المجلس القومي السوداني للتخصصات الطبية
SUDAN MEDICAL SPECIALIZATION BOARD

Sudan Medical Specialization Board

Council of Emergency Medicine

Proportion and Clinical Profile of Hypoxic Patients in Tertiary Hospitals in Dongola City, 2026

A Proposal of Thesis Submitted in Partial Fulfillment of the Requirements for the Medical Doctorate in Emergency Medicine

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Table of Abbreviations

Abbreviation	Full Form
AHRF	Acute Hypoxemic Respiratory Failure
ARDS	Acute Respiratory Distress Syndrome
AUROC	Area Under the Receiver Operating Characteristic curve
CI	Confidence Interval
CPAP	Continuous Positive Airway Pressure
COPD	Chronic Obstructive Pulmonary Disease
CRDs	Chronic Respiratory Diseases
CXR	Chest X-Ray
ED	Emergency Department
EDC	Educational Development Center
HFNO	High-Flow Nasal Oxygen
ICU	Intensive Care Unit
MEWS	Modified Early Warning Score
OR	Odds Ratio
PoCUS	Point-of-Care Ultrasound
PTB	Pulmonary Tuberculosis
qSOFA	Quick Sequential Organ Failure Assessment
SMSB	Sudan Medical Specialization Board
SpO_2	Peripheral Capillary Oxygen Saturation
UVA	Universal Vital Assessment
NIV	Non-Invasive Ventilation

Chapter One

Introduction, Literature review, Problem statement, Justification, Research question, and objectives

1.1 INTRODUCTION AND BACKGROUND

Hypoxia, defined as a deficiency in the amount of oxygen reaching the tissues, is a significant challenge encountered in various clinical settings. It is frequently observed in emergency departments, intensive care units, and among patients with chronic cardiopulmonary diseases. Timely recognition and management of hypoxia are crucial to prevent organ damage and improve patient outcomes. [1]

The pathophysiology of hypoxia involves complex interactions between the respiratory and cardiovascular systems. Its causes include acute airway obstruction, respiratory failure, anemia, and impaired cellular oxygen utilization. The clinical manifestations of hypoxia vary depending on the severity and duration of oxygen deprivation, making early diagnosis essential in patient care. [2,3]

Despite advancements in monitoring technologies and oxygen delivery systems, challenges remain in the timely identification and management of hypoxic patients. This thesis explores the mechanisms, diagnostic approaches, and evidence-based management strategies for hypoxia, aiming to improve clinical outcomes through early intervention and patient-centered care. By examining the complex nature of hypoxia and the current challenges in its management, this study seeks to provide insights to enhance the quality of care for hypoxic patients in both acute and chronic settings [4].

Additionally, hypoxia is a common finding among hospitalized patients and is defined as a decrease in blood oxygen saturation (typically $SpO_2 < 94\%$ on room air). It is associated with various acute and chronic conditions, including respiratory, cardiovascular, and systemic diseases. Prompt recognition and early management of hypoxia in the emergency department (ED) are critical to reducing morbidity and mortality. [4,5]

Despite its clinical significance, there is limited local data quantifying the prevalence of hypoxia and its associated clinical profiles. Understanding the epidemiology and clinical patterns of hypoxia can support evidence-based triage, optimize the use of healthcare resources, and improve patient outcomes.

1.2 LITERATURE REVIEW

1.2.1 Local Studies

A cross-sectional hospital-based study conducted at Mohamed Alamin Hamid Hospital included 150 under-five children diagnosed with pneumonia. Males constituted 86 (57.3%) of the sample, while 48 (32%) were aged 2 to ≤12 months. Regarding disease severity, 73 (48.7%) had pneumonia, 70 (46.7%) had severe pneumonia, and 7 (4.6%) had very severe pneumonia. The overall prevalence of hypoxemia (SpO_2 <90%) was 42.7% (n≈64). Among hypoxemic children, 36 (56.25%) were aged <2 months, indicating a higher burden in younger age groups. In terms of severity, 30 (46.88%) of hypoxemic cases had severe pneumonia and 7 (10.94%) had very severe pneumonia. Statistical analysis demonstrated a significant association between hypoxemia and younger age ($P < 0.001$), as well as disease severity, particularly very severe pneumonia ($P < 0.001$). Although hypoxemia was more frequent in males, this was not statistically significant ($P = 0.72$). Additionally, hypoxemia showed a significant association with the presence of danger signs ($P < 0.01$) [6].

1.2.2 Regional Studies

A large prospective cohort study conducted across five hospitals in Kenya, Malawi, and Rwanda included 1,732 hypoxemic adult patients identified from 24,724 screened admissions. The median age was 52 years (IQR 36–70), with 806 (46.5%) females. Overall in-hospital mortality was 35% (n = 615). Among severity scores, the Universal Vital Assessment (UVA) showed the strongest association with mortality (OR 3.40; 95% CI 2.54–4.56), followed by qSOFA (OR 3.12; 95% CI 2.38–4.08) and MEWS (OR 2.47; 95% CI 1.87–3.25). Inability to walk independently also predicted mortality (OR 2.26; 95% CI 1.62–3.15). Discriminative performance was modest, with AUROC values of 0.66 for MEWS, 0.66 for qSOFA, and 0.69 for UVA. Sensitivity ranged from 44% to 47% and specificity from 74% to 80% across scores. Missing data were substantial, with complete score availability ranging from 55.8% to 65.5%. Mortality varied between sites (24.8%–38.6%), with significant differences persisting after adjustment [7].

A multicenter prospective cohort study conducted across hospitals in Kenya, Malawi, and Rwanda screened 24,724 adult admissions, identifying 1,739 (7%) hypoxemic patients; among nonobstetric

admissions, prevalence reached 14% (range 8%–20%). The median age was 52 years (IQR 36–70), and 808 (46.5%) were female. Median SpO_2 was 89% (IQR 82–96%), and the median PaO_2:FiO_2 ratio was 168, indicating moderate hypoxemia. Notably, 450 (26%) hypoxemic patients were not receiving oxygen at admission. Documentation of oxygenation parameters was limited, with only 18% of all patients having complete oxygenation data on admission and 44% of patient-days having complete records. Suboptimal oxygen therapy was common: 770 (51%) patients experienced at least one day with SpO_2 <90%, while 84% of oxygen-treated patient-days showed supratherapeutic levels (SpO_2 >94%). Overall in-hospital mortality was 35% (n = 615), rising to 49% among mechanically ventilated patients (16% of cohort) [8].

A cross-sectional descriptive study conducted at a tertiary hospital in Cape Town, South Africa included 1,053 patients presenting with primary respiratory diagnoses over a 9-month period. The majority of patients (>60%) originated from the immediate subdistrict, while fewer than 10% were referred from outside the metropolitan area. Readmission occurred in 8.3% of patients during the study period. Non-chronic respiratory diseases (non-CRDs) accounted for 643 cases (61.1%), with the leading causes being infections (n = 272; 25.8%), pulmonary tuberculosis (PTB) (n = 224; 21.3%), and malignancy (n = 140; 13.3%). Hemoptysis was reported in 9.8% of patients, primarily due to post-tuberculosis lung disease (37.9%) and PTB (36.9%). Chronic respiratory diseases (CRDs) were present in 410 patients (38.9%), with chronic obstructive pulmonary disease (COPD) being the most common (n = 192; 18.2%), followed by post-tuberculosis lung disease (n = 88; 8.5%) and asthma (n = 52; 5.1%) [9].

1.2.3 International Studies

A prospective survey and clinical record review conducted at a tertiary emergency department evaluated 2,041 presentations over a 17-day period. Of these, 1,345 (66%) patients were eligible, and 1,212 (90%) completed the survey. Among respondents, 424 (35%) reported experiencing breathlessness most days in the preceding month. Of these, 245 patients identified breathlessness as the primary reason for their emergency presentation. Consequently, the prevalence of acute-on-chronic breathlessness as a presenting complaint was 20.2% (245/1,212; 95% CI 17.9–22.5%). When considering all emergency department attendances (n = 4,692), breathlessness accounted for at least 5.2% (95% CI 4.6–5.9%) of presentations. These findings indicate that a substantial

proportion of emergency visits were attributable to breathlessness, with a notable burden among patients experiencing chronic symptoms prior to presentation [10].

A review study on acute hypoxemic respiratory failure (AHRF) reported that it represents the leading cause of intensive care unit (ICU) admissions. Among patients with AHRF, approximately 40%–50% require invasive mechanical ventilation during their ICU stay. Additionally, 30%–80% of these patients fulfill the Berlin criteria for Acute Respiratory Distress Syndrome. Despite advances in diagnostic approaches, up to 10% of patients with ARDS have no identifiable classical risk factors, and the underlying etiology of AHRF remains undetermined in up to 15% of cases, particularly among immunocompromised individuals. These findings highlight the diagnostic complexity of AHRF and the variability in disease severity and outcomes, emphasizing the need for comprehensive evaluation strategies [11].

A prospective cohort study by García-Grimshaw et al. evaluated 470 hospitalized adult COVID-19 patients presenting with severe hypoxemia (SpO_2 ≤80%). The cohort had a median age of 55 years (IQR 46–64), with 64.4% males. Among the patients, 447 (95.1%) presented with dyspnea, while 23 (4.9%) exhibited silent hypoxemia. There were no significant differences between the two groups regarding demographic characteristics, comorbidities, laboratory findings, imaging results, disease severity, or in-hospital outcomes. In patients with dyspnea, higher respiratory and heart rates showed significant correlation with lower SpO_2 levels, whereas this association was not observed in silent hypoxemia cases. Multivariate analysis identified independent predictors of silent hypoxemia, including new-onset headache (OR 2.919; 95% CI 1.101–7.742; P=0.031) and presentation within 8 days of symptom onset (OR 3.183; 95% CI 1.024–9.89; P=0.045). These findings indicate that silent hypoxemia, although uncommon, represents a clinically significant subset with distinct physiological responses [12].

A systematic review and meta-analysis by Graham et al. included 213 studies comprising 601,757 participants from low- and middle-income countries, predominantly sub-Saharan Africa (51%) and South Asia (27%). The pooled prevalence of hypoxaemia (SpO_2 <90%) among admitted patients was highest in neonates at 24.5% (95% CI 19.9–29.4), followed by children at 12.1% (95% CI 10.0–14.4), and adults at 10.8% (95% CI 4.9–18.7). Hypoxaemia was most common in neonatal and primary respiratory conditions but remained significant across a wide range of

illnesses. Importantly, hypoxaemia was strongly associated with mortality, with affected patients having 4.84 times higher odds of death (95% CI 4.11–5.69) compared to non-hypoxaemic individuals. These findings highlight the substantial burden of hypoxaemia across all age groups and reinforce its role as a critical predictor of poor clinical outcomes in resource-limited settings.

1.3 PROBLEM STATEMENT

Hypoxia is a prevalent and clinical condition among different hospital departments, often signaling underlying respiratory or cardiovascular issues. Despite its significance, the diagnostic and management challenges in resource-limited settings like Dongola Specialized Hospital and Dongola police hospital are profound. The reliance on traditional imaging methods such as chest X-ray (CXR) often falls short in accurately identifying the causes of hypoxia, leading to delayed or inadequate treatment. Point-of-care ultrasound (PoCUS) has shown promise in overcoming these diagnostic hurdles, yet its adoption and effectiveness in such settings remain underexplored.

Moreover, the clinical spectrum of hypoxic presentations, including acute respiratory distress syndrome (ARDS), pneumonia, chronic obstructive pulmonary disease (COPD), and heart failure, necessitates a multifaceted approach to diagnosis and management. The phenomenon of "silent hypoxemia," particularly observed during the COVID-19 pandemic, further complicates clinical assessments, highlighting the need for objective monitoring tools.

This study aims to quantify the frequency and characterize the clinical profiles of hypoxic patients in the ED at Dongola Specialized Hospital. By doing so, it seeks to inform targeted interventions, optimize resource allocation, and ultimately improve emergency care outcomes in similar resource-limited settings.

1.4 JUSTIFICATION

The prevalence of hypoxia in in-patient departments (EDs) is a significant concern, particularly in resource-limited settings such as Dongola Specialized Hospital and Dongola Police Hospital. Hypoxia often reflects underlying respiratory or cardiovascular conditions, and its timely and accurate diagnosis is crucial for effective management and improved patient outcomes. Traditional imaging methods, such as chest X-ray (CXR), frequently fail to identify the precise causes of hypoxia, leading to delayed or inadequate treatment.

Point-of-care ultrasound (PoCUS) has demonstrated superior diagnostic performance compared to CXR, with a 98% agreement with physician diagnosis, suggesting its value as a diagnostic tool in EDs with constrained resources. Furthermore, lung ultrasound integrated with echocardiography enables rapid, non-invasive, and highly accurate differentiation between cardiac and pulmonary causes of dyspnea.

The clinical spectrum of hypoxic presentations—including acute respiratory distress syndrome (ARDS), pneumonia, chronic obstructive pulmonary disease (COPD), and heart failure—necessitates a multifaceted diagnostic and management approach. The phenomenon of "silent hypoxemia," particularly noted during the COVID-19 pandemic, further complicates clinical assessment, highlighting the need for objective monitoring tools such as pulse oximetry and arterial blood gas analysis.

Non-invasive respiratory support strategies—including high-flow nasal oxygen (HFNO), continuous positive airway pressure (CPAP), and non-invasive ventilation (NIV)—have been shown to improve outcomes in hypoxic patients. These strategies reduce respiratory rate, improve oxygenation, and decrease the need for intubation in patients with acute cardiogenic pulmonary edema and hypoxemic respiratory failure.

Given the substantial burden of hypoxia-related conditions on emergency services and the importance of early recognition and intervention, there is a clear need for a localized study at Dongola Specialized Hospital and Dongola Police Hospital. This study aims to quantify the outcomes and characterize the clinical profiles of hypoxic patients in the hospital setting, thereby informing targeted interventions, optimizing resource allocation, and ultimately improving emergency care outcomes in similar resource-limited environments.

1.5 RSEARCH QUESTION

What are the clinical presentations, underlying causes, and outcomes of hypoxic patients admitted to Dongola Specialized Hospital and Dongola Police Hospital?

1.6 OBJECTIVES

1.6.1 General Objective

- To assess the clinical presentation and outcomes of hypoxic patients admitted to Dongola Specialized Hospital and Dongola Police Hospital.

1.6.2 Specific Objectives

- To determine the proportion of patients presenting with hypoxia.
- To identify the underlying causes of hypoxia in these patients.
- To evaluate the clinical outcomes of hypoxic patients, including hospital admission, ICU care, discharge, or death.

Chapter Two

Methodology

2. Methodology

2.1 Study Design

This study will employ a descriptive cross-sectional hospital-based study design.

2.2 Study Area

Dongola city, located in Northern State, Sudan, serves as the capital of the state and lies along the banks of the Nile River, approximately 500 kilometers north of Sudan's capital, Khartoum. Dongola is a regional administrative and economic center, providing essential services and acting as a hub for transportation and trade. The surrounding region is characterized by arid desert landscapes, with the Nile Valley providing fertile land for agriculture and settlements.

Hospitals in the city serve as major referral centers specializing in the region. The study will be conducted in inpatient hospital settings at:

- Dongola Specialized Hospital: 260 in-patient beds, 5 resuscitation beds, 12 ICU beds, and 18 acute medical beds within the emergency department.
- Dongola Police Hospital: 80 in-patient beds, 3 resuscitation beds, 5 high-dependency unit beds, 8 ICU beds, and 6 acute medical beds within the emergency department.
- Al-Shimal Specialized Hospital: 30 in-patient beds, 2 resuscitation beds, 2 high-dependency unit beds, 2 ICU beds, and 8 acute medical beds within the emergency department.

2.3 Study Population

Patients of any age or gender (pediatric and adult) presenting with oxygen saturation (SpO_2) <96% on room air.

2.3.1 Inclusion Criteria

- Patients of any age or gender with SpO_2 <96% on room air presenting to tertiary hospitals in Dongola city.

2.3.2 Exclusion Criteria

- Patients with SpO_2 ≥96% on room air.

2.4 Sampling Technique and Size

A multistage sampling method will be used. All eligible patients within the study period will be considered. Based on current hospital data, approximately 10% of daily visits (around 439 patients: 295 at Dongola Specialized Hospital, 102 at Dongola Police Hospital, and 42 at Al-Shimal Specialized Hospital) may present with hypoxia. A total of 150 cases will be prioritized proportionally according to each hospital's caseload, using a first-in, first-included approach.

3.5 Sample Size Calculation

The study sample size will be calculated using Cochran's formula (1977) to determine the minimum number of participants needed for a desired precision:

$$n_0 = \frac{Z^2 \cdot p(1-p)}{e^2}$$

Where:

- n_0= minimum sample size
- Z= Z-value corresponding to the preferred confidence level (1.96 for 95% confidence)
- p= estimated population proportion with the characteristic of interest
- e= desired margin of error

Using this formula, the calculated sample size is 206 participants.

2.6 Data Collection Tools

Data will be collected over a two-month period using a structured questionnaire designed by the researcher and approved by two senior Emergency Medicine consultants. Information recorded will include:

- Demographic data (age, gender, etc.)
- Clinical presentation (symptoms, vital signs, etc.)
- Underlying causes of hypoxia (diagnosed using point-of-care ultrasound [POCUS] and other diagnostic tools)
- Outcomes (hospital admission, length of stay, need for invasive ventilation, etc.)

2.7 Data Analysis

Data will be analyzed using SPSS version 26.0. Descriptive statistics will summarize the data. The proportion of hypoxic episodes will be calculated among all clinical presentations during the study period. Underlying causes of hypoxia will be categorized, and outcomes will be reported accordingly.

2.8 Ethical Considerations

Ethical approval will be obtained from the Sudan Medical Specialization Board (SMSB) Educational Development Center (EDC) and from the Research and Training Centers at Dongola Specialized Hospital, Dongola Police Hospital, and Al-Shimal Specialized Hospital. Authorization from relevant hospital authorities will be formally requested. Informed consent will be obtained from all patients or their legal guardians. Patient confidentiality will be ensured by anonymizing data with identification numbers, and no individual will be identifiable in study reports. Data will be securely stored and accessible only to study personnel.

2.9 TIME PLAN

Activity	Jan-26	Feb-26	March-26	April -26	May-26
Proposal writing & approval	✓				
Ethical approval process	✓				
Data collection tool development	✓	✓			
Data collection		✓	✓	✓	✓
Data entry and cleaning				✓	✓
Data analysis				✓	✓
Report writing and thesis prep					✓

2.10 BUDGET

Item	Cost
Paper printing & copying	50.000 SDG
Transportation	100.000 SDG
final printing	20.000 SDG
Others	20.000SDG
Total	**190.000 SDG**

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APPNDIX

APPENDIX (1)

CONSENT

<u>إذن أخذ معلومات بغرض البحث</u>

إسم الباحث: د. محمد موسى محمد على

عنوان البحث: العلامات الاكلينيكيه للمريض مصاب بنقص الاوكسجين في الدم بدنقلا 2026

أنت مدعو للمشاركه في بحث علمي طبي يستهدف أطباء الطورئ و العناية الحرجة بـولايه الشماليه . الرجاء أن تاخذ الوقت الكافي لقراءة المعلومات التالية بتأني قبل أن تقرر إن كنت تريد المشاركه في البحث أم لا وبإمكانك طلب إيضاحات أو معلومات إضافيه عن أي شيء مكتوب في هذه الإستمارة أو الدراسة ككل من الباحث.

هذا البحث بغرض العلامات الاكلينيكيه للمريض مصاب بنقص الاوكسجين في الدم بدنقلا 2026

في حال وافقت على المشاركه في هذا البحث ستبقى معلوماتك طي الكتمان. لن يكون لأي شخص (مالم ينص القانون على ذلك) حق الإطلاع على الإستبيان الخاص بك ماعدا الطبيب المسئول عن الدراسة واستاذه.

إجراءات الدراسة : عن طريق إستبيان

إن كان لديك أي إستفسار في مايخص الدراسة يمكنك الإتصال بالباحث : د. محمد موسى محمد على 0129882271

الفوائد: لاتوجد فوائد مباشرة أو شخصية تعود إليك إذا شاركت في هذه الدراسة.

المخاطر: لاتوجد مخاطر مباشرة أو شخصية تعود إليك إذا شاركت في هذه الدراسة.

المشاركة في هذا البحث إختيارية ويمكن التوقف عنها في أي وقت

إقرار بالموافقة على المشاركه في الاستبيان

انا ..... بعد تم شرح طبيعة البحث وأعطيت فرصة كافية للإستفسار عنه وقد تم الإجابة على أسئلتي بصورة واضحة وفهمت أني لي حق التوقف عن المشاركة في اي وقت أوافق طوعيا على المشاركة في هذا الاستبيان.

الإسم.....

التوقيع.....

التاريخ.....

APPENDIX (2)

QUESTIONNAIRE

Section A: Patient Demographics

1. Hospital Name:

- ☐ Dongola Specialized Hospital
- ☐ Dongola Police Hospital
- ☐ Al-Shimal Specialized Hospital

2. Patient Age:

- ☐ Pediatric (<18 years)
- ☐ Adult (≥18 years)

3. Gender:

- ☐ Male
- ☐ Female

4. Residence:

- ☐ From Dongola
- ☐ Outside Dongola

5. Occupation:

- ☐ Healthcare worker
- ☐ Government / Private employee
- ☐ Farmer
- ☐ Manual laborer
- ☐ Self-employed / Trader
- ☐ Student
- ☐ Housewife / Homemaker
- ☐ Unemployed / Retired
- ☐ Other: _____

Section B: Presenting Complaints & Past Medical History

6. Main Symptoms at Presentation (check all that apply):

- ☐ Shortness of breath

- ☐ Chest pain
- ☐ Cough
- ☐ Fever
- ☐ Confusion
- ☐ Other: _____

7. Duration of Symptoms:

- ☐ <24 hours
- ☐ 1–3 days
- ☐ 4–7 days
- ☐ 8–14 days
- ☐ >14 days

8. Recent History of Respiratory Disease:

- ☐ Yes
- ☐ No
- If yes, specify:
    - ☐ Bronchial Asthma
    - ☐ COPD
    - ☐ TB
    - ☐ Lung Fibrosis
    - ☐ Lung Cancer
    - ☐ Occupational
    - ☐ Other: _____

9. Recent History of Cardiac Disease:

- ☐ Yes
- ☐ No
- If yes, specify:
    - ☐ Heart Failure
    - ☐ Myocardial Infarction
    - ☐ DCM
    - ☐ Immunosuppression (e.g., HIV, steroids)

- ☐ Pulmonary Embolism
- ☐ Other: _____

10. Previous Hospitalization for Hypoxic Illness in Past Year:

- ☐ Yes
- ☐ No
- If yes, duration:
  - ☐ <3 days
  - ☐ 3–7 days
  - ☐ 8–14 days
  - ☐ >14 days

Section C: Clinical Presentation (ABCDE / Primary Survey)

11. Airway Patency:

- ☐ Patent – self-maintaining
- ☐ Non-patent – required airway management

12. Type of Breathing:

- ☐ Normal
- ☐ Labored
- ☐ Apnea
- ☐ Cheyne-Stokes

13. Presence of Respiratory Distress:

- ☐ Yes
- ☐ No
- If yes, signs:
  - ☐ Use of accessory muscles
  - ☐ Intercostal recession
  - ☐ Tripod position
  - ☐ Cheyne-Stokes breathing
  - ☐ Apnea

14. Respiratory Rate (breaths/min):

- ☐ <10

- ☐ 14–18
- ☐ >24

15. Oxygen Saturation (SpO_2):

- ☐ ≥95%
- ☐ 90–94%
- ☐ 85–89%
- ☐ 80–84%
- ☐ 75–79%
- ☐ 70–74%

16. Chest Findings (Auscultation):

- ☐ Normal
- ☐ Wheeze
- ☐ Crepitations (Crackles)
- ☐ Reduced air entry
- ☐ Bronchial breathing
- ☐ Other: _____

17. Blood Pressure:

- ☐ Normal (120/80 mmHg)
- ☐ Hypertensive
- ☐ Hypotensive

18. Heart Rate:

- ☐ Normal
- ☐ <60 bpm
- ☐ >100 bpm

19. Disability (GCS):

- ☐ 15
- ☐ 13–14
- ☐ 10–12
- ☐ 6–9
- ☐ <6

20. Skin Findings:

- ☐ Normal
- ☐ Cyanosis
- ☐ Bruising
- ☐ Other: _____

21. Temperature: _____ °C

Section D: Diagnostic Tools & Findings

22. Point-of-Care Ultrasound (POCUS):

- ☐ Normal
- ☐ Lung consolidation
- ☐ Pleural effusion
- ☐ B-lines / Interstitial syndrome
- ☐ Pneumothorax
- ☐ Other: _____

23. Chest X-ray:

- ☐ Done
- ☐ Not done
- If done, findings:
    - ☐ Normal
    - ☐ Consolidation
    - ☐ Pleural effusion
    - ☐ Interstitial infiltrates
    - ☐ Pneumothorax
    - ☐ Other: _____
- Side: ☐ Unilateral ☐ Bilateral

24. CT Lung:

- ☐ Done
- ☐ Not done
- If done, findings:
    - ☐ Pleural effusion

- ☐ Consolidation
- ☐ Pneumothorax
- ☐ Lung collapse / Atelectasis
- ☐ Other: _____

25. ABG:

- ☐ Done
- ☐ Not done
- If done, findings:
  - ☐ Metabolic acidosis
  - ☐ Respiratory acidosis
  - ☐ Metabolic alkalosis
  - ☐ Respiratory alkalosis
  - ☐ Normal
  - ☐ Other: _____

26. PF Ratio:

- ☐ >300
- ☐ 200–300
- ☐ 100–199
- ☐ <100

27. Laboratory Values:

- WBCs: _____
- Hemoglobin: _____
- CRP: _____

Section E: Final Diagnosis & Disposition

28. Final Diagnosis:

- ☐ Pneumonia
- ☐ COPD exacerbation
- ☐ Pulmonary embolism
- ☐ Heart failure / Pulmonary edema
- ☐ ARDS

- ☐ Other: _____

29. Disposition Decision:

- ☐ Admitted to general ward
- ☐ Admitted to ICU
- ☐ Referred to another facility
- ☐ Other: _____

30. Patient Outcome:

- ☐ Hypoxia improved / Discharged
- ☐ Required long-term oxygen therapy
- ☐ Admission to ICU
- ☐ Death
- ☐ Other: _____