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# ER

## A Ready Reckoner

### for Emergency Room (ER) Doctors and First Responders

*Editors*

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CHAPTER 1

# Fast Track to the Most Common Presentations in the Emergency Room

## 1.1 FAST TRACK TO THE MOST COMMON PRESENTATIONS IN THE EMERGENCY ROOM

*Sachna P Shetty, Jamshed D Sunavala*

**BOX 1:** Presentation: Breathlessness/shortness of breath.

| ***Pertinent bedside tests*** | ***Differential diagnosis*** | ***Strong clinical indicators*** |
|---|---|---|
| $SpO_2$: Hypoxia<br>Portable spirometry-FEV1, FVC<br>CXR | **Respiratory system**<br>Severe asthma<br>(Page no. 35) | • Past history of asthma<br>• Rhonchi or silent chest if severe |
| ABG: Type II respiratory failure<br>CXR | COPD exacerbation<br>(Page no. 42) | • Past history of COPD along with other relevant risk factor<br>• Smoker<br>• Drowsy<br>• Diffuse crepitation or rhonchi |
| $SpO_2$: Hypoxia<br>ECG<br>CXR-WNL mostly, other signs in details in the chapter<br>2D echo-rv dilation and the other findings in respective chapter<br>ABG: Type I respiratory failure, respiratory alkalosis might be noted, look for alveolar arterial oxygen gradient | Pulmonary embolism<br>(Page no. 114) | **Risk factors:** Obesity/malignancy/bedridden/recent surgery/long flight/long bone fracture:<br>• Sudden SOB<br>• Unilateral leg swelling<br>• Tachycardia<br>• Tachypnea<br>• Rule out other causes of SOB/chest pain |
| $SpO_2$: Hypoxia<br>*CXR*: LRTI (usually bilateral/right dominant) | Aspiration | • Bedridden/decreased GCS/precise history of coughing or choking while eating/recent stroke<br>• Decreased saturation<br>• Crepitation right dominant<br>• Fever |

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| ***Pertinent bedside tests*** | ***Differential diagnosis*** | ***Strong clinical indicators*** |
|---|---|---|
| $SpO_2$: Hypoxia<br>CBC<br>Biomarkers (CRP/PCT)<br>CXR | Pneumonia<br>(Page no. 48) | • History of fever and cough, green/yellow phlegm<br>• Focal crepitation/adventitious sounds |
| Mainly clinical and history | Anaphylaxis<br>(Page no. 676) | • History of intake of new drug or food<br>• Sudden breathless/wheeze/stridor<br>• Itching/rash/diarrhea/abdomen pain<br>• Edema face or oral<br>• Chest discomfort<br>• Shock in some cases |
| $SpO_2$: Hypoxia<br>CXR | Airway obstruction | • History of foreign body ingestion/pediatric age group<br>• Stridor<br>• Ca larynx/radiation<br>• Postprolonged intubation |
| CXR<br>Bedside POCUS | Pneumothorax<br>(Page no. 448) | • Trauma/TB/malignancy/iatrogenic<br>• Desaturation<br>• Reduced breath sound/movement unilaterally<br>• Hemodynamic instability noted in moderate-to-severe cases |
| CXR<br>USG chest | Pleural effusion | • Shortness of breath only with large amount of fluids<br>• Pleuritic pain<br>• Dullness in percussion<br>• Classically reduced breath sounds on auscultation in the effected zone |
| Bedside CXR<br>*ABG*: Hypoxia<br>bedside POCUS<br>2D echo<br>ECG | **Cardiovascular system**<br>Acute heart failure<br>(Page no. 101) | • History of cardiac ailment (ACS/arrhythmias/valvular heart disease/cardiomyopathy)<br>• Desaturation/hypoxia<br>• Chest discomfort<br>• Basal crepitation<br>• Pedal edema/raised JVP<br>• Frothing/perspiration<br>• Tachycardia<br>• Tachypnea<br>• Hypertension/hypotension |
| ECG: Electric alternans, low voltage ECG<br>Bedside echo | Cardiac tamponade<br>(Page no. 144) | • Trauma/iatrogenic<br>• Triad of hypotension, raised JVP muffled heart sound |

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| ***Pertinent bedside tests*** | ***Differential diagnosis*** | ***Strong clinical indicators*** |
|---|---|---|
| Beside USG | **Extrathoracic causes:** Raised intra-abdominal pressure (abdominal-ascites, obesity, pregnancy, tumor, obstruction, and paralytic ileus) | • Increased or normal respiratory rate<br>• Pain/discomfort in the abdomen<br>• Reduced breath sounds if pleural effusion secondary to ascites |
| | Metabolic acidosis (DKA and renal failure) (Page no. 845) | Details given in **Box 9** |
| *ABG:* Hypoxia or hypocarbia but very often normal | Neuromuscular [GBS, multiple sclerosis (MS)] | • Abnormal breathing pattern (SHALLOW)—GBS<br>• Associated history<br>• Ascending paralysis in GBS<br>• Symptoms of limb weakens, loss of vision, tingling, and impaired coordination |
| | *Toxicology:*<br>• Snake bite<br>• Neuro toxins<br>• Carbon monoxide poisoning<br>• Methemoglobinemia<br>• Organophosphate or salicylate poisoning<br>(Page no. 525) | *History of bites/toxin administration:* Determine the appropriate toxidrome (anticholinergic, cholinergic, sympathetic, and opioid) |
| *CBC:* Neutrophilic leukocytosis or leukopenia<br>ABG—elevated lactates (shock)<br>Increased CRP/PCT cultures | Sepsis (Page no. 298) | • History of infection<br>• Tachycardia<br>• Tachypnea<br>• Temperature<br>• Organ dysfunction<br>• Hypotension not responding to volume resuscitation (shock) |
| Most bedside tests are normal<br>ABG: Low $pCO_2$ (hyperventilation) | Psychiatric | Diagnosis of exclusion normal lungs/saturation hyperventilation, anxiety |

(ABG: arterial blood gas; ACS: acute coronary syndrome; BUN: blood urea nitrogen; CBC: complete blood count; CRP: C-reactive protein; COPD: chronic obstructive pulmonary disease; CVS: coronary artery vasospasm; CXR: chest X-ray; CXR-WNL: chest X-ray within normal limits; ECG: electrocardiography; FEV1: forced expiratory volume in the one second; FVC: forced vital capacity; GCS: Glasgow Coma Scale; JVP: jugular venous pressure; LRTI: lower respiratory tract infection; PCT: procalcitonin; POCUS: point-of-care ultrasound; $SpO_2$: arterial oxygen saturation; SOB: shortness of breath; USG: ultrasonography)

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**BOX 2:** Presentation: Chest pain.

| ***Pertinent bedside tests*** | ***Differential diagnosis*** | ***Strong clinical indicators*** |
|---|---|---|
| Bedside ECG<br>Cardiac markers<br>Echo | **Cardiovascular system**<br>Angina<br>(Page no. 71) | • Diffuse precordial or retrosternal chest pain can radiate (arms, neck, and jaw; epigastric), intermittently present, last few minutes can be associated with sweating, nausea, and giddiness<br>• Usually on exertion<br>• Inframammary an uncommon site of pain<br>• Risk factors |
| Bedside ECG<br>cardiac markers<br>2D echo | Acute myocardial infarction<br>(Page no. 71) | • Acute severe chest pain at rest<br>• Can present as heaviness/squeezing/pressing sensation of chest radiates mostly (arms/neck/jaw), associated with perspiration, nausea, discomfort, giddiness, and breathlessness<br>• Unusual site is inframammary<br>• Hypotension/hypertension<br>• May mimic like acid reflux |
| Echo/POCUS/<br>2D echo<br>CXR | Aortic dissection<br>(Page no. 130) | • Risk factors<br>• Pain is acute sharp/stabbing/may or may not radiate to back<br>• Most of the patients have severe-onset pain, maximal at beginning with radiation from anterior chest to the interscapular area; tearing quality; pain migrates<br>• Neuro complications common—stroke, syncope, paresis, or paraplegia<br>• Can mimic ACS, mesenteric ischemia, acute abdomen<br>• Majority have **hypertension** or hemodynamic compromise, limb BP discrepancy |
| ECG<br>Echo | Pericarditis myocarditis, stress cardiomyopathy<br>(Page no. 144) | Postviral/infective |
| | Cardiac tamponade | Mentioned in **Box 1** |
| | **Respiratory system**<br>• Pulmonary embolism<br>• Pneumothorax | Mentioned in **Box 1** |
| | Pleuritic chest pain | Mentioned in **Box 1** |
| | Pneumonia | Discussed in **Box 1** |

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| ***Pertinent bedside tests*** | ***Differential diagnosis*** | ***Strong clinical indicators*** |
|---|---|---|
| ECG and CXR (negative findings) | **Other causes**<br>Chest wall pain | • Sharp/localized/positional/on inspiration or coughing<br>• Can have tenderness—costochondritis<br>• Can have xiphoid swelling—xiphodynia |
| UGI scopy | GI pain<br>(Page no. 194) | • History/physical examination<br>• Acid reflux-burning/burping/acid taste, relives with antacid<br>• Peptic ulcer disease—postprandial dull aching<br>• Esophageal spasm<br>• Duodenal-relived pain on eating<br>• Gastric ulcer increased pain on eating<br>• Pancreatitis—mentioned<br>• Biliary colic |
| CXR -mediastinal air/pleural effusion/widened mediastinum/ pneumothorax<br>UGI scopy | Esophageal tear (Mallory Weiss or Boerhaave's)<br>(Page no. 214) | • Risk factors—forceful vomiting, foreign body, caustic ingestion, trauma, alcoholism, esophageal disease<br>• Pain is mostly retrosternal, persistent, precedes vomiting in most cases may be in shock might have signs of pleural effusion/pneumothorax/ consolidation |
| | Psychiatry | Hyperventilation, rule out other causes |
| | Shingles | Unilateral lesions/pain restricted to one dermatome for HZV |
| | Trauma (pneumothorax, cardiac tamponade, rib fracture/chest contusion) | History and examination mentioned in detail in the chapter |

(HZV: Herpes zoster virus; GI: gastrointestinal; UGI: upper gastrointestinal)

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**BOX 3:** Presentation: Headache.

| ***Pertinent bedside tests*** | ***Differential diagnosis*** | ***Strong clinical indicators*** |
|---|---|---|
| Bedside LP-Xanthochromia | **CNS**<br>Subacute arachnoid hemorrhage<br>(Page no. 293) | • Worst headache ever<br>• Hypertension<br>• Other neurological signs and symptoms, check ottawa rule for SAH |
| LP: CSF examination | Meningitis/ encephalitis/abscess<br>(Page no. 361) | • Tachycardia/fever, seizure, and neck stiffness<br>• History of sinus/ear infection or recent surgery<br>• Impacted living conditions (e.g., military barracks and college dormitories) |
| CSF: Increased pressure<br>Fundoscopy | Increased ICP | • History of prior benign intracranial hypertension<br>• Presence of a CSF shunt-hypertension with normal HR or bradycardia |
| | Cluster headache<br>(Page no. 248) | • Severe<br>• Unilateral<br>• Lasts 15–180 minutes (untreated)<br>• Circadian/circannual pattern<br>• Lacrimation/conjunctival injection<br>• Nasal congestion or rhinorrhea<br>Can have:<br>• Ptosis and/or miosis<br>• Edema of the eyelid and/or face<br>• Sweating of the forehead and/or face |
| | Tension headache<br>(Page no. 248) | • Tight, bandlike discomfort around the head that is nonpulsating and dull, may experience tightening of the neck muscles<br>• Generally mild, self-resolving<br>• Associated with anxiety/depression |
| | Migraine<br>(Page no. 298) | • Classic—Aura-visual, sensory, speech, motor, brainstem, retinal, photophobia and phonophobia<br>• Triggering factors, past history<br>• Nonclassic—attack lasts 4–72 hours (untreated or unsuccessfully treated)<br>– Unilateral location<br>– Pulsating quality<br>– Moderate-to-severe pain intensity<br>– Aggravation by or causing avoidance of routine physical activity (e.g., walking or climbing stairs) |

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| ***Pertinent bedside tests*** | ***Differential diagnosis*** | ***Strong clinical indicators*** |
|---|---|---|
| | | – Nausea or vomiting<br>– Not attributable to another disorder<br>• In females, it is common to have migraines during menstruation |
| Important to refer for imaging as it is diagnostic | Cerebral venous thrombosis | • Generally severe, sudden, thunderclap headache mostly in women of postpartum, peripartum, reproductive age/on oral contraceptive, prothrombotic<br>• Near syncope such as features might be noted |
| Important to refer for imaging as it is diagnostic | Posterior reversible encephalopathy syndrome (PRES) | • Headache with visual loss, altered mental status, seizures<br>• Patient has increased blood pressure mostly<br>• Underlying associated conditions—autoimmune disorder, immunosuppression, chemotherapy, and preeclampsia hypertension |
| | Cervical dissection | • Sudden, thunderclap headache<br>• Syncope |
| Important to refer for imaging as it is diagnostic | Stroke (ischemic/nonischemic) (Page no. 260) | • Focal neurological deficit<br>• Hemiparesis<br>• Speech impairment, gait impairment |
| | **Others**<br>Sinusitis or infection (Page no. 625) | • Fulminant pain of the forehead and area of maxillary sinus<br>• Nasal congestion, discharge |
| ESR<br>Vascular work-up | Temporal arteritis (Page no. 248) | Headache with abrupt visual disturbance with tender temporal arteries more often in females |
| | Temporomandibular junction disease | • Clicking/snapping<br>• Pain with jaw movement<br>• Facial pain<br>• History of trauma |
| ABG | Carbon monoxide Poisoning (Page no. 525) | • Breathing in enclosed/confined spaces with engine exhaust/CO producing equipment<br>• Usually, gradual dull headache, drowsiness with no focal neurologic findings<br>• After drowsiness or mild confusion depending on severity |
| | Hypertensive crisis (Page no. 124) | Markedly elevated BP |

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| ***Pertinent bedside tests*** | ***Differential diagnosis*** | ***Strong clinical indicators*** |
|---|---|---|
| Tonometry | Glaucoma<br>Sudden angle closure<br>(Page no. 623) | • Past history<br>• Eye pain, vision loss, and halos around lights<br>• Age >30 years<br>• History of pain increased in a dark environment<br>• Tight pressure around eyeballs<br>• Acute red eye (severe ciliary flushing) and poorly reactive, dilated pupils |
| | Postlumbar puncture/ spinal anesthesia | History of procedure, wrong posture postprocedure, inadequate hydration |
| Urine protein | Preeclampsia | Pregnancy >20 weeks |
| (CNS: central nervous system; CSF: cerebrospinal fluid; ESR: erythrocyte sedimentation rate; ICP: intracranial pressure; LP: lumbar puncture; SAH: subacute arachnoid hemorrhage) | | |

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**BOX 4:** Presentation: Dizziness/giddiness.

| ***Pertinent bedside tests*** | ***Differential diagnosis*** | ***Clinical indicators*** |
|---|---|---|
| HINTS | **VERTIGO**<br>Peripheral<br>(Page no. 251) | • Sudden, severe, lasts seconds to minutes mainly intermittent, one direction, worsened by position, no neurological signs, auditory signs-deafness/tinnitus may be present—ménière's<br>• Walking preserved, unidirectional instability<br>• Unidirectional-horizontal nystagmus<br>• Spinning always indicates vestibular disease<br>• History of drugs causing vestibulotoxicity, caffeine/nicotine<br>• Post-trauma and whiplash<br>• Head eye and ENT (HEENT) examination<br>• HINTS TEST (mentioned in Chapter 6.2 Acute Giddiness) |
| | Central | • Gradual, mild intensity, weeks to months, multidirectional, no postural change<br>• No auditory signs (deafness/tinnitus)<br>• Neurological signs often present (Ataxia, diplopia, dysarthria, dysphagia, weakness etc.)<br>• Check BP in both arms-subclavian steal neck bruits cranial nerves<br>• Ophthalmoplegia fall while walking<br>• Vertical/torsional nystagmus |
| Blood glucose, ECG, CBC, sepsis panel | **Non vertigo**<br>Light-headedness/ Near syncope/ Disequilibrium | Look for signs and symptoms of anemia, hypoglycemia, dysrhythmias, myocardial infarction, dehydration, vasovagal, sepsis, drug side effect, peripheral neuropathy anxiety related |

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**BOX 5:** Presentation: Nausea/vomiting.

| ***Pertinent bedside tests*** | ***Differential diagnosis*** | ***Strong clinical indicators*** |
|---|---|---|
| | **CNS**<br>• Cerebellar infarct<br>• Raised ICP (SOL, bleed, infarct, infection, and hydrocephalus)<br>• Migraine<br>• Seizure<br>• CNS infection<br>• CP tumor | • Central giddiness symptoms<br>• Cerebellar signs<br>• Papilledema<br>• Nystagmus<br>• (Details in Respective Boxes) |
| | **GI**<br>Gastroenteritis<br>(Page no. 306) | • Crampy abdomen<br>• Might be associated with diarrhea, fever, and history of eating food outside |
| | Gastritis/peptic or duodenal ulcer disease | • Epigastric pain/tenderness<br>• Belching<br>• Regurgitation<br>• Pain in relation to food |
| USG | Acute abdomen | See **Box 6** |
| HINTS<br>(Refer Chapter 6.2: Acute Giddiness) | **Head, Eyes, Ears, Nose, Throat (HEENT)**<br>Labyrinthitis, Ménière's disease, tumor, and iatrogenic | **Box 4**<br>All signs and D/D of peripheral giddiness |
| UPT<br>Pelvis USG | **Others**<br>N/V of pregnancy | • UPT, pregnancy NVP typically starts in week 4–7<br>• Peaks in 12 weeks |
| *ABG*: Metabolic acidosis<br>*Urine*: Ketones<br>Blood sugar | DKA | Details given **(Box 6)** |
| | Uremia<br>Alcohol/starvation | History |
| | *Treatment related:*<br>• Drugs<br>• Chemotherapy<br>• Radiation | Get detail history |
| | *Miscellaneous:*<br>• Emotional response<br>• Psychiatric disorder | Anxiety |

(CP: cerebellopontine; DKA: diabetic ketoacidosis; NVP: nausea and vomiting in pregnancy; SOL: space occupying lesion; UPT: urine pregnancy test)

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**BOX 6:** Presentation: Abdomen pain.

| ***Pertinent bedside tests*** | ***Differential diagnosis*** | ***Strong clinical indicators*** |
|---|---|---|
| USG-abdomen | **Abdomen**<br>Ruptured or leaking abdominal aortic aneurysm<br>(Page no. 130) | • Incidence increases with advancing age >60<br>• Risk factors—male sex, hypertension, family history, and peripheral vascular disease<br>• Often asymptomatic until rupture<br>• Acute epigastric and back pain + syncope or signs of shock<br>• Pain may radiate to back, groin, or testes<br>• Palpation of pulsatile mass usually possible in aneurysms >5 cm<br>• Bruits or inequality of femoral pulses may be evident |
| | Descending aortic dissection<br>(Page no. 130) | • *Risk factors:* Hypertension, connective tissue disorder, vasculitis, aortic surgery, aneurysm, family history, dissection, trauma, pregnancy<br>• Other details mentioned in **Box 2** |
| USG abdomen<br>X-ray abdomen erect | Perforated viscus<br>(Page no. 188) | • Incidence increases with advancing age<br>• Acute severe, mostly diffuse pain<br>• Vomiting can cause peritonitis<br>• Fever might be noted<br>• Might result in shock<br>• OE: guarding and rebound + "board-like" abdomen in later stages |
| Amylase—first 72 hours<br>Lipase next 72 hours<br>USG-abdomen | Pancreatitis<br>(Page no. 183) | • Risk factors commonly noted are alcoholic/gall stones<br>• Epigastric pain radiating to back in subscapular area, continuous (mainly upper abdomen section)<br>• Vomiting/nausea<br>• May worsen while lying flat, may improve on forward bending<br>*Physical examination* not correlating to symptoms hypotensive or tachypneic if in shock, an alcoholic withdrawal patient can present with hypertension and tachycardia |

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# ER A Ready Reckoner for Emergency Room (ER) Doctors and First Responders

*Emergency medicine* is a well-established academic discipline in India with formally recognized postgraduate courses offered by the Medical Council of India and the National Board of Education. Hospitals across the country now have well-equipped emergency rooms staffed by trained personnel to provide prompt and often life-saving emergency care. Emergency rooms play the crucial role of providing immediate care to patients with a diverse spectrum of medical conditions. Hence, training and experience in emergency medicine involve a unique skill set that includes the temperament to handle high patient loads, make quick decisions, effectively triage patients (separate the grain from the chaff), and offer timely intervention and stabilization while facilitating communication and collaboration with other hospital departments.

Often viewed as the busy, chaotic gateway to the hospital; the efficiency and versatility of the emergency room (ER) makes it an integral and indispensable component providing constant support and resilience to the entire healthcare system.

This book serves as a ready reckoner and as an easy reference for common conditions that find their way to a busy ER. It includes the following sections:

- Fast track to the most common presentations and differential diagnosis in the ER
- Bedside diagnosis and management of diseases presenting to the ER
- Resuscitation in the ER
- Emergency supports in the ER
- Procedures
- Interpretation of emergency investigations
- Medicolegal queries.

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