REUE | Original Article

Variability of Emergency Department care for patients with exacerbated chronic obstructive pulmonary disease in Castilla-León

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OBJECTIVES. Assess the degree of implementation of action protocols for managing exacerbated chronic obstructive pulmonary disease (COPD) in hospital emergency departments (EDs) in Castilla y León, and evaluate access to logistical and therapeutic resources.

MATERIAL AND METHODS. Cross-sectional, descriptive study based on a 27-item multicenter email survey of hospital EDs in the Spanish autonomous community of Castilla y León. Univariate and bivariate analyses were applied to the responses. Absolute and relative frequency tables were constructed for categorical variables and hospital classifications. Contingency tables were constructed for continuous variables; we calculated means as well as medians and ranges for nonnormally distributed data. The Fisher and Kruskal-Wallis tests were used to explore associations between categorical variables according to hospital classification.

RESULTS. Fourteen hospital EDs participated in the research network (100% of all hospitals in the region). No action protocol for exacerbated COPD was in use in 6 hospitals (42.9%). In 7 hospitals, management of exacerbated COPD was led by the emergency department (vs Neumologist or internists). In 10 hospitals (71.4%), no specialist in acute respiratory disease was available. No regular meetings to evaluate, update, or monitor the management of exacerbated COPD were held in 42.9% of the EDs; occasional meetings were held in the remaining hospitals. Thirteen of the 14 EDs had access to noninvasive mechanical ventilators. The ventilators were used routinely as the first line of treatment in 42.9% of them. In 35.7% they were used sometimes, and in 21.4% they were not used.

CONCLUSIONS. The findings revealed great variability in access to medications, action protocols, referral to specialists, and management of exacerbated COPD among the hospitals in Castilla y León. Although these hospital EDs have an essential role to play in the care pathway for managing COPD exacerbations, they should take steps to unify criteria and create consensus-based guidelines for managing exacerbations.

Keywords: Emergency department. Chronic obstructive pulmonary disease (COPD). Variability.

Variabilidad en la atención del paciente con exacerbación EPOC en urgencias hospitalarias de la Red SACYL

OBJETIVO. Analizar y evaluar el grado de implementación de protocolos de actuación y acceso de medios logísticos y terapéuticos en la exacerbación aguda de la enfermedad pulmonar obstructiva crónica –EPOC– (EA EPOC) en los Servicios de Urgencias Hospitalarias (SUH) de SACYL (Sanidad de Castilla y León).

MATERIAL Y MÉTODOS. Estudio transversal, descriptivo mediante una encuesta digital autonómica multicéntrica de 27 preguntas, enviada a los 14 SUH del SACYL. Se recogen variables de clasificación y categóricas (se calculan tablas de frecuencia absolutas y relativas); variables continuas (se calculan tablas de contingencias con cálculo de media, mediana y rango si la distribución no fuera normal). Se hace una prueba de Fisher/Kruskal-Wallis para conocer la asociación de la variable categórica y la de clasificación.

RESULTADOS. Participaron el 100% de los SUH de la Red SACYL. En 42,9% (6) no se disponía de protocolo de actuación frente a la EA EPOC, en siete casos los SUH lideraron el manejo de la EA EPOC frente a otras especialidades médicas (neumología y medicina interna), pero en el 71,4% (10) no existía un profesional de referencia para la patología respiratoria aguda. No existían reuniones periódicas que permitan evaluar, actualizar o monitorizar el manejo de la EA EPOC en el 42,9% y en el resto se realizaba ocasionalmente. Trece servicios tenían acceso a la ventilación mecánica no invasiva con uso habitual en el 42,9%, de los casos, en el 35,7% lo utilizaban de manera ocasional y no se usaba en el 21,4%.

CONCLUSIONES. Existe una gran variabilidad en términos de acceso a medicamentos, protocolos de actuación, derivación y manejo de la EA EPOC entre en los SUH SACYL. Aunque ocupan un papel fundamental en la cadena asistencial de la EA EPOC, se debe avanzar en la unificación de criterios.

Palabras clave: Urgencias. EPOC. Variabilidad.

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Introduction

Exacerbations of chronic obstructive pulmonary disease (COPD) are defined as a worsening of respiratory symptoms that requires additional treatment. These events negatively affect those who experience them in terms of hospital admission and readmission, as well as disease progression. They are complex events caused by increased airway inflammation, mucus production, and marked air trapping. Increased dyspnea is the main reason for consultation among patients presenting to the emergency department, although increased sputum production and purulence may also be present, along with increased cough and wheezing.[1,5,7]

COPD is one of the 3 leading causes of death worldwide,[2,3] being both preventable and treatable, especially in its early stages. Population aging and increasing exposure to risk factors such as pollution and smoking[6] suggest a substantial rise in cases in the coming decades.[4] Emergency departments (EDs) play a fundamental role in the management of acute chronic obstructive pulmonary disease exacerbations (AECOPD),[8] as demonstrated after the COVID-19 pandemic.[9,10] During this period, we experienced changes spanning initial diagnostic strategies, therapeutic measures, and follow-up[11-14] which, despite the scientific evidence, have not resulted in standardized management criteria for AECOPD in our setting. This variability motivated the creation of the EPOC URG CyL (Castilla y León) Project, whose purpose is to update knowledge on this condition and provide high-quality care for patients in SACYL (Health Service of Castilla y León) EDs.

Material and methods

The EPOC URG CyL Project was designed after institutional team meetings and discussions with SACYL ED chiefs (Health Service of Castilla y León) in January and February 2022. The project was divided into 3 phases that define the "before, during, and after" of AECOPD care.

Initially, the degree of implementation of action protocols and access to logistical and therapeutic resources for AECOPD in SACYL EDs was analyzed (Phase I), which also describes differences among EDs and is presented in this article. In Phase II, currently underway, a regional consensus manual is being developed. In Phase III, a multipurpose prospective study is being conducted, currently in the data collection stage. The aim of this final phase is to determine the clinical characteristics of patients with AECOPD who attend SACYL EDs and to create a risk prediction model for short-term adverse events, enabling better health care resource management and more specific protocols for medical care and referral, ultimately benefiting the patient.

A representative expert committee of SACYL EDs and institutional partners was formed through the Institute of Health Sciences of Castilla y León (ICSCYL), and the selection of principal and collaborating investigators was delegated to department heads. The team is composed of 126 health care professionals (82 physicians and 44 nurses), representing the 14 SACYL EDs. For Phase I, a cross-sectional descriptive study was conducted using a multicenter digital survey of 27 questions distributed in April 2022 via official corporate email to the 14 principal investigators (one per ED), representing the entire research team (Figure 1). Data were stored on the ICSCYL digital platform and later analyzed using IBM SPSS Statistics 27. A univariate and bivariate analysis of all variables was performed, involving classification (Table 1), categorical (absolute and relative frequencies or percentages) (Table 2), and continuous variables (contingency tables with calculation of mean, median, and range if the distribution was non-normal) (Table 3). Fisher's exact test/Kruskal–Wallis test was used to analyze associations between categorical and classification variables, considering $P < .05$ statistically significant.

This study was approved by Hospital Clínico Universitario de Valladolid (Valladolid, Spain) Clinical Research Ethics Committee (reference PI 22-2656), as well as by the remaining participant centers.

Results

All 14 EDs in the SACYL network responded. All had residency training programs, and 71.4% had an on-call pulmonologist (Table 2). In 12 centers (85.7%), there was an Emergency Observation Area. During 2021, a total of 890,678 emergency visits were recorded, of which 9,796 cases (1.1%) were AECOPD, with a hospital admission rate of 9.1% (895 patients) and a mean length of stay of 6.4 days. The emergency physician decided admission in 271 patients (30%) due to AECOPD.

Management of AECOPD in SACYL EDs was carried out by ED physicians in 50% of cases (7.1% pulmonology, 7.1% internal medicine, and the remainder through a multidisciplinary approach involving the above-mentioned specialties). Four EDs had a designated professional reference for this type of case. Periodic meetings to review attended cases were absent in 42.9% of EDs (and occurred occasionally in 57.1%). Six EDs (42.9%) lacked a specific management protocol. In 3 centers (21.4%), patients could not be directly referred for follow-up in hospital outpatient clinics upon ED discharge. Additionally, 12 EDs (85.7%) lacked a rapid-access pulmonology clinic for patients requiring priority evaluation. Thirteen EDs (92.1%) had non-invasive ventilation (NIV) devices available, but only 6 (42.9%) used them routinely. Seven EDs (50%) used nebu-

Table 1. Classification variables. SACYL hospitals by level of care and according to the hospital care service portfolio (organizational structure) of SACYL

Level 1	Level 2	Level 3
Hospital de Medina del Campo	*Complejo Asistencial de Ávila*	*Complejo Asistencial Universitario de Burgos*
Hospital Santos Reyes de Aranda de Duero	*Complejo Asistencial de Palencia*	*Complejo Asistencial Universitario de León*
Hospital Santiago Apóstol de Miranda de Ebro	*Complejo Asistencial de Segovia*	*Complejo Asistencial Universitario de Salamanca*
Complejo Asistencial de Soria	*Complejo Asistencial Universitario de Zamora*	*Hospital Clínico Universitario de Valladolid*
Hospital El Bierzo de Ponferrada	*Hospital Universitario Río Hortega de Valladolid*	

SACYL: Health Service of Castilla y León.

1.-Type of hospital/Level of care (check one):
Teaching Hospital (Level 3)/General Hospital (Level 2)/ Regional Hospital (Level 1)

2.-Does your hospital have an on-call pulmonologist? Yes/ No

3.-Does your hospital have MIR residency training? Yes/No

4.-Number of annual Emergency Department (ED) visits (2021):

5.-Number of annual ED visits (2021) for COPD exacerbation:

6.-Number of hospital admissions to inpatient wards for COPD exacerbation:

7.-Specify destination and number: → Pulmonology:
→ Internal Medicine:
→ ICU:
→ Other:

8.-Number of Observation Unit beds:

9.-Number of patients admitted to Observation for COPD exacerbation:

10.-After Observation, how many were. → Discharged:
→ Admitted:

11.-Is there a treatment protocol for COPD exacerbation in your ED?
Yes/No
If so, indicate year of implementation:

12.-Is COPD exacerbation managed by a multidisciplinary team involving different specialties?
Who leads COPD exacerbation management in your hospital? (Check all that apply)
ED/Radiology/Internal Medicine/ICU/Pulmonology/Other/ No identified leadership

13.-Is there a clearly identified professional in your ED responsible for acute respiratory disease in COPD patients? Yes/No

14.-Are there regular meetings in your department to review (feedback) cases of COPD exacerbation? Yes/No/ Sometimes

15.-Does your department have NIV equipment for COPD exacerbation management? Yes/No

16.-Is NIV used as the first-line ventilatory support in COPD exacerbation with acute respiratory failure, when not contraindicated, by ED physicians?
Yes/No/Sometimes

17.-Are COPD exacerbation patients admitted to the ED Observation Unit after receiving inhaled or ventilatory treatment?
Yes/No/Occasionally (due to lack of ward beds)/Other

18.-What is the destination of COPD exacerbation patients treated with inhaled or ventilatory therapy in the ED?
Pulmonology/Internal Medicine/ICU/Hospital Discharge/ Other

19.-Is mono/dual/triple inhaled therapy prescribed according to current GOLD and GesEPOC guidelines in your ED for COPD exacerbation?
Yes/No (they are referred to a specialist—Pulmonology/ Internal Medicine—where it is performed)

20.-If the COPD exacerbation patient is discharged from the ED, does your department have the ability to refer directly to a Pulmonology clinic?
Yes (eg, via the hospital's internal appointment system)/ No (via the patient's Primary Care physician)

21.-Is there a rapid-access COPD clinic in your hospital for urgent follow-up of COPD exacerbation patients discharged from the ED?
Yes/No/Other

22.-When inhalation therapy is administered, which modality is frequently used in COPD exacerbation?
Nebulization (O_2 vs. Air)/Inhalation (pMDI/Soft-mist/ Dry-powder)

23.-If inhalers are used, are they associated with a spacer chamber? Yes/No

24.-Please indicate whether your ED has direct access to the following inhalers for therapeutic use:
– SABA (eg, salbutamol or terbutaline): Yes/No
– SAMA (eg, ipratropium): Yes/No
– LABA (eg, formoterol): Yes/No
– LAMA (eg, aclidinium or glycopyrronium): Yes/No
– LABA + LAMA (eg, formoterol/aclidinium): Yes/No
– LABA + ICS (eg, formoterol/budesonide or salmeterol/ fluticasone): Yes/No

25.-Are triple-therapy inhalers (LABA/LAMA/ICS) available in your department? Yes/No

26.-When attending a COPD exacerbation in the ED, do you investigate (eg, via interview or clinical records such as Jimena) whether the COPD diagnosis is confirmed, phenotype, exacerbator status, treatment adequacy, etc.? Yes/No/Sometimes

27.-After discharging a COPD exacerbation patient from your ED, do you adjust treatment according to the patient's clinical needs?
– YES, I follow protocol or clinical guidelines
– NO, I maintain their usual treatment and leave adjustment to their Primary Care physician or Pulmonologist
– Sometimes

Figure 1. Questionnaire PHASE I COPD Project URG CyL.
COPD: chronic obstructive pulmonary disease; NIV: noninvasive mechanical ventilation; NLP: pulmonology; IM: internal medicine; ICU: intensive care unit; SABA: short-acting beta agonists; SAMA: short-acting anticholinergics; IC: inhaled corticosteroids; LABA: long-acting beta agonists; LAMA: long-acting anticholinergics.

Table 2. Univariate analysis of categorical variables

SACYL EDs (14)	Results in percentages		
Your hospital has an on-call pulmonologist	Yes: 71.4%; No: 28.6%		
Your department has MIR residency training	Yes: 100%; No: 0%		
Your department has an Emergency Observation Area	Yes: 85.7%; No: 14.3%		
There is a treatment protocol for COPD exacerbation in your ED	Yes: 57.1%; No: 42.9%		
Who leads the management of COPD exacerbations in your ED (multiple options allowed)	ED: 50%; Internal Medicine: 7.1%; Pulmonology: 14.3%; ED ± Pulmonology ± Internal Medicine: 7.1%; None: 14.3%		
A designated professional for acute respiratory disease in COPD patients is clearly identified in your ED	Yes: 28.6%; No: 71.4%		
There are periodic meetings in your department to review feedback on cases of COPD exacerbation	Yes: 0%; No: 42.9%; Sometimes: 57.1%		
Your department has NIV equipment for the management of COPD exacerbations	Yes: 92.9%; No: 7.1%		
NIV is used as the first-line ventilatory support in COPD exacerbations with acute respiratory failure	Yes: 42.9%; No: 21.4%; Sometimes: 35.7%		
Patients with COPD exacerbation are admitted to the ED Observation Unit after receiving inhaled or ventilatory treatment	Yes: 50%; No: 28.6%; Sometimes: 14.3%; Other: 7.1%		
Inhaled mono/dual/triple therapy is prescribed in accordance with current GOLD and GESEPOC guidelines	Yes: 71.4%; No (referred to specialist): 28.6%		
If a COPD exacerbation patient is discharged from the ED, does your department have the capacity to refer directly to pulmonology?	Yes (through hospital scheduling): 78.6%; No (through PC): 21.4%		
Your hospital has a rapid-access COPD unit for follow-up of patients discharged from the ED needing priority evaluation	Yes: 14.3%; No: 85.7%		
When performing inhalation therapy, you could indicate which modality you frequently use in COPD exacerbatio	Nebulization: 50% Inhalation: 50% pMDI inhalation 85.7% Dry powder inhalation: 7.1% Mild vapor inhalation: 7.1%	– Neb. with air: 7.1% – Neb. with O_2: 92.9% – Inhalation pMDI with chamber: 100% – Inhalation pMDI without chamber: 0%	
Please indicate the availability of direct access from your department to inhalers for therapeutic use in your service."		Yes	No
	SABA	100%	0%
	SAMA	100%	0%
	CI	100%	0%
	LABA	57.1%	42.9%
	LAMA	21.4%	78.6%
	LABA + LAMA	21.4%	78.6%
	LABA + CI	71.4%	28.6%
	LABA+CI+LAMA	0%	100%
When attending a patient with COPD exacerbation, investigates—via clinical interview or records such as Jimena—whether the COPD diagnosis is confirmed, phenotype, exacerbator status, treatment adequacy	Yes: 78.3%; No: 0%; Sometimes: 21.4%		
After discharging a patient with COPD exacerbation from the ED, adjusts treatment according to the patient's specific needs	Yes: 64.3%; No: 7.1%; Sometimes: 28.6%		

ED: emergency department; SACYL: Health Service of Castilla y León; COPD: chronic obstructive pulmonary disease; NIV: non-invasive ventilation; PC: primary care; SABA: short-acting β-agonists; SAMA: short-acting anticholinergics; ICS: inhaled corticosteroids; LABA: long-acting β-agonists; LAMA: long-acting anticholinergics.

lized therapy (92.7% with oxygen instead of air), while the remaining EDs (85.7%) used pressurized metered-dose inhalers (100% with spacer devices) and soft-mist or dry-powder inhalers. Regarding pharmacological therapy, all EDs had access to short-acting β-agonists (SABA), short-acting anticholinergics (SAMA), and inhaled corticosteroids (ICS). However, long-acting β-agonists (LABA) and long-acting anticholinergics (LAMA) were available only in 8 (57.1%) and 3 (21.4%) EDs, respectively.

Regarding combination therapies, 4 centers (28.6%) lacked LABA+ICS inhalers. Currently, no ED has access to triple therapy inhalers (LABA+LAMA+ICS). At discharge, 9 EDs (64.3%) adjusted the patient's medication according to clinical practice guidelines. Notably, quantitative data collection (continuous variables) showed considerable variability, compromising uniform participation from all 14 EDs (Table 3). Nevertheless, most hospital admissions from the ED were under pulmonology, with a mean of 282.8 patients (the mean number of AECOPD admissions in 2021 was 1,318.5), followed by internal medicine with 121.2 patients. ED Observation Areas were used for a mean of 149.4 cases, for continued treatment for up to 24 hours (with improvement and discharge in 57.6 cases and admission in 115.8 cases).

In the bivariate analysis of categorical and continuous variables with classification variables, no significant differences were found, as no Fisher's exact test yielded a *P*-value < .05.

Discussion

AECOPD is associated with a high social and health care cost, with EDs playing a fundamental role in its management.[15,16] We did not find any reports detailing and comparing variability in the routine clinical practice—not only in AECOPD but in any other acute condition managed in SACYL EDs or nationwide—except for rare exceptions such as acute stroke care, which also highlights significant variability in the management of the same condition

Table 3. Univariate analysis of continuous variables

SACYL EDs (14)	Total EDs responding	Mean	Median	Interquartile range
Number of emergency visits attended in 2021	14	60.427.4	45.846.5	46.524.2
Number of emergency visits in 2021 due to COPD exacerbation	14	1.318.5	315.0	276.0
Number of hospital admissions from the ED due to COPD exacerbation in 2021	13	282.8	238.0	215.0
If available, indicate mean length of stay (days)	6	6.4	6.4	1.2
Of these, number of patients admitted from the ED to pulmonology	10	139.9	124.5	92.2
If applicable, number of observation beds	14	12.6	10.0	10.5
Number of patients admitted to ED observation for COPD exacerbation in 2021	8	149.4	120	216.8
Of these, number admitted to hospital wards	8	115.8	99.0	203
Of these, number discharged from ED observation	8	57.6	64.5	35.2
If applicable, indicate year of implementation	8	2015	2016	3.5
If yes, number of physicians assigned to this role	11	0	0	1.5
If applicable, year monotherapy treatment began	5	2002	2010	26
If applicable, year dual therapy treatment began	5	013	2016	1
If applicable, year triple therapy treatment began	6	2018	2020	2.2
Number of patients admitted from the ED to Internal Medicine	13	121.2	91.0	130.0
Number of patients admitted from the ED to ICU	12	2.8	1.5	2.5
Number of patients admitted from the ED to Cardiology	13	6.5	1	2
Number of patients admitted from the ED to other services	13	4.9	1	4

ED: emergency department; SACYL: Health Service of Castilla y León; COPD: chronic obstructive pulmonary disease; ICU: intensive care unit.

across different hospitals in Spain[17] and the essential role of Emergency Physicians managing this disease. Furthermore, outside the ED setting, the IBÉRICA study, conducted by cardiologists, describes characteristics of patients with acute myocardial infarction (AMI) across geographic regions regarding management and prognosis, suggesting inequalities in AMI care in Spain at hospital level,[18] although without mentioning the role of Emergency Physicians in this disease. In other countries, no studies with the above-mentioned characteristics were found. However, the REDALYC platform[19] exists within the Ibero-American health care context. Related to this tool, we identified the application of Big Data[20] through advanced analytical programs used to evaluate and address asymmetries in scientific data, inequalities, and socioeconomic and institutional impacts, describing a set of solutions that could provide a toolbox for professionals to improve clinical performance and optimize resource use.

Variability in the capacity of EDs across Spain to solve clinical problems in acute care has also been observed. These differing capabilities increase practice variability depending on region and hospital level, thereby increasing asymmetries.[21]

In analyzing the difficulties encountered when collecting the necessary data for this study—particularly continuous variables—it becomes evident that accessibility issues are largely attributable to current electronic systems and clinical record software used across SACYL EDs. These systems are not efficient for monitoring clinical information of treated patients, whether due to data protection requirements or inadequate diagnostic and process coding, resulting in the loss of relevant clinical information. Implementing an adequate digital system would provide a valuable tool for clinical management, improving quality of care and supporting ED research.[22]

We understand that during the COVID pandemic (the pandemic per se is not really the subject of this study), the number of patients with AECOPD attending EDs may have decreased significantly. However, the admission rate of patients with AECOPD who did present to SACYL EDs remained high,[23] particularly regarding crucial aspects such as the use of NIV, for which indications and benefits in AECOPD are well established.[24,25]

A common standard protocol for managing AECOPD should be implemented across all 14 SACYL EDs. This protocol should also allow adaptation to the specific characteristics and idiosyncrasies of each ED based on hospital level and population served. Therapeutic pathways should permit escalation or de-escalation of inhaled therapies, the use of systemic drugs (corticosteroids, antibiotics, etc.), which is consistent with the latest GOLD 2023 report,[26] and should incorporate assessment tools such as the CAT (COPD Assessment Test), whose utility and characteristics have been described in various studies by Pulido Herrero *et al.*[27,28] and which may support ED management of AECOPD. Risk prediction scales or models for short-term outcomes should also be included to improve decision-making at ED discharge.[29,30]

Finally, accessibility and communication should be improved for both mild and moderate patients discharged from the ED, ensuring timely evaluation in primary care (PC) or hospital outpatient clinics without requiring the patient to initiate the appointment process with their PC physician, who must then refer to a specialist.

Although the principle of justice—according to the ethical principles of bioethics[31]—is the most difficult to fulfill within a high-quality health care system, equal opportunities should be offered to all patients regardless of where they live.

This study presents limitations which are inherent to retrospective observational studies and survey-based designs, although it provides a reliable perspective on AECOPD care within SACYL EDs. We are currently developing a regional consensus manual and collecting data for a prospective, multipurpose study as part of the EPOC URG CyL Project, which will conclude in 2023.

Conclusions

The results of our study reveal a concerning degree of variability among SACYL EDs, depending on the center to which the patient presents, together with logical differences inherent to each hospital's level of care, geographical location, and available resources.

A common framework for action must be established across SACYL EDs to offer patients measures that improve AECOPD management, reduce observed variability, and implement training and competency programs for SACYL ED health care personnel.

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ADDENDUM

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