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3rd Edition

CMC Vellore Handbook of EMERGENCY MEDICINE

Previously known as Emergency Medicine: Best Practices at CMC (EMAC)



KPP Abhilash

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COVID-19

20 CHAPTER

INTRODUCTION

Coronavirus disease-2019 (COVID-19) is a viral infection caused by the novel Coronavirus SARS-CoV-2, which probably originated from Wuhan, China in late 2019 and was declared a pandemic on March 11th, 2020 by the World Health Organization.

It spreads from person to person via respiratory transmission and direct contact.

Incubation period: 2–7 days, up to 14 days

Period of infectivity: 8–10 days, up to 14 days

CLINICAL PRESENTATION

- Majority of cases are asymptomatic to mild self-limiting disease. However, high-risk* population may develop severe to critical illness. These include the elderly, diabetic patients, hypertensive, obese, immunocompromised, and those with multiple comorbidities.
- Initial symptoms may be nonspecific such as fever, sore throat, dry cough, myalgias, diarrhea, and fatigue. Loss of smell and taste may also be noted.
- Breathlessness may preclude the onset of severe disease. Dyspnea may soon progress to severe hypoxemia and respiratory failure due to ARDS.
- Procoagulant states have also been described with increased arterial thrombotic events such as cerebrovascular accidents, cerebral venous thrombosis, myocardial infarction, and pulmonary embolism.

EVALUATION

- COVID-19 can be confirmed by direct viral tests like by reverse transcription-polymerase chain reaction (RT-PCR) test, which is considered to be the gold standard or rapid antigen test (RAT).
- *Chest X-ray*: Multifocal and bilateral air-space opacities and/or consolidation with peripheral and basal predominance.
- *CT chest*: Common findings include ground glass opacities (77.18%), reticulation (46.24%), air bronchogram (41.61%), pleural thickening (33.35%), and bronchial wall thickening (15.48%). Lesions are predominantly distributed bilaterally (75.72%) and peripherally (65.64%).

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MANAGEMENT (TABLE 1)

The quintessential components of resuscitation (airway, breathing, and circulation) with good supportive care are the cornerstone of acute management of critically ill COVID-19 patients.

TABLE 1: Summary of evaluation and management of COVID-19 based on severity.

Severity category	Evaluation	Management
Mild illness • SpO_2 > 94% on room air • RR < 20/min	No laboratory tests or radiological imaging needed	• Home isolation recommended • Symptomatic management with paracetamol
Moderate illness • SpO_2 > 94% on room air • RR < 24/min • One or more high-risk factors*	• CBC profile • *Metabolic profile*: Serum electrolytes, BUN, serum creatinine, LFT	• Home isolation can be considered with pulse oximetry monitoring • Symptomatic management with paracetamol • Consider admitting high-risk patients for monitoring
Severe illness • SpO_2 < 94% on room air • RR > 24/min	• CBC profile, ABG, ECG • *Metabolic profile*: Serum electrolytes, BUN, serum creatinine, LFT • *Prognostication markers*: Consider D-dimer, LDH, ferritin, CRP • *Radiological imaging*: CXR	• *Corticosteroids*: Dexamethasone 6 mg IV OD or another equivalent steroid • Prophylactic thromboprophylaxis for all patients. Change to therapeutic dose, if evidence of thromboembolism • Proning, if no contraindication • Oxygen supplementation, targeting a SpO_2 of 94%. NIV/HFNC, if indicated • Consider remdesivir or tocilizumab (if no contraindication)
Critical illness • SpO_2 < 94% on room air • RR > 30/min • PaO_2/FiO_2 < 300	• CBC profile, ABG, ECG • *Metabolic profile*: Serum electrolytes, BUN, serum creatinine, LFT • Blood culture x 2 • *Prognostication markers*: Consider D-dimer, LDH, ferritin, CRP • *Radiological imaging*: CXR	• *Corticosteroids*: Dexamethasone 6 mg IV OD or another equivalent steroid • Prophylactic thromboprophylaxis for all patients. Change to therapeutic dose, if evidence of thromboembolism • Proning, if no contraindication • Oxygen supplementation, targeting a SpO_2 of 94% • NIV/HFNC if indicated • Consider IMV if indicated • Broad spectrum antibiotics if secondary infection • Consider remdesivir or tocilizumab (if no contraindication)

(ABG: arterial blood gas; BUN: blood urea nitrogen; CBC: complete blood count; CRP: C-reactive protein; CXR: chest X-ray; ECG: electrocardiogram; HFNC: high-flow nasal cannulae; IMV: invasive mechanical ventilation; LDH: lactate dehydrogenase; LFT: liver function tests; NIV: noninvasive ventilation; RR: respiratory rate)

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Airway

In patients with a compromised airway, plan for rapid sequence induction (RSI) and use a video laryngoscope, if available. Passively preoxygenate with 100% FiO_2 for 3–5 minutes and avoid manual ventilation after paralysis to minimize potential aerosolization of virus from the airways.

Breathing

Administer supplemental oxygen aiming to maintain target SpO_2 > 92% by using nasal prongs, venturi mask, nonrebreathing mask, high-flow nasal cannulae, noninvasive ventilation, or invasive mechanical ventilation.

Oxygen flow rates must be adjusted and delivered using appropriate delivery devices.

- *Nasal cannula*: Oxygen flow rate up to 4 L/min.
- *Simple mask or Venturi mask*: Oxygen flow rates 6–10 L/min.
- *Non rebreather mask/face mask with reservoir bag*: Oxygen flow rates 10–15 L/min

Patients with acute hypoxemic respiratory failure despite supplemental oxygen therapy require additional respiratory support with either Hi Flow Nasal Cannula (HFNC) or Non-invasive ventilation (NIV). This may reduce the work of breathing and obviate the need for intubation and invasive mechanical ventilation (IMV)

Circulation

COVID-19 patients requiring fluid resuscitation and hemodynamic support should be treated and managed like patients with septic shock in accordance with standard guidelines.

Drugs (Therapeutics)

The COVID-19 disease progression and lethality have a viraemic and inflammatory phases providing the biologic rationale for current strategies to reduce morbidity and mortality associated with COVID-19.

- *Corticosteroids:* Corticosteroids are currently recommended only for patients requiring supplemental oxygen to maintain SpO_2 > 94%. The recommended dose of dexamethasone, assuming no contraindications, is 6 mg once daily (OD) IV/PO for 7–10 days or until discharge (if earlier), with blood glucose monitoring, and concurrent proton pump inhibitor use for gastroprotection. Prednisolone (40 mg OD PO) or methylprednisolone (32 mg OD PO or IV) are suitable alternative recommendations for women who are pregnant or breastfeeding.
- *Anticoagulants*: *Recommended only for hospitalized patients*
  - *Enoxaparin*: For < 80 kg, 40 mg subcutaneously OD; For > 80 kg, 60 mg subcutaneously OD (consider dose adjustment in renal failure)

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- *Unfractionated heparin*: 5,000 units subcutaneously BD
- Fondaparinux 2.5 mg subcutaneously OD (consider dose adjustment in renal failure)

- Antivirals, anti-inflammatory agents and antibiotics
  - *Primary antivirals against SARS-CoV-2*: Many drugs like hydroxychloroquine, ivermectin, ritonavir, remdesevir and favipiravir, have been tried for their antiviral properties against SARS-CoV-2 and have now fallen out of favor with most guidelines and recommendations.
  - *Anti-inflammatory agents for host-directed therapy*: Several targeted immunomodulatory drugs have shown promise against SARS-CoV-2 induced cytokine storm. These include tocilizumab (IL-6 inhibitor), Canakinumab (IL-1 inhibitor) and Baricitinib (Janus Kinase inhibitor).
  - *Empiric antibiotics*: Administer broad spectrum empiric antibiotics (piperacillin-tazobactam/meropenem) only for patients with severe and critical illness to cover secondary bacterial infections.

PREVENTION

- Good hand hygiene, wearing face masks, physical distancing, and contact prevention. Quarantining and other public health measures advised.
- Appropriate PPE use for high-risk procedures to prevent transmission to healthcare workers (HCW).
- Mass national vaccination campaigns from all over the world have shown a clear benefit of vaccines preventing death and severe disease, and help attain herd immunity.
- Vaccines currently available include mRNA vaccines (Pfizer, Moderna), nonreplicating vector vaccines (AstraZeneca/Covishield, Sputnik), and inactivated viral vaccines (Covaxin).

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Urinary Tract Infections

23 CHAPTER

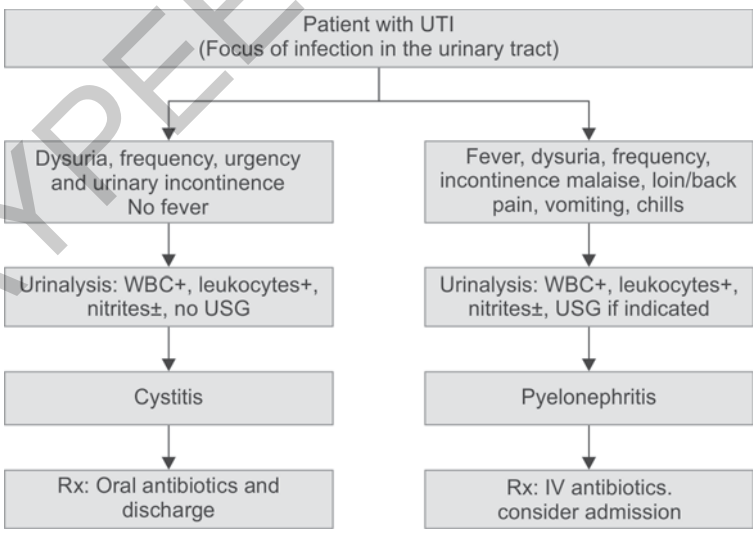
INTRODUCTION

The term urinary tract infection (UTI) covers a heterogeneous group of conditions with different etiologies, which have as their common factor the presence of bacteria in the urinary tract, associated with variable clinical symptoms.

The first and the most important step after making a diagnosis of UTI is to differentiate between cystitis and pyelonephritis (**Flowchart 1**).

- *Lower UTI (cystitis)*: Infections that are localized to the lower urinary tract (urethra, bladder). Symptoms are dysuria, frequency, urgency, and urinary incontinence.
- *Upper UTI (acute pyelonephritis)*: The most important symptom is fever. Other symptoms include nausea and vomiting, loin and back (flank) pain. Costovertebral angle tenderness may be elicited. The patient is systemically ill with signs of sepsis and shock.

Cystitis presents only with lower urinary tract symptom. Fever is not a feature of cystitis. Presence of fever with chills with urinary symptoms indicates acute pyelonephritis. Oral antibiotics are adequate for cystitis; IV antibiotics are preferred for pyelonephritis.



FLOWCHART 1: Diagnosis and management of urinary tract infection (UTI).

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ASYMPTOMATIC BACTERIURIA

Asymptomatic bacteriuria is defined as isolation of a specified quantitative count of bacteria in an appropriately collected urine specimen from an individual without symptoms or signs of UTI.

- In asymptomatic women or men, bacteriuria is defined as two consecutive clean-catch voided urine specimens with isolation of the same organism in quantitative counts of $\geq 10^5$ cfu/mL.
- In asymptomatic catheterized men or women, bacteriuria is defined as a single catheterized specimen with isolation of a single organism in quantitative counts of $\geq 10^5$ cfu/mL.

Whom to treat: Screening for and treatment of asymptomatic bacteriuria is appropriate for pregnant women and for patients undergoing urologic procedures in which mucosal bleeding is anticipated.

Whom not to treat: There is no role for screening for or treating asymptomatic bacteriuria in populations other than pregnant women or patients undergoing urologic procedures expected to cause mucosal bleeding.

Investigations to be sent: For lower urinary tract infections, confirm with urine analysis and microscopy. Complete blood count, electrolytes, creatinine, liver function test, blood culture and sensitivity (c/s), urinalysis, and urine c/s may be sent for suspected pyelonephritis.

HOW TO INTERPRET URINALYSIS?

- *Look for the urine white blood cell count*: More than 5 cells in males and more than 10 cells in females is significant.
- *Leukocyte esterase* may be used to detect more than 10 leukocytes per high-power field (sensitivity of 75–96%; specificity of 94–98%).
- *The nitrite test* is fairly sensitive and specific for detecting $\geq 10^5$ cfu of Enterobacteriaceae per mL of urine.

ULTRASONOGRAPHY OF THE KIDNEYS

Acute pyelonephritis is a clinical diagnosis confirmed with results of urinalysis. An ultrasonography (USG) of abdomen is not needed for most cases of community-acquired pyelonephritis or for cystitis. The indications for an urgent USG are:

- Unresponsive to 48 hours of appropriate antibiotic therapy
- Patients with known urogenital tract abnormalities
- Catheter-acquired UTI
- Past history of renal calculi
- Elevated creatinine (acute worsening of renal functions).

Presence of renal angle tenderness without the above-mentioned conditions is *not* an indication for requesting an USG abdomen.

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A complicated UTI is defined as being associated with one of the following: Diabetes mellitus, pregnancy, symptoms >7 days, renal failure, urinary tract obstruction, renal transplantation, immunosuppression, nosocomial infection, and indwelling urethral catheter or stent.

MANAGEMENT OF UNCOMPLICATED UTI

- *Cystitis*:
  - Oral antibiotics [nitrofurantoin, fluoroquinolones, and trimethoprim/sulfamethoxazole (TMP/SMX)]
  - Amoxicillin–clavulanate, cefpodoxime, and cefaclor are alternatives but are less effective
  - Ampicillin or amoxicillin should not be used (high-resistance rates).
- *Pyelonephritis*:
  - Outpatient management with oral fluoroquinolones is acceptable for patients with mild-to-moderate illness. IV ceftriaxone is an alternative
  - Patients requiring hospitalization should receive beta lactams + beta-lactamase inhibitor or carbapenems.

MANAGEMENT OF COMPLICATED UTI

- *Cystitis*:
  - Oral fluoroquinolones (ciprofloxacin 500 mg bd/levofloxacin 750 mg od)
  - Nitrofurantoin, TMP/SMX, oral beta-lactams are poor choices (high resistance rates)
  - Parenteral therapy with once daily regimen of levofloxacin (500 mg), ceftriaxone (1 g), ertapenem (1 g), or an aminoglycoside (3–5 mg/kg of gentamicin) may be tried.
- *Pyelonephritis*:
  - Patients with complicated pyelonephritis should be managed as inpatients with carbapenems (**Table 1**).

TABLE 1: Antibiotics for urinary tract infection (UTI).

Acute uncomplicated cystitis in women (dysuria and frequency in healthy, adult, non-pregnant women with normal urinary tract)	*Escherichia coli*	Nitrofurantoin 100 mg PO qid × 5–7days	Alternate choice: Ciprofloxacin 500 mg PO bd × 3 days
Pyelonephritis—uncomplicated [no underlying genitourinary (GU) disease]	*E. coli*	Mild-to-moderate illness: Piperacillin tazobactam 4.5 g IV q6-8h or Cefoperazone/sulbactam 3 g IV q12h	Severe illness (qSOFA ≥ 2): Ertapenam 1 g IV od
Complicated UTI (underlying GU disease)	*E. coli, Proteus Pseudomonas Acinetobacter*	Meropenem 1 g IV q8h; de-escalate as per c/s	

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CMC Vellore Handbook of EMERGENCY MEDICINE

Salient Features

- *CMC Vellore Handbook of Emergency Medicine*, previously known as "Emergency Medicine: Best Practices at CMC (EMAC)" is a comprehensive and concise compilation of management guidelines and protocols to be followed in the "emergency department (ED)".
- This book covers the basics of all the commonly seen medical and surgical conditions in our ED and the emergency management principles in a simplified manner.
- Many newer concepts have replaced the traditional management practices. Every effort has been taken to incorporate the latest evidence-based recommendations.
- This book would be very useful in all EDs and secondary level hospitals in managing acute medical and surgical emergencies and trauma.

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Printed in India

Available at all medical bookstores or buy online at www.jaypeebrothers.com

JAYPEE BROTHERS
Medical Publishers (P) Ltd.
EMCA House, 23/23-B, Ansari Road,
Daryaganj, New Delhi - 110 002, INDIA
www.jaypeebrothers.com

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ISBN 978-93-5465-132-8