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Timeliness and Documented Guideline Concordance of Initial Management for Acute Exacerbations of Chronic Obstructive Pulmonary Disease

[1] Sajid Hayati, [2] Mazin Mohamed, [3] Yousif Elnour, [4] Sana Asghar, [5] Musa Kaleem Ullah, [6] Zeeshan Alam, [7] Eissam Arabi, [8] Mohamed Ibrahim, [9] Mohammed Ali, [10] Taiwo Abdulrahman Lamidi, [11] Mohammed Alzubair Ahmed, [12] Liam Chowke

[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12] Department of Pharmacy, Kerry University Hospital, Tralee, Co.Kerry, Ireland

Corresponding Author: **Sajid Hayati**

Abstract

Background: Early management of acute exacerbations of chronic obstructive pulmonary disease (AECOPD) requires coordinated assessment, prompt symptom-directed treatment, recognition of respiratory failure and timely escalation. Reliability across these processes was unknown at University Hospital Kerry.

Objective: To measure the documented timeliness and delivery of predefined assessment, treatment, safety and specialist-care processes for adults presenting to the emergency department with AECOPD.

Methods: We conducted a baseline, single-centre descriptive clinical audit of 30 adult emergency presentations between 20 July and 20 August 2026. Fifteen process criteria were abstracted from clinical records into a structured audit form. Compliance was calculated as the number of "Yes" responses divided by the total number of "Yes" and "No" responses; records classified as not applicable were excluded from the criterion-specific denominator. Results are reported as counts, percentages and Wilson 95% confidence intervals.

Results: Two of 15 criteria achieved at least 80% documented compliance: admission blood testing (27/30, 90.0%; 95% CI 74.4%–96.5%) and review of laboratory results within two hours (24/30, 80.0%; 95% CI 62.7%–90.5%). Controlled oxygen was documented in 9/12 applicable presentations (75.0%), systemic corticosteroid within four hours in 18/30 (60.0%), and an antibiotic within four hours in 15/27 applicable presentations (55.6%). Lower rates were observed for nebulised bronchodilator within 30 minutes (6/30, 20.0%), initial arterial blood gas within 30 minutes (9/30, 30.0%), repeat blood gas following oxygen or non-invasive ventilation change (6/18, 33.3%), appropriate venous thromboembolism prophylaxis within eight hours (3/30, 10.0%), respiratory review within 24 hours (12/30, 40.0%) and COPD outreach assessment within four hours (0/30).

Conclusions: Documented routine investigation processes were more reliable than time-critical treatment, reassessment, prevention and specialist escalation. Because eligibility and reasons for non-delivery were incompletely differentiated, these findings identify process and documentation gaps rather than proving inappropriate care in individual cases. A locally approved, timestamped AECOPD admission bundle with explicit exception coding and prospective re-audit is warranted.

Keywords: Chronic Obstructive Pulmonary Disease, Acute Exacerbation, Emergency Department, Clinical Audit, Quality Improvement, Care Bundle

Introduction

Chronic obstructive pulmonary disease (COPD) is characterised by persistent respiratory symptoms and airflow obstruction arising from airway and/or alveolar abnormalities. Acute exacerbations are episodes of worsening dyspnoea and/or cough and sputum over a short period and can be complicated by hypoxaemia, acute hypercapnic respiratory failure, pneumonia, cardiac disease and thromboembolism. International guidance therefore emphasises prompt assessment, controlled oxygen when hypercapnic respiratory failure is a concern, short-acting bronchodilators, systemic corticosteroids, indication-led antimicrobials and timely evaluation for non-invasive ventilation (NIV) [1-5].

Delivering these elements reliably in an emergency pathway is operationally complex. Some processes are universal, whereas

others depend on physiology, suspected infection, treatment response, contraindications or service availability. Care bundles can support reliability by bringing a small number of evidence-based actions, ownership prompts and timestamps into one workflow. However, bundle measures can be misleading if conditional interventions are treated as universal or if "not indicated", "contraindicated", "unavailable" and "not documented" are collapsed into a single category [6, 7].

University Hospital Kerry (UHK) undertook a baseline audit to evaluate the documented delivery and timeliness of early AECOPD care. The primary objective was to measure compliance with 15 predefined process criteria. Secondary objectives were to identify high-reliability processes and priority gaps, examine denominator and documentation limitations, and define a quality-improvement and re-audit framework.

Methods

Design and setting

This was a baseline, descriptive clinical audit conducted across the emergency department and acute hospital pathway at University Hospital Kerry, Tralee, Ireland. The audit period was 20 July to 20 August 2026, inclusive. The manuscript was prepared with reference to the Standards for Quality Improvement Reporting Excellence 2.0 (SQUIRE 2.0), while recognising that the dataset represents a baseline audit rather than a completed intervention study [7].

Eligibility and case identification

Eligible records were adult presentations (age 18 years or older) with a documented history of COPD that were triaged or clinically assessed as an acute exacerbation of COPD. Other emergency presentations, including presentations without documented COPD or not assessed as AECOPD, were excluded. Thirty eligible presentations were audited. [Before submission, specify how cases were identified and whether the sample was consecutive, convenience-based or selected by another method].

Audit standards and data collection

Fifteen process criteria covering assessment, investigations, oxygen and blood-gas management, medicines, venous thromboembolism (VTE) prevention and specialist care were assessed from the clinical record. Data were transcribed into a structured Google Forms audit tool using "Yes", "No" or "Not applicable" responses. The criteria drew on GOLD, NICE, British Thoracic Society and Irish Health Service Executive guidance, but several time thresholds were operational audit standards and require explicit confirmation against the approved UHK pathway before external submission [1-6].

Conditional criteria included controlled oxygen, repeat blood gas, NIV and antibiotic treatment. The audit tool did not consistently capture the clinical evidence supporting eligibility or distinguish non-indication, contraindication, service unavailability and absence of documentation. Consequently, criterion compliance is interpreted as documented process completion among records classified as applicable, not independently adjudicated clinical appropriateness.

Outcome measures

The primary outcome was documented compliance for each criterion. The denominator for unconditional measures was 30. For conditional measures, presentations recorded as not applicable were excluded. No patient-level clinical outcomes, severity adjustment, balancing measures or composite score were collected.

Statistical analysis

Analysis was descriptive. Applicable-case compliance was calculated as Yes/(Yes + No) and expressed as a percentage. Wilson 95% confidence intervals were calculated for each proportion. No hypothesis tests or multivariable analyses were undertaken because the audit had no comparator group and the sample was small. For local interpretation, compliance of 80% or higher was labelled strong, 60%–79.9% moderate and below 60% a priority gap; these bands were improvement categories rather than validated clinical thresholds.

Governance and ethical considerations

The work was undertaken as a clinical audit using routinely collected clinical-record data. [Insert UHK audit registration number, approving office/committee and date.] [Confirm whether formal research ethics committee review was not required and provide the written determination or waiver.] Data were analysed in aggregate and the working dataset was anonymised or pseudonymised [confirm]. No patient or public involvement occurred in the baseline audit [confirm]. Publication must not proceed until the audit, data-protection and publication permissions are documented.

Results

Overall process reliability

Thirty presentations were included. Two of the 15 criteria met the predefined strong-compliance band, three were moderate and ten were below 60%. The pattern was polarised: routine blood testing and review were comparatively reliable, while measures requiring rapid treatment, repeat physiological assessment, prophylaxis or specialist activation were less consistently documented (Table 1).

Table 1: Documented compliance with 15 early AECOPD care criteria. N/A records were excluded from the applicable denominator. CI, confidence interval; NIV, non-invasive ventilation; VTE, venous thromboembolism

Criterion	Compliant / applicable	Compliance	95% CI	N/A
Chest radiograph on presentation	18/30	60.0%	42.3–75.4%	0
Electrocardiogram performed	6/30	20.0%	9.5–37.3%	0
Admission FBC, U&E, LFTs and CRP	27/30	90.0%	74.4–96.5%	0
Controlled oxygen when applicable	9/12	75.0%	46.8–91.1%	18
Initial arterial blood gas within 30 minutes	9/30	30.0%	16.7–47.9%	0
Repeat blood gas after oxygen or NIV change	6/18	33.3%	16.3–56.3%	12
Nebulised bronchodilator within 30 minutes	6/30	20.0%	9.5–37.3%	0
NIV commenced when indicated	6/12	50.0%	25.4–74.6%	18
COPD outreach assessment within 4 hours	0/30	0.0%	0.0–11.4%	0
Laboratory results reviewed within 2 hours	24/30	80.0%	62.7–90.5%	0
Chest radiograph reviewed within 2 hours	15/30	50.0%	33.2–66.8%	0
Antibiotic within 4 hours when indicated	15/27	55.6%	37.3–72.4%	3
Systemic corticosteroid within 4 hours	18/30	60.0%	42.3–75.4%	0
Appropriate VTE prophylaxis within 8 hours	3/30	10.0%	3.5–25.6%	0
Respiratory review within 24 hours	12/30	40.0%	24.6–57.7%	0

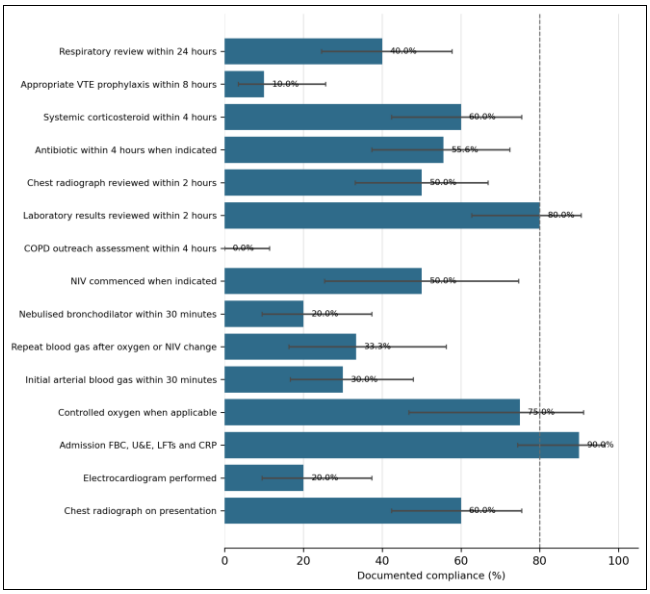

Fig 1: Documented compliance across 15 early AECOPD process criteria. Error bars are Wilson 95% confidence intervals; the dashed line marks the local 80% strong-compliance band. Conditional criteria use applicable-case denominators

Assessment and investigations

Admission FBC, urea and electrolytes, liver function tests and C-reactive protein were documented in 27/30 presentations (90.0%; 95% CI 74.4%–96.5%), and results were reviewed within two hours in 24/30 (80.0%; 95% CI 62.7%–90.5%). Chest radiography was completed on presentation in 18/30 (60.0%; 95% CI 42.3%–75.4%), with documented review within two hours in 15/30 (50.0%; 95% CI 33.2%–66.8%). An electrocardiogram was documented in 6/30 (20.0%; 95% CI 9.5%–37.3%). Whether electrocardiography should be universal or indication-based was not specified in the dataset.

Oxygen, blood gases and ventilatory support

Controlled oxygen targeting an oxygen saturation of 88%–92% was documented in 9/12 records classified as applicable (75.0%; 95% CI 46.8%–91.1%). An initial arterial blood gas within 30 minutes was documented in 9/30 (30.0%; 95% CI 16.7%–47.9%). A repeat blood gas 30–60 minutes after an oxygen or NIV change was documented in 6/18 applicable presentations (33.3%; 95% CI 16.3%–56.3%). NIV was commenced in 6/12 presentations recorded as eligible (50.0%; 95% CI 25.4%–74.6%). The source tool did not retain pH, $PaCO_2$, oxygen requirement, contraindications, tolerance or ceiling-of-care information, preventing independent adjudication of eligibility.

Medicines, prevention and specialist care

Nebulised bronchodilator treatment within 30 minutes was documented in 6/30 presentations (20.0%; 95% CI 9.5%–37.3%). Systemic corticosteroid treatment within four hours was recorded in 18/30 (60.0%; 95% CI 42.3%–75.4%). Antibiotic treatment within four hours was recorded in 15/27 applicable presentations (55.6%; 95% CI 37.3%–72.4%); three presentations were classified as not applicable. Appropriate VTE prophylaxis within eight hours was documented in 3/30 (10.0%; 95% CI 3.5%–25.6%). COPD outreach assessment within four hours was not documented in any presentation (0/30; 95% CI 0.0%–11.4%), and respiratory review within 24 hours was documented in 12/30 (40.0%; 95% CI 24.6%–57.7%).

Discussion

Principal findings

This baseline audit found a marked difference between the reliability of routine investigation processes and processes requiring rapid coordination, reassessment or cross-team ownership. Admission blood testing and two-hour laboratory review were the only criteria reaching at least 80% documented compliance. In contrast, prompt bronchodilator delivery, arterial blood-gas assessment and reassessment, VTE prevention, outreach assessment and respiratory review were documented less consistently.

The findings should not be read as proof that all non-compliant records represented clinically inappropriate care. The audit measured documentation against predefined process criteria and did not independently validate every indication, contraindication or exception. This distinction is particularly important for antibiotics, controlled oxygen, repeat blood gases and NIV. For antibiotics, the appropriate improvement target is a timely, documented decision based on clinical features and local antimicrobial guidance rather than universal prescribing. For oxygen and NIV, eligibility must be anchored to physiology and treatment response [1-5].

Interpretation in relation to guidance

International and national guidance supports short-acting

bronchodilators as initial therapy, short courses of systemic corticosteroids for appropriate patients, controlled oxygen in those at risk of hypercapnic respiratory failure, and NIV for persistent acute hypercapnic respiratory acidosis despite optimal medical treatment [1-5, 8-10]. The low documented rates for several of these processes therefore justify focused pathway review. However, a universal 30-minute blood-gas standard, four-hour outreach standard and universal electrocardiogram criterion should not be presented as directly mandated by all cited guidelines; they should be identified as locally approved operational standards if retained.

The comparatively strong performance of routine laboratory processes suggests that reliability improved where the action was embedded in an established order-and-review workflow. The weaker performance of repeat assessment and referral processes is consistent with fragmented ownership across the emergency department, acute floor, respiratory service and out-of-hours pathway. This is a hypothesis generated by the pattern of results, not a tested causal explanation.

Implications for quality improvement

A timestamped AECOPD admission bundle offers a practical response because it can make ownership, eligibility, actions and exceptions visible in one place. The proposed intervention should include confirmation of the working diagnosis and differential diagnosis; an individual oxygen target; explicit blood-gas and repeat-gas indications; bronchodilator administration and response; systemic corticosteroid decision; antibiotic indication, allergy status, renal dose and review date; VTE and bleeding-risk assessment; NIV and ceiling-of-care assessment; and respiratory or outreach referral with an out-of-hours alternative.

Implementation should proceed in three phases: local validation and approval of criteria, deployment with short case-based teaching and weekly feedback, and stabilisation with exception review before re-audit. The intervention should be studied prospectively using exact timestamps, consecutive case capture where feasible, predefined eligibility fields and balancing measures. Table 2 presents the proposed re-audit dataset and targets.

Table 2: Proposed measures for the post-intervention re-audit. Targets require local governance approval and are improvement aims, not externally validated standards

Domain	Operational definition	Denominator	Proposed target
Bundle uptake	Completed timestamped bundle	All eligible presentations	≥90%
Time-critical treatment	Bronchodilator, oxygen, steroid and documented antibiotic decision	Eligible presentations per item	≥85%
Respiratory safety	Indicated initial/repeat gas and NIV assessment	Eligible presentations per item	≥80%
Specialist care	Eligible outreach/referral and respiratory review	Eligible presentations per item	≥80%
VTE safety	Risk assessment plus prophylaxis or contraindication	All presentations	≥90%
Data quality	Mandatory fields complete	All presentations	≥95%

Strengths and limitations

Strengths include reporting of raw counts, correction of previously inconsistent steroid and chest-radiograph review values, preservation of applicable-case denominators and explicit separation of process measurement from patient outcome claims. The criterion-level results provide a reproducible baseline for local improvement.

The principal limitations are the small sample, single-centre design and undocumented case-ascertainment method.

Conclusion

In this single-centre baseline audit, documented routine blood testing and review were more reliable than prompt respiratory treatment, repeat physiological assessment, VTE prevention and specialist escalation. The data identify priorities for system redesign but do not establish inappropriate care in individual cases. A locally approved, timestamped AECOPD admission bundle, supported by explicit eligibility rules, exception coding, named ownership and feedback, should be implemented and prospectively re-audited.

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