia primary problem), CPR if needed, monitor minimum 6-8h even if asymptomatic	

💡 *Poor Prognostic Factors: Submersion >5-10 min, Time to effective CPR >10 min, GCS <5 on arrival, pH <7.1, Asystole/PEA on arrival*

4. HIGH ALTITUDE ILLNESS

Condition	Onset	Key Features	Treatment
AMS	6-12h after ascent	Headache + fatigue/dizziness/GI symptoms	Rest, analgesics, acetazolamide 250mg BID, descent if severe
HAPE	2-4 days	Dyspnea at rest, cough, pink frothy sputum, hypoxemia	Immediate descent, O2, nifedipine 20-30mg SR q12h, hyperbaric chamber
HACE	3-5 days	AMS + ataxia, altered mental status, coma	Immediate descent, dexamethasone 4mg q6h, hyperbaric chamber

Prevention: Gradual ascent (>2500m: sleep no more than 500m higher/day). Acetazolamide 125-250mg BID speeds acclimatization. NEVER use acetazolamide alone for HAPE (can worsen)

5. DECOMPRESSION SICKNESS (DCS) & AGE

Feature	Type I DCS	Type II DCS	Arterial Gas Embolism
Onset	Gradual	Rapid	Immediate (on surfacing)
Manifestations	Joint pain (bends), skin mottling	Pulmonary (chokes), neuro (spinal cord), cardiovascular	Cerebral (confusion, seizures, focal deficits), coronary
Treatment	100% O2, aggressive hydration, hyperbaric O2 (US Navy Table 6), avoid air transport (cabin altitude worsens bubbles)		

CREW for Altitude Illness: **C**hest symptoms (HAPE) | **R**est at same altitude | **E**mergency descent if severe | **W**ait 2-3 days before next ascent

Genetics & Chromosomal Disorders

DOWN • MARFAN • INHERITANCE • METABOLIC DISORDERS

1. CHROMOSOMAL DISORDERS

Feature	Down (Trisomy 21)	Edwards (Trisomy 18)	Patau (Trisomy 13)
Incidence	1:700	1:5,000	1:10,000
Survival	Normal (reduced)	90% die by 1 year	90% die by 1 year
Craniofacial	Flat face, upslanting eyes, epicanthal folds, flat nasal bridge, protruding tongue, Brushfield spots	Prominent occiput, micrognathia, low-set ears	Microphthalmia, cleft lip/palate, polydactyly, holoprosencephaly
Hands	Single palmar crease, clinodactyly (5th finger), hyperflexible joints	Clenched fists with overlapping fingers	Polydactyly
Feet	Wide space between 1st-2nd toes (sandal gap)	Rocker-bottom feet	-
Cardiac	AVSD (most common), VSD, ASD, PDA (40-50%)	VSD, PDA	VSD, PDA, dextrocardia
GI	Duodenal atresia ("double bubble"), Hirschsprung, imperforate anus	-	-
Other	Hypotonia, intellectual disability, Alzheimer by 40-50, hypothyroidism, leukemia risk	Severe intellectual disability, apnea	Severe neuro defects, seizures

💡 *Down Syndrome Karyotypes: Free trisomy 21 (95%, maternal age-related), Robertsonian translocation (4%, chr 14/21, familial), Mosaicism (1%, milder)*

🚨 Duodenal Atresia "Double Bubble" on X-ray: 30% of cases have Down syndrome. Bilious vomiting in newborn. Emergency surgery required

2. SINGLE GENE DISORDERS

Disorder	Inheritance	Gene/Defect	Key Features	Management
Marfan	AD	FBN1 (fibrillin-1), chr 15	Tall, arachnodactyly, pectus excavatum/carinatum, ectopia lentis (superior), aortic root dilation, MVP	Beta-blockers, ARBs, aortic root replacement if >5cm, avoid contact sports
Cystic Fibrosis	AR	CFTR (chr 7)	Chronic lung disease (bronchiectasis), pancreatic insufficiency (malabsorption), high sweat chloride (>60)	Pancreatic enzymes, chest physiotherapy, antibiotics, CFTR modulators
Sickle Cell	AR	HBB (Glu6Val)	Vaso-occlusive crises, dactylitis, functional asplenia (Howell-Jolly), acute chest syndrome, stroke	Hydroxyurea, penicillin prophylaxis, transfusion, hematopoietic stem cell transplant
Hemophilia A	XR	F8 gene	Factor VIII deficiency, hemarthrosis, prolonged PTT, normal PT/INR	Factor VIII replacement, desmopressin (mild), emicizumab (prophylaxis)
Duchenne MD	XR	Dystrophin	Proximal muscle weakness, Gower sign, calf pseudohypertrophy, cardiomyopathy, CK >10x	Corticosteroids (prolongs ambulation), genetic counseling, supportive care
Neurofibromatosis 1	AD	NF1 gene	Café-au-lait spots (>6, >5mm), neurofibromas, Lisch nodules (iris), scoliosis, learning disabilities	Annual exam, MRI if symptomatic, surgery for complications

💡 *Marfan vs Homocystinuria: BOTH have lens dislocation. Marfan = SUPERIOR dislocation + tall stature + aortic disease. Homocystinuria = INFERIOR dislocation + intellectual disability + thrombosis risk*

3. INHERITANCE PATTERNS

Pattern	Characteristics	Examples
Autosomal Dominant	Vertical transmission, M=F, 50% risk, often structural proteins	Marfan, Huntington, Achondroplasia, NF1, Familial hypercholesterolemia

Autosomal Recessive	Horizontal (siblings), consanguinity increases risk, 25% risk, often enzyme defects	CF, Sickle cell, Thalassemia, PKU, Galactosemia, G6PD deficiency
X-Linked Recessive	Males affected, females carriers, no male-to-male transmission	Hemophilia A/B, Duchenne MD, G6PD deficiency, Fragile X
X-Linked Dominant	Males severely affected (often lethal), females milder, father-to-daughter transmission	Hypophosphatemic rickets, Rett syndrome (mostly lethal in males)
Mitochondrial	Maternal inheritance only, all offspring of affected mother at risk, variable expression	MELAS, MERRF, Leber hereditary optic neuropathy, Kearns-Sayre

4. METABOLIC DISORDERS

Disorder	Defect	Key Features	Treatment
GSD Type I (von Gierke)	Glucose-6-phosphatase	Fasting hypoglycemia, lactic acidosis, hepatomegaly, hyperuricemia, lipid accumulation, "cherry red spot"	Frequent feeds, cornstarch, avoid fasting
GSD Type II (Pompe)	Acid α-glucosidase (lysosomal)	Cardiomyopathy (hypertrophic), hypotonia, macroglossia, infantile form lethal by 2y if untreated	Enzyme replacement (Myozyme), only lysosomal GSD
GSD Type V (McArdle)	Muscle phosphorylase	Exercise intolerance, muscle cramps, "second wind" phenomenon, myoglobinuria	Avoid intense exercise, oral sucrose before activity
Hurler (MPS I)	α-L-iduronidase	Coarse facies, corneal clouding, organomegaly, intellectual disability, gibbus deformity	HSCT, enzyme replacement
Hunter (MPS II)	Iduronate sulfatase	X-linked, similar to Hurler but NO corneal clouding, aggressive behavior	Enzyme replacement
PKU	Phenylalanine hydroxylase	Intellectual disability, seizures, hypopigmentation, musty odor, eczema	Phenylalanine-restricted diet (for life), special formula
Galactosemia	GALT deficiency	Jaundice, hepatomegaly, cataracts, intellectual disability, E. coli sepsis (neonatal)	Lactose-free diet immediately (soy formula), good prognosis if early

GSD Types: **I** - von Gierke (liver, hypoglycemia) | **II** - Pompe (heart + muscle, lysosomal) | **V** - McArdle (muscle only, second wind)

Rheumatology & Autoimmune Disorders

SLE • APS • SCLERODERMA • VASCULITIS

1. SYSTEMIC LUPUS ERYTHEMATOSUS (SLE)

Feature	Clinical Manifestations
Constitutional	Fatigue, fever, weight loss, lymphadenopathy
Mucocutaneous (80%)	Malar rash (spares nasolabial folds), discoid rash, photosensitivity, oral ulcers (painless), alopecia
Musculoskeletal (90%)	Non-erosive arthritis (small joints), Jaccoud arthropathy, myositis
Renal (50%)	Lupus nephritis (major morbidity/mortality), proteinuria, hematuria, cellular casts
Neuropsychiatric (40%)	Seizures, psychosis, cerebritis, stroke, myelitis, peripheral neuropathy
Cardiopulmonary	Pleuritis, pericarditis, Libman-Sacks endocarditis, myocarditis, ILD
Hematologic	Hemolytic anemia (Coombs +), leukopenia (<4000), lymphopenia (<1500), thrombocytopenia (<100k)
Other	Raynaud phenomenon, livedo reticularis, secondary Sjögren

SLE Autoantibodies

Antibody	Frequency	Specificity	Clinical Association
ANA	95-99%	Low	Screening test, titer ≥1:80
Anti-dsDNA	70%	High	Correlates with disease activity, nephritis
Anti-Smith (Sm)	20-30%	Very High (99%)	Specific but not activity-related
Anti-Ro/SSA	30-40%	Moderate	Neonatal lupus (CHB), photosensitivity, Sjögren
Antiphospholipid Abs	30-40%	Moderate	Thrombosis, pregnancy loss, livedo

Lupus Nephritis (ISN/RPS Classification)

Class	Name	Features	Treatment
I	Minimal Mesangial	Normal LM, mesangial deposits on IF	None (treat extrarenal)
II	Mesangial Proliferative	Mesangial hypercellularity	HCQ, low-dose steroids if needed
III	Focal LN	<50% glomeruli involved	Steroids + MMF or CYC
IV	Diffuse LN	≥50% glomeruli (most severe)	Aggressive: Steroids + MMF or CYC
V	Membranous LN	Subepithelial deposits, nephrotic syndrome	Steroids + MMF/CNIs
VI	Advanced Sclerosing	>90% sclerotic glomeruli	Dialysis/transplant

🚨 Active Urinary Sediment in LN: RBC casts, WBC casts, granular casts = Active glomerular inflammation requiring urgent treatment

2. ANTIPHOSPHOLIPID SYNDROME (APS)

Criteria	Details
Clinical	Vascular thrombosis (venous or arterial) OR Pregnancy morbidity (≥1 unexplained deaths ≥10w, ≥3 consecutive <10w miscarriages, premature <34w due to eclampsia/placental insufficiency)
Laboratory (persistent >12w)	Lupus anticoagulant (functional assay, prolonged aPTT not corrected with mixing) OR Anticardiolipin (IgG/IgM, medium-high titer) OR Anti-β2 glycoprotein I (IgG/IgM)
Clinical Features	Recurrent DVT/PE, stroke (young), livedo reticularis, thrombocytopenia, hemolytic anemia, valve disease, nephropathy
Treatment	Thrombosis: Warfarin (INR 2-3) or DOACs (avoid in high-risk/triple positive). Pregnancy: LDA + prophylactic/therapeutic LMWH

💡 *Lupus Anticoagulant causes PROLONGED clotting in vitro but THROMBOSIS in vivo. Paradoxical but key concept!*

3. SYSTEMIC SCLEROSIS (SCLERODERMA)

Feature	Diffuse Cutaneous (dcSSc)	Limited Cutaneous (lcSSc/CREST)
Skin	Proximal + distal (trunk, face), rapid onset	Distal only (hands, face), slow onset
Raynaud	May occur after skin changes	Precedes skin changes by years
Internal Organs	Early and severe: ILD, renal crisis	Late, PAH prominent
Antibodies	Anti-Scl-70 (topoisomerase I)	Anti-centromere
Prognosis	Worse	Better
Renal Crisis	10-20% risk, malignant HTN, AKI	Rare

🚨 Scleroderma Renal Crisis: Occurs in dcSSc. Risk factors: Rapid skin progression, new anemia, high-dose steroids. ACE-I is MANDATORY and life-saving

CREST: **C**alcinosis | **R**aynaud | **E**sophageal dysmotility | **S**clerodactyly | **T**elangiectasia (Limited SSc)

4. VASCULITIS

Vasculitis	Vessel Size	Key Features	ANCA	Treatment
Giant Cell Arteritis	Large	Age >50, new headache, temporal artery tenderness, jaw claudication, visual loss (emergency!)	Negative	High-dose steroids immediately (don't wait for biopsy)
Takayasu	Large	"Pulseless disease", women <40, aortic arch/branches, bruits, BP discrepancy	Negative	Steroids + immunosuppressants, revascularization
Polyarteritis Nodosa	Medium	NO glomerulonephritis (distinguishes from small vessel), HBV association, microaneurysms, mononeuritis multiplex	Negative	Steroids + CYC. Treat HBV if present
GPA (Wegener)	Small	Upper airway (saddle nose, sinusitis), lower airway (pulmonary nodules/cavities), kidney (pauci-immune GN)	c-ANCA/PR3	Steroids + CYC or Rituximab
MPA	Small	RPGN + pulmonary hemorrhage (capillaritis). NO granulomas, NO upper airway	p-ANCA/MPO	Steroids + CYC or Rituximab
EGPA (Churg-Strauss)	Small	Asthma, eosinophilia, granulomatous inflammation, neuropathy	p-ANCA/MPO (40%)	Steroids ± immunosuppressants

💡 *ANCA: c-ANCA (cytoplasmic) = PR3 = GPA. p-ANCA (perinuclear) = MPO = MPA, EGPA. Also seen in IBD, infection (lower specificity)*

Pediatrics Multisystem

PEM • KAWASAKI • PEDIATRIC POISONING

1. PROTEIN-ENERGY MALNUTRITION (PEM)

Feature	Kwashiorkor	Marasmus
Pathophysiology	Protein deficiency with adequate calories	Total calorie deficiency (protein + energy)
Weight-for-Age	60-80%	<60%
Edema	Present (hypoalbuminemia)	Absent
Subcutaneous fat	Preserved	Absent (wasted)
Muscle wasting	Mild-moderate	Severe
Skin	Flag sign (hair), flaky paint dermatosis, hyperpigmentation	Loose, wrinkled skin
Hair	Discolored (reddish, gray), easily pluckable	Sparse, thin
Liver	Fatty liver (enlarged)	Not enlarged
Mental state	Apathetic, irritable, poor appetite	Alert, hungry, ravenous
Mortality	Higher (despite better weight)	Lower if treated

💡 *Kwashiorkor = "Red boy" (edema, reddish hair). Marasmus = "Old man face" (wrinkled, wizened)*

WHO Management Protocol

Phase	Actions
Initial (Days 1-2)	Treat hypoglycemia (feed q2-3h), hypothermia (skin-to-skin, warm room), infection (antibiotics), dehydration (ReSoMal - reduced osmolarity ORS)
Rehabilitation	F-75 (75kcal/100mL) initially → F-100 or RUTF when appetite returns. Iron ONLY after week 2 (when edema resolved)
Micronutrients	Vitamin A (Day 1, 2, 8), folic acid, zinc, multivitamins
Follow-up	Weight monitoring, nutrition education, infection prevention

🚨 Refeeding Syndrome: Potentially fatal shift of fluids/electrolytes when nutrition restarted. Hypophosphatemia (cardiac/respiratory failure), hypokalemia, hypomagnesemia. Start feeds slowly, monitor electrolytes

2. KAWASAKI DISEASE

Diagnostic Criteria	Details
Fever	≥5 days (often high, spiking), unresponsive to antibiotics
+ 4 of 5:	1. Bilateral conjunctival injection (non-exudative, limbic sparing) 2. Mucous membrane changes (strawberry tongue, fissured lips, injected pharynx) 3. Cervical lymphadenopathy (>1.5cm, usually unilateral) 4. Polymorphous rash (maculopapular, NOT vesicular) 5. Extremity changes (erythema/edema acute, periungual desquamation week 2-3)
Incomplete KD	Fever + <4 criteria but coronary abnormalities or compatible features. More common in infants <6 months (highest risk!)
Labs	↑ESR/CRP, thrombocytosis (2nd-3rd week, can be >1M), anemia, leukocytosis, hyponatremia, sterile pyuria, ↑LFTs, ↑pro-BNP

Cardiac Complications

Feature	Details
Coronary Artery Aneurysms	15-25% untreated, 5% treated. Risk: Male, <1y or >8y, prolonged fever, delayed treatment, incomplete KD. Peak formation week 2-4
Classification	Small (<5mm), Medium (5-8mm), Giant (>8mm). Giant = highest risk thrombosis/MI

Other Cardiac	Myocarditis, pericardial effusion, MR, KD shock syndrome
Monitoring	Echo at diagnosis, 2 weeks, 6-8 weeks. More frequent if abnormalities

Treatment

Agent	Dose	Notes
IVIG	2g/kg single infusion over 10-12h	Reduces aneurysm risk 25%→5%. Best within 10 days of fever onset
Aspirin	High dose 80-100mg/kg/day (until afebrile 48-72h) → Low dose 3-5mg/kg/day for 6-8 weeks	Continue low-dose indefinitely if aneurysm present
IVIG-Resistant (10-20%)	Retreatment with IVIG OR IV methylprednisolone 30mg/kg/day x3d OR Infliximab	Defervescence failure after 36h of initial IVIG
Giant Aneurysm	Add anticoagulation (warfarin INR 2-2.5 or LMWH)	Lifetime management, dual antiplatelet (aspirin + clopidogrel)

CRASH and BURN: **C**onjunctivitis | **R**ash | **A**denopathy | **S**trawberry tongue | **H**ands/feet changes | **BURN** (fever ≥5 days)

3. PEDIATRIC POISONING

Toxin	Considerations	Treatment
Iron	Fatal: 60mg/kg elemental iron. Tablets look like candy. Stages: GI toxicity → latent → shock/acidosis → hepatic failure → gastric outlet obstruction	Whole bowel irrigation, deferoxamine 15mg/kg/h IV if severe, "vin rose" urine
Button Battery	Esophageal impaction = EMERGENCY. Tissue necrosis in 2h, perforation in 6h, fistula in 12h	Immediate endoscopic removal. Honey/sucralfate if delayed
Lead	Pica (paint chips). Developmental delay, anemia (basophilic stippling), abdominal pain, irritability	Chelation: Succimer (PO) if 45-70mcg/dL, EDTA + BAL if >70 or encephalopathy
Hydrocarbons	Aspiration risk > systemic toxicity. Low viscosity = high aspiration risk (kerosene, gasoline)	NO emesis, NO lavage (aspiration risk). Supportive care, O2
Caustics	Acids (coagulation necrosis) or Alkalis (liquefaction necrosis). Stricture risk	NO emesis, NO charcoal. Dilution if immediate, endoscopy at 12-24h

Nutrition & Vitamin Deficiencies

VITAMINS A-K • DEFICIENCY • TOXICITY • NUTRITIONAL SUPPORT

1. FAT-SOLUBLE VITAMINS (A, D, E, K)

Vitamin	Function	Deficiency Features	Treatment
A	Vision, epithelial integrity, immunity	Night blindness, xerophthalmia, Bitot spots, keratomalacia (blindness), follicular hyperkeratosis	Adults: 200,000 IU x1-3 doses. Children: 50,000-200,000 IU based on age
D	Calcium/phosphate homeostasis, bone mineralization	Children: Rickets (craniotabes, rachitic rosary, bow legs). Adults: Osteomalacia (bone pain, fractures)	D3 2000-4000 IU daily or 50,000 IU weekly x6-8 weeks, then maintenance 800-1000 IU
E	Antioxidant, cell membrane protection	Hemolytic anemia (premature infants), peripheral neuropathy, ataxia, ophthalmoplegia	Vitamin E supplements (water-soluble if malabsorption)
K	Clotting factors II, VII, IX, X synthesis	Hemorrhagic disease of newborn, bleeding, easy bruising, prolonged PT/INR	Vitamin K 1mg IM at birth (prophylaxis). Treatment: 1-10mg IV/IM/SC

🚨 Measles + Vitamin A: All children with measles should receive Vitamin A regardless of nutritional status. Reduces mortality 50%. Dose: 200,000 IU (50,000 if <6 months) immediately and next day

2. WATER-SOLUBLE VITAMINS (B-COMPLEX, C)

Vitamin	Function	Deficiency	High-Risk Groups	Treatment
B1 (Thiamine)	Glucose metabolism (transketolase, PDH)	Beriberi (dry: neuropathy; wet: high-output HF), Wernicke encephalopathy (triad: confusion, ataxia, ophthalmoplegia), Korsakoff psychosis	Alcoholism, malnutrition, hyperemesis, TPN without B1, bariatric surgery	100mg IV before glucose! Then 100mg daily until normal diet
B6 (Pyridoxine)	Neurotransmitter synthesis (GABA, serotonin)	Peripheral neuropathy, seizures (infants), sideroblastic anemia, dermatitis	INH therapy, penicillamine, hydralazine, OCPs, alcoholism	25-50mg daily with INH (prophylaxis)
B12 (Cobalamin)	DNA synthesis, myelin synthesis	Megaloblastic anemia, glossitis, posterior column deficits (vibration/proprioception loss), peripheral neuropathy, dementia	Pernicious anemia, gastrectomy, ileal disease, strict veganism, metformin, PPIs	IM cyanocobalamin 1000mcg (daily x1 week, weekly x1 month, then monthly for life if PA)
Folate	DNA synthesis	Megaloblastic anemia, glossitis, NTD in pregnancy. NO neurological symptoms (vs B12)	Malnutrition, malabsorption, pregnancy, hemolysis, methotrexate	Folic acid 1-5mg daily. CRITICAL in pregnancy (400mcg, 4mg if high risk)
C (Ascorbic Acid)	Collagen synthesis, antioxidant, iron absorption	Scurvy: perifollicular hemorrhage, corkscrew hairs, gingival bleeding, poor wound healing	Alcoholism, elderly, infants (cow's milk only), malabsorption	100-300mg daily until resolved, then 40mg maintenance

💡 *B12 vs Folate: BOTH cause megaloblastic anemia. B12 has neurological symptoms (posterior column, neuropathy). Folate does NOT. NEVER give folate alone if B12 deficiency possible (corrects anemia but neurological damage progresses)*

3. NUTRITIONAL SUPPORT

Aspect	Enteral Nutrition	Parenteral Nutrition
Indications	Functional GI tract but unable to meet needs orally (stroke, ICU, malignancy)	Intestinal failure (short bowel, severe malabsorption, prolonged ileus, severe pancreatitis)
Access	NG (short-term), PEG (long-term), NJ (gastroparesis, aspiration risk)	Central venous catheter required (high osmolarity)
Components	Polymeric (standard), Elemental (malabsorption), Disease-specific (renal, hepatic)	Dextrose (3.4kcal/g), Lipids (9kcal/g), Amino acids (4kcal/g), Electrolytes, Vitamins

Complications	Aspiration, diarrhea, constipation, tube occlusion, metabolic abnormalities	Hyperglycemia, electrolyte abnormalities, hepatic dysfunction, cholestasis, CRBSI, refeeding syndrome
Monitoring	Gastric residual, bowel function, weight, prealbumin	Daily electrolytes, glucose, LFTs, triglycerides, weekly weight, prealbumin

🚨 Refeeding Syndrome: Occurs when nutrition restarted after prolonged starvation. Hypophosphatemia (cardiac/respiratory failure), hypokalemia, hypomagnesemia. Prevent by starting feeds at 10-20kcal/kg and increasing slowly. Monitor electrolytes closely

Obesity & Bariatric Surgery

METABOLIC SYNDROME • BMI • PHARMACOTHERAPY • SURGICAL OPTIONS

1. OBESITY CLASSIFICATION

Classification	BMI (kg/m²)	Waist Circumference Risk (Men/Women)
Underweight	<18.5	-
Normal	18.5-24.9	-
Overweight	25.0-29.9	>102/>88 cm (>90/>80 cm Asian)
Obesity Class I	30.0-34.9	High risk
Obesity Class II	35.0-39.9	Very high risk
Obesity Class III (Morbid)	≥40	Extremely high risk
Super Obesity	≥50	Extreme risk

2. METABOLIC SYNDROME (ATP III CRITERIA - 3 OF 5)

Component	Defining Level
Central obesity	Waist >102cm men, >88cm women (>90/>80 Asian)
Triglycerides	≥150 mg/dL or on therapy
HDL cholesterol	<40 mg/dL men, <50 mg/dL women or on therapy
Blood pressure	≥130/85 mmHg or on therapy
Fasting glucose	≥100 mg/dL or on therapy

Metabolic syndrome increases risk: T2DM (5-fold), CVD (2-fold), stroke, NAFLD, certain cancers

3. PHARMACOTHERAPY FOR OBESITY

Drug	Mechanism	Weight Loss	Side Effects/Notes
Orlistat	Lipase inhibitor	2.9 kg	Steatorrhea, fecal incontinence, fat-soluble vitamin deficiency
Phentermine/Topiramate	Appetite suppressant	8-10%	Paresthesias, cognitive effects, teratogenic (cleft lip)
Naltrexone/Bupropion	Appetite + reward pathway	5%	Nausea, headache, BP/HR increase, avoid in seizure disorder
Liraglutide 3mg	GLP-1 agonist	8%	Nausea, pancreatitis risk, thyroid C-cell tumors (contraindicated)
Semaglutide 2.4mg	GLP-1 agonist (weekly)	15%	GI side effects, gallbladder disease. Also reduces CV events

4. BARIATRIC SURGERY

Procedure	Mechanism	%EWL	Pros	Cons
Sleeve Gastrectomy (VSG)	Restrictive (80% stomach removed)	50-60%	Most common, technically easier, no malabsorption	Irreversible, GERD may worsen
Roux-en-Y Gastric Bypass (RYGB)	Restrictive + Malabsorptive	60-70%	Gold standard, best for GERD, durable weight loss	More complications, dumping syndrome, malabsorption
BPD-DS	Malabsorptive	70-80%	Most effective, for super-obese	Highest malnutrition risk
Adjustable Gastric Band	Restrictive	40-50%	Reversible, adjustable	High reoperation rate, declining use

Indications & Complications

Category	Details

Indications	BMI ≥40, OR BMI ≥35 with comorbidity (T2DM, HTN, OSA, severe joint disease). Failed non-surgical attempts. Age 18-65 typically
Benefits Beyond Weight	T2DM remission (60-80% RYGB, 50-60% VSG), reduced CV mortality (30-40%), improved NAFLD, OSA, PCOS, cancer risk reduction
Early Complications	Anastomotic/staple line leak (fever, tachycardia, pain), bleeding, PE, wound infection, bowel obstruction
Late Complications	Malabsorption (B12, iron, folate, D, calcium), dumping syndrome (RYGB), gallstones, strictures, weight regain
Lifelong Follow-up	Multivitamin, B12 (monthly IM or daily high-dose), iron, calcium + D, annual labs, protein goal 60-80g/day

🚨 Anastomotic Leak: Most feared early complication (1-5%). Presents with tachycardia >120, fever, increased O2 requirements, abdominal pain. High mortality if missed. Treatment: NPO, antibiotics, drainage, possible reoperation

BARIATRIC: **B**MI criteria | **A**ssessment (cardiac, pulmonary, psych) | **R**isks discussed | **I**ndications (failed medical) | **A**lternatives discussed | **T**ype of procedure | **R**ehabilitation | **I**ntensive follow-up | **C**ommitment