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EXPERT OPINION

Recommendations for Improving Discharge-Related Care Following a COPD Exacerbation: An Expert Panel Consensus with Emphasis on Low- and Middle-Income Countries

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Abstract: Exacerbations of chronic obstructive pulmonary disease (COPD) continue to place a considerable disease and financial burden on both patients and healthcare systems, particularly in low- and middle-income countries (LMICs). Therefore, preventing future exacerbations remains a key treatment goal. However, gaps remain in the standard of COPD care following exacerbations, despite the availability of evidence-based recommendations providing guidance on discharging patients from hospital or emergency department (ED) after a COPD exacerbation. To better understand these gaps in clinical practice, an advisory board meeting of 13 international pulmonologists was convened in September 2022, with the principal objective to formulate and recommend an evidence-based hospital discharge protocol following a COPD exacerbation, with a particular focus on LMICs. Based on identified gaps in COPD care, recommendations for alleviating the burden of exacerbations were proposed, which could be delivered as a discharge protocol for implementation in hospitals and/or ED. Following a review of the available clinical evidence, including an online survey of 11 pre-meeting questions and 5 additional questions discussed during the meeting, the key unmet needs identified by the experts included poor integration of standardized protocols in routine clinical practice, failure to ensure consistent delivery of post-discharge care, and lack of efficiently functioning healthcare systems. A protocol was formulated for delivery as part of a disease management program involving an interdisciplinary approach and a care bundle, aiming to address gaps in discharge-related care by determining the likelihood of readmission and optimizing maintenance treatment plans based on assessment of symptoms and future exacerbation risk. This can provide holistic care following hospital/ED discharge and personalized treatment plans by advocating referral to a specialist. To ensure wide-ranging uptake, implementation of a discharge protocol will need to be tailored to local healthcare settings by conducting feasibility studies, standardizing clinical pathways and healthcare policies, and engaging relevant stakeholders.

Keywords: chronic obstructive pulmonary disease, exacerbation, discharge protocol, hospital, emergency department

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Introduction

Chronic obstructive pulmonary disease (COPD), the third leading cause of death worldwide, exerts a considerable burden on both patients and healthcare systems.[1,2] Additionally, COPD continues to be a global public health challenge, particularly in low- and middle-income countries (LMICs), where approximately 90% of COPD-related deaths occur in those under 70 years of age.[1]

Exacerbations of COPD are clinically significant events that drive disease progression[3] and are marked by acute worsening of respiratory symptoms, which unfold over a period of <14 days and are frequently linked to infections and flare of airway inflammation.[4] COPD is characterized by a progressive decline of pulmonary function. Recurrent exacerbations accelerate lung function decline, negatively impact exercise performance and overall patient quality of life (QoL), and increase the risk of hospitalization, readmission, and even mortality.[5] Findings of the EXACOS International study, an observational, cross-sectional study that analyzed retrospective data from medical records for a 5-year period from 12 countries with limited healthcare resources, showed that the interval between successive severe exacerbations decreased with increasing number of events.[6] During the 5-year period, the mean annual prevalence of severe exacerbations in the EXACOS International study was 20.1%, and approximately half of the patients experienced ≥1 severe exacerbation, demonstrating that there is a critical unmet need for effective treatment strategies to prevent severe exacerbations and enhance overall care for COPD patients in LMICs.[6] Severe exacerbations represent a significant factor contributing to mortality among patients with COPD.[7] Indeed, findings of a meta-analysis involving 6 studies, reporting ≥1.5-year survival after a severe COPD exacerbation resulting in hospitalization, estimated the average case-fatality rate of 15.6%, varying from 11.4% to 19.0% for individual studies.[7] Patients with COPD are also at an increased risk of cardiopulmonary events, such as pneumonia,[8] pulmonary embolism,[9] myocardial infarction, and stroke.[4,10] It is worth noting that acute COPD exacerbations increase the risk of developing the aforementioned cardiopulmonary events, not only in the acute setting but also frequently after discharge.[11,12]

Exacerbations cluster together in time, such that there is a high-risk period for recurrent exacerbation in the 8-week period after an initial exacerbation,[13] with exacerbations also increasing in frequency and severity as COPD progresses.[14] The occurrence of multiple and/or severe exacerbations has been reported to increase the likelihood of and reduce the time to subsequent exacerbations.[15] Due to the poor prognosis associated with COPD exacerbations, especially when hospitalization is needed,[3] it is crucial to prioritize effective treatment and prevention strategies for exacerbations, with the goal of improving patient outcomes and reducing COPD-related morbidity and mortality.[4] Despite the availability of treatment guidelines and recommendations to optimize case management,[4,16,17] their global implementation remains inadequate,[18–20] adversely impacting patient outcomes.[19] Although current COPD evidence-based recommendations provide guidance on hospital discharge, patient follow-up, and interventions to reduce exacerbation risk,[4,16] substantial gaps remain in the standards of clinical care, with many patients discharged from the hospital or emergency department (ED) with no clear management plan to prevent future episodes[21] and a lack of coordination and continuity of care following discharge.[22] For instance, a retrospective analysis of COPD-related medication patterns and outpatient visits before and after an acute COPD exacerbation found that 31.2% of patients were not prescribed maintenance therapy 90 days after discharge.[22] Further, a prospective, multicenter, real-life cohort study of hospitalized patients with COPD revealed low rates of long-acting bronchodilator therapy, pulmonary rehabilitation initiation, and spirometry utilization, 30 days after discharge.[23] Studies conducted in Spain,[24] Taiwan,[25] the United Kingdom (UK),[26] and the United States (US)[27] have reported that a high proportion of patients admitted to hospitals for a COPD exacerbation are either readmitted or die within a year of their discharge, in particular from cardiorespiratory events. In 2019, more than three-quarters of the global COPD cases were reported in LMICs, which is expected to increase further.[28] Compared with 2020, the global burden of COPD is projected to increase by 23% by 2050, estimated to be largely driven by females from LMICs.[29] Considering that COPD may disproportionately impact LMICs, many of which have limited resources, achieving significant reduction in disease burden will require proactive action to prioritize respiratory care.[28,29]

Based on this unmet clinical need and to further understand important care gaps in the management of patients discharged from hospital or the ED following a COPD exacerbation, an advisory board meeting of international experts in pulmonary medicine was convened to seek consensus on the optimal management of patients following discharge. This article summarizes the discussions and conclusions of that meeting.

Toward a Consensus on a Hospital Discharge Protocol or Guideline Following a COPD Exacerbation

An expert advisory committee of 13 pulmonologists with experience in the management of COPD from Argentina, Australia, Colombia, Egypt, Guatemala, Malaysia, Mexico, Saudi Arabia, South Korea, Taiwan, Trinidad and Tobago, Turkey, and the UK participated in an advisory board meeting that convened in September 2022 in Barcelona, Spain. The principal objectives of this meeting were to (i) identify current challenges and unmet needs in the management of COPD exacerbations in various settings and with a focus on LMICs, particularly around discharge protocols and guidelines, and (ii) achieve consensus on recommendations for evidence-based hospital discharge protocols and practices following a COPD exacerbation, with a particular focus on LMICs.

After review, consideration, and discussion of the available evidence, including the completion of an online survey of 11 questions prior to the meeting (Supplementary Table 1A) and additional 5 questions answered and discussed during the meeting (Supplementary Table 1B), consensus was reached on the key unmet needs in COPD care. Recommendations were then formulated for strategies to alleviate the burden of exacerbations (Figure 1) to define a protocol for hospital/ED discharge (Figure 2 and Supplementary Table 2).

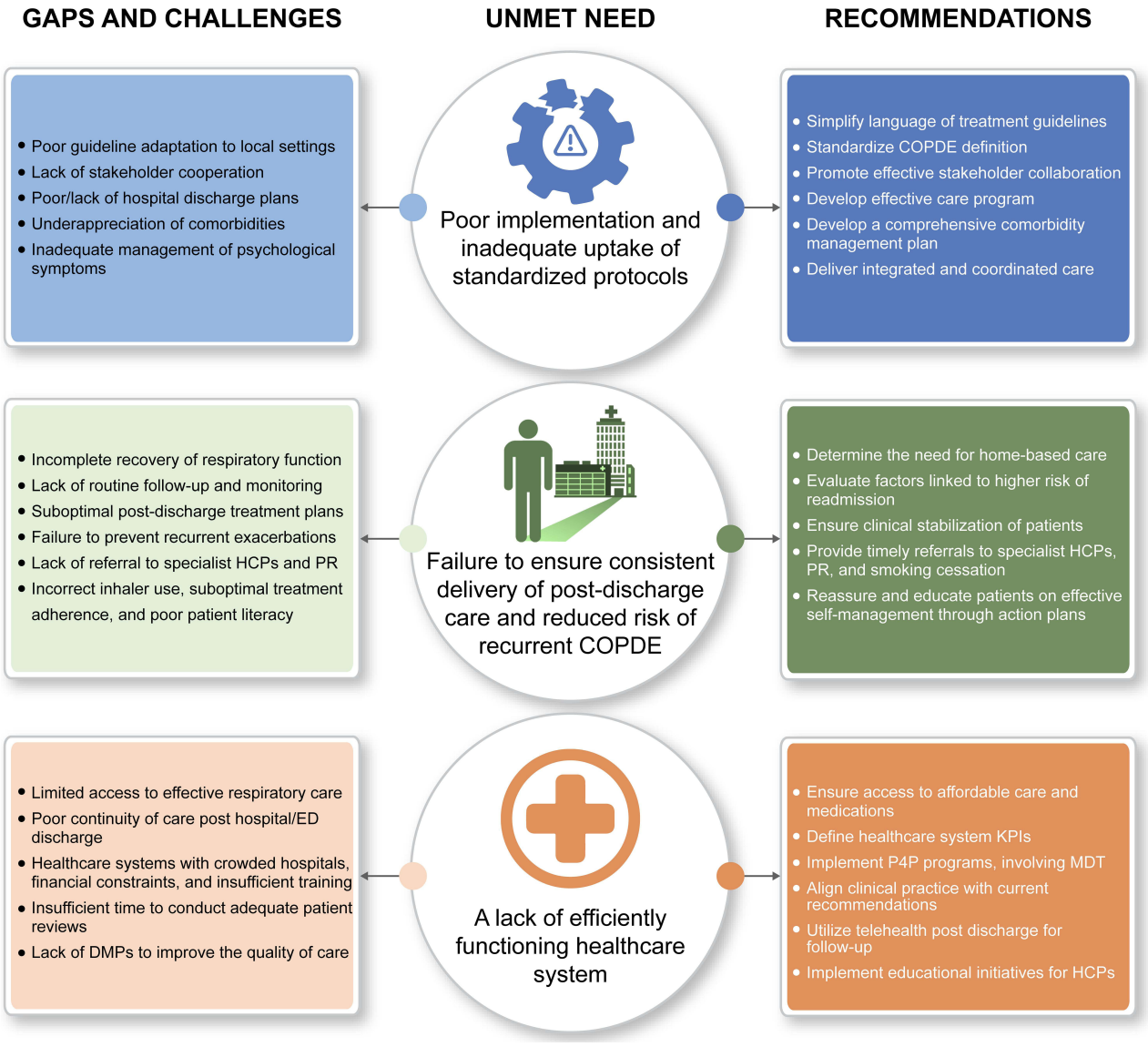

Figure 1 Key gaps and unmet needs in COPD-related care and recommendations for alleviating the exacerbation-related burden.
Abbreviations: COPD, chronic obstructive pulmonary disease; COPDE, COPD exacerbation; DMP, disease management program; ED, emergency department; HCP, healthcare practitioner; KPI, key performance indicator; MDT, multi-disciplinary team; P4P, pay-for-performance; PR, pulmonary rehabilitation.

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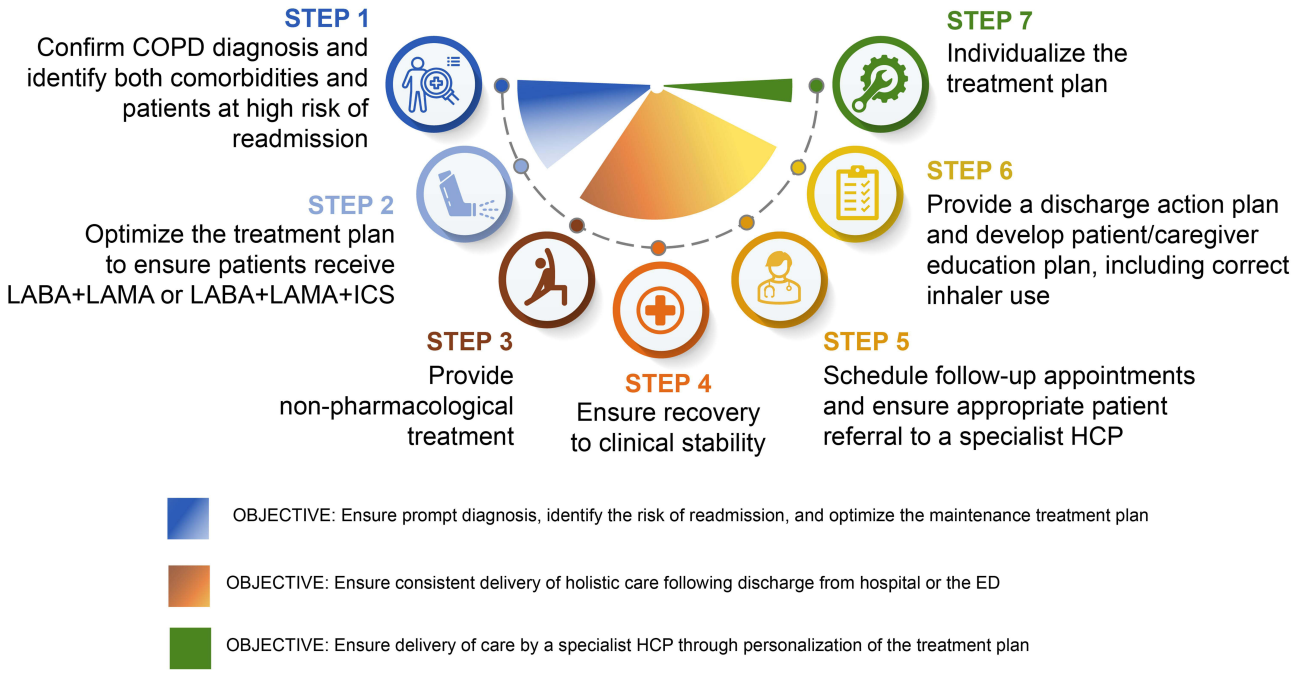

Figure 2 Step-wise protocol for discharge of patients with COPD following an exacerbation.
Abbreviations: COPD, chronic obstructive pulmonary disease; ED, emergency department; HCP, healthcare practitioner; ICS, inhaled corticosteroid; LABA, long-acting β_2-agonist; LAMA, long-acting muscarinic antagonist.

Key Unmet Needs in the Management of COPD Exacerbations Following Hospital Assessment

Poor Implementation and Inadequate Uptake of Standardized Discharge Protocols for Evidence-Based Management of Exacerbations

Patient discharge from the hospital/ED represents the transition of ongoing treatment to the primary, community, or home-based setting and should not be viewed as an endpoint to patient care.[30] However, the lack of checklists and appropriate guidelines to ensure consistent standards of care for patients discharged from hospital or the ED represents a significant challenge. In this regard, the use of discharge care bundles, which are recommended by the British Thoracic Society (BTS),[31] may serve as a useful basis for a discharge protocol/guideline. Implementation of discharge care bundles has been shown, in some studies, to reduce hospital readmissions; however, clinical evidence demonstrating a reduction in long-term mortality remains insufficient.[32] To ensure clinical benefit, effective implementation of the individual components of evidence-based care bundles for COPD management should be tailored to patients' needs and include healthcare practitioner (HCP) education and a provision for audits to provide feedback to staff on the effectiveness of individual care elements.[33]

While guidelines are crucial for enhancing the quality of healthcare, most of them have been developed considering the available resources in high-income countries. There is a lack of national guidelines in LMICs, with limited availability of international guidelines.[34] Additionally, suboptimal implementation and/or insufficient acceptance of guidelines[35] can lead to a gap between clinical practice and evidence-based medicine. Therefore, to ensure effective implementation and improve uptake, treatment guidelines need to be translated into different languages and adapted according to local contexts; this should be achieved through the involvement of appropriate decision-makers, taking into consideration the requirements of relevant stakeholders and potential users.[36,37] Additionally, factors such as efficient use of resources, active cooperation of stakeholders, and clinical expertise and familiarity with empirical evidence are crucial to coordinate the implementation and acceptance of guidelines.[36,38] To this end, existing evidence-based treatment strategies, such as the Global Initiative for Chronic Obstructive Lung Disease (GOLD),[4] provide an effective alternative

to *de novo* development of local guidelines and overcome limitations associated with a potential lack of expertise and/or resources in certain regions.

Patients with COPD also commonly experience multisystem involvement, which is linked to increased healthcare resource utilization (HCRU) and a higher risk of exacerbations.[39–41] However, despite the high burden of comorbidities,[39–41] they often remain underdiagnosed and undertreated due to the lack of a standardized protocol for their determination, challenges in differentiating comorbidities from severe COPD, and the absence of clear guidelines on the treatment of patients with COPD and comorbidities.[42,43] For instance, although anxiety and depression are remarkably common in patients with COPD, optimal approaches for managing these psychological conditions are not clearly defined in treatment recommendations.[44] Therefore, the GOLD strategy document recommends that coexisting conditions, including mental health disorders, should be actively sought and treated appropriately when present, without altering COPD treatment plans.[4] To further improve prognosis and COPD-related outcomes, an integrated care approach involving a holistic approach to patient care[45,46] is increasingly being adopted by healthcare systems.[47,48] The World Health Organization (WHO) defines integrated care as a "concept bringing together inputs, delivery, management, and organization of services related to diagnosis, treatment, care, rehabilitation, and health promotion".[49] The use of an integrated care intervention, involving standardized shared-care arrangements between HCPs and hospitals, can generate synergies among different levels of healthcare systems, leading to a reduction in COPD-related hospitalizations[50] and improvement in health-related QoL.[51]

Failure to Ensure Consistent Delivery of Post-Discharge Care and Reduce the Risk of Recurrent COPD Exacerbations and Readmission for Any Cause

Recovery from a COPD exacerbation may be delayed in some patients, the consequences of which include poorer health status, an increased risk of a subsequent exacerbation and cardiovascular events, and prolonged duration of symptoms.[11,12,52] Consequently, preventing the development of subsequent exacerbations and recovering baseline respiratory function by maximizing pharmacological and non-pharmacological treatments to resume daily activities represent key opportunities.

Post-exacerbation pulmonary rehabilitation is now a recommended approach for COPD management and has been shown to reduce hospital readmissions when delivered within 3 weeks after discharge.[53] However, despite substantial evidence that this intervention improves COPD-related outcomes,[54,55] its uptake in clinical practice has been low.[56] Indeed, results of an audit conducted in an acute-care hospital setting in London (UK) in 448 patients discharged following an exacerbation revealed that <10% received and completed pulmonary rehabilitation.[56] Such poor referral and uptake rates for pulmonary rehabilitation in the post-discharge setting may be attributable to a number of factors, including a lack of awareness of its clinical benefits, limited knowledge of local providers, consultation time constraints, absence from service commissioning, the challenge of managing a variable workload, presumed low patient motivation,[57] and limited access to pulmonary rehabilitation services in LMICs.[58] Additionally, even patients discharged directly from the ED, who are at a significantly greater risk of readmission than those discharged from hospital, frequently do not receive appropriate referral to pulmonary rehabilitation services,[59] underscoring the need for a multifaceted approach to increase uptake and referral to pulmonary rehabilitation programs. Furthermore, ensuring continuity of COPD care through prompt and regularly scheduled follow-up visits, an essential requirement to prevent COPD exacerbations and improve health status and QoL, remains a major concern.[60–62] Other areas of concern include limited understanding of factors associated with an increased risk of recurrent exacerbations, the availability of timely specialist follow-up appointments, poor patient literacy, suboptimal medication adherence, and a lack of access to affordable medications.[60,63,64]

Lack of Efficiently Functioning Healthcare Systems

Suboptimal delivery of recommended COPD-related care remains common globally,[65,66] particularly in LMICs, where underdiagnosis, limited access to specialist care and affordable inhaled medications, inadequate provision of non-pharmacological interventions, and a lack of emphasis on the prevention of future exacerbations remain common.[34,67,68] Notably, even in countries where maintenance medications are available and reasonably priced, their

use is often restricted to specialist centers,[69] prompting the use of reliever medications instead. Therefore, there remains a continued need to focus on the prompt optimization of both pharmacological and non-pharmacological treatments, align clinical practices with the latest evidence-based recommendations, improve access to affordable inhaled medications, and ensure a multidisciplinary approach to disease management involving primary care clinicians, specialists, and allied HCPs. However, the implementation of treatment guidelines in clinical practice may be hindered by a number of hurdles that impede the efficient functioning of healthcare systems, including heavy clinician workloads, inadequate delivery of HCP education and training programs, crowded hospitals, and insufficient time for healthcare professionals to conduct thorough patient reviews.[70–74]

As a result, the use of disease management programs (DMPs) has gained in popularity as a means of improving the quality and efficiency of care for patients with chronic conditions, with a focus on the effective use of available resources.[75,76] Indeed, a range of interventions, including patient education, reminders and financial incentives, and HCP education, and feedback have all been associated with significant improvements in patient disease control and HCP adherence to guidelines.[75] Moreover, the delivery of integrated care through DMPs ensures better continuity of patient care and mitigates the impact of chronic diseases, leading to improved health outcomes.[76] Notably, participation in a COPD DMP in Singapore was associated with lower all-cause mortality compared with controls not included in the program.[77]

Another approach aimed at improving quality of care involves the use of the pay-for-performance (P4P) programs that are designed to reward adherence to clinical guidelines and positively influence HCP behavior by utilizing financial incentives to improve outcomes based on the achievement of pre-specified performance targets.[78,79] In Taiwan, P4P programs were implemented in 2002 by the National Health Insurance Administration (NHIA) with the aim of improving healthcare services by compensating HCPs based on performance targets.[80,81] An evaluation of the effectiveness of a COPD P4P program in Taiwan reported a significant reduction in COPD exacerbations, including COPD-related ED visits and hospitalizations 1 year after enrollment.[82] Moreover, recent data from Taiwan have demonstrated that integrated disease management, implemented as part of the P4P program, was associated with continued improvement in the health status of patients with COPD, particularly those with a high symptom burden (COPD Assessment Test scores ≥10).[83] Notably, while these programs have been successfully implemented in Taiwan, demonstrating improvement in patient outcomes and quality of care through a reduction in mortality rates and improved adherence to guideline-based recommendations, resulting in long-term cost benefits,[82,84–87] findings from other countries have reported inconsistent improvements in quality of care.[88–90]

The Discharge Protocol/Guideline Following a COPD Exacerbation

Key recommendations for discharging patients with COPD from the hospital/ED following an exacerbation could be delivered as part of a discharge bundle and are summarized in Figure 2 and Supplementary Table 2.

The objectives of this protocol are to (i) identify the risk of readmission and optimize the maintenance treatment plan; (ii) deliver prompt, high-quality holistic care following discharge from hospital or the ED; and (iii) ensure optimal care by a specialist HCP through personalization of the discharge bundle. This protocol is intended for a multi-disciplinary team of HCPs, including ED doctors, primary care practitioners, pulmonologists, and pharmacists, and could be delivered as a component of a DMP, with case managers and clinicians collaborating to provide coordinated care. Moreover, these recommendations are aimed at guiding HCPs and stakeholders, even those without specialist knowledge in chronic disease care, in LMICs to redirect the resource allocation towards improving patient care and enhance the overall QoL following discharge.

Objective: Ensure Prompt Diagnosis, Identify the Risk of Readmission, and Optimize the Maintenance Treatment Plan

Step 1: Confirm COPD Diagnosis and Identify Both Comorbidities and Patients at High Risk of Readmission

Over one-third of patients hospitalized for an acute exacerbation are not previously diagnosed with COPD and, therefore, remain untreated.[91] This represents a missed opportunity for early diagnosis and preventing significant disease

progression; therefore, ensuring a prompt and accurate diagnosis is crucial. Since symptoms of exacerbations, such as dyspnea and productive cough, are non-specific, clinicians should consider differential diagnosis, particularly pneumonia, congestive heart failure, and pulmonary embolism.[4]

While spirometry provides an objective assessment of airflow limitation and is essential for confirming a COPD diagnosis, it is not routinely recommended in patients with exacerbations.[4] Since spirometry remains underutilized in clinical practice,[92] many patients hospitalized for a COPD exacerbation may not have a documented diagnosis of COPD.[93] Therefore, spirometry may play an important role in eliminating diagnostic uncertainty prior to discharge and identifying patients admitted with suspected COPD exacerbation who have no prior spirometric documentation.[94,95] Indeed, real-world evidence suggests that pre-discharge spirometry can be performed reliably to confirm a diagnosis of COPD and serves as a predictor of subsequent airflow limitation.[94,95] These data suggest that spirometry, when available, could be performed before discharge.

Given the impact of exacerbations on both COPD progression[3] and healthcare costs and HCRU,[2] it is also essential to identify factors associated with hospital readmission to reduce the risk of future events and identify patients who may require additional support following discharge. Such risk factors include a history of previous exacerbations;[14] frequent productive cough;[96] severity of dyspnea (Medical Research Council grade >3);[97] older age; length of hospital stay; male sex; insurance type; type of hospital;[98–100] comorbidities,[101] including depression and anxiety;[102] lower physical activity;[103] and suboptimal peak inspiratory flow rate.[104] As a severe exacerbation requiring hospitalization is associated with a higher risk of mortality during both hospitalization and the time period following discharge,[7] it is important to identify factors associated with poor outcomes and an increased risk of mortality (Figure 2 and Supplementary Table 2), so that the therapeutic strategy may be optimized accordingly.

Step 2: Optimize the Pharmacological Treatment Plan to Ensure That Patients Receive Combination Long-Acting Bronchodilator Maintenance Therapy, with or without Inhaled Corticosteroid (ICS)

Prior to discharge, the treatment plan should be reevaluated, with the goal of ensuring that patients receive appropriate maintenance treatment, involving combination long-acting bronchodilator therapy, based on an individualized assessment of their symptoms and exacerbation risk.[4,33] The GOLD 2024 guidelines recommend that patients with high symptom and/or exacerbation burden should receive dual bronchodilator combinations of a long-acting β_2-agonist (LABA) and a long-acting muscarinic antagonist (LAMA). ICS should be added for patients who have blood eosinophil counts ≥300 cells/μL or those who experience further exacerbations on LABA+LAMA therapy and have blood eosinophil counts ≥100 cells/μL (Supplementary Table 2).[4]

The GOLD 2024 recommendations emphasize reducing mortality as a key treatment goal for COPD. Evidence from two large randomized controlled trials (RCTs), IMPACT[105] and ETHOS,[106] have demonstrated that treatment with fixed-dose triple therapy combination reduces both exacerbations and all-cause mortality vs dual bronchodilator therapy. These findings support timely addition of ICS to dual bronchodilator therapy for eligible patients (based on blood eosinophil counts described above) to reduce moderate or severe exacerbations and prevent hospitalization.[105,106] Indeed, real-world evidence from retrospective studies show that prompt initiation of triple therapy, within 30 days following an exacerbation, is associated with a reduction in subsequent exacerbations and cardiopulmonary events, fewer hospital readmissions, and reduced HCRU costs compared with delayed initiation.[107–109]

Objective: Ensure Consistent Delivery of Holistic Care Following Discharge from Hospital or the ED

Step 3: Provide Non-Pharmacological Treatment

Patients should be given access to cost-effective non-pharmacological interventions, consistent with clinical guidelines.[4] Such evidence-based non-pharmacological interventions have been shown to relieve dyspnea and fatigue, prevent exacerbations,[110] and improve exercise capacity and health-related QoL in patients with COPD.[111] Non-pharmacological treatments complement pharmacological interventions and have evolved as a core component of COPD management,[4] particularly for patients with severe or very severe disease who experience a decline in function and QoL.[112] Crucially, pulmonary rehabilitation programs also promote adherence to health-enhancing behaviors, taking into consideration the complex nature of COPD and its multisystem involvement; patients' individual needs, including

the severity and complexity of the disease; and any comorbid conditions.[4,113] While telerehabilitation of patients with COPD offers a safe and effective approach to improve functional exercise capacity and QoL comparable to conventional center-based rehabilitation programs, a standardized approach for integration in clinical practice is currently lacking.[114] Nevertheless, telerehabilitation can help ensure the inclusion of patients who may have difficulty accessing traditional center-based rehabilitation programs,[114] thereby having important implications for the delivery of patient-centered care, particularly for resource-constrained settings.

Since smoking cessation can significantly alter the course of COPD, clinicians should create personalized health strategies to help patients quit smoking, thereby lowering their exacerbation risk.[4] Patients with COPD should also receive all recommended vaccinations, including those for influenza, coronavirus disease, *Pneumococcus, Bordetella pertussis*, shingles, and respiratory syncytial virus, in accordance with current evidence-based recommendations,[4] as these have been shown to reduce the risk of exacerbations and subsequent hospitalization.[115,116]

Step 4: Ensure Recovery to Clinical Stability

Clinicians should conduct a thorough review of clinical and laboratory data to establish that the patient is well enough to be discharged and confirm that all clinical/investigational abnormalities have been identified and acted on. To improve the overall discharge process from hospital or the ED, health plans should be tailored to include an assessment of symptoms and lung function to ensure patients return to a stable clinical state following discharge.[33] This review would be conducted by the clinician in charge of the first outpatient consultation post-discharge.

Oxygen therapy represents a key component in the hospital treatment of exacerbations and should aim for a target oxygen saturation of 88–92% to improve hypoxemia.[4,117] Pulse oximetry can be performed to diagnose hypoxemia (oxygen saturation of 88–92%) and evaluate the need for supplemental oxygen therapy on discharge, with follow-up assessment in stable state to decide on chronic oxygen supplementation or signs of respiratory failure at the point of care; however, oximeters may not offer high accuracy.[4,118,119] Therefore, if peripheral arterial oxygen saturation is ≤92%, direct arterial blood gas measurement may be performed in patients suspected of chronic hypoxemia.[119]

Step 5: Schedule Follow-up Appointments and Ensure Appropriate Patient Referral to a Specialist HCP

Since COPD exacerbations frequently occur during a period of elevated risk for subsequent occurrences following the initial exacerbation,[13] HCPs have a window of opportunity to optimize preventive measures. However, medical evaluations of patients with COPD continue to fall short of the recommended standard, with only one-third of patients attending regular follow-up visits after an exacerbation.[60] A lack of follow-up visits following hospital discharge for a COPD exacerbation is associated with early readmission.[101] Therefore, to ensure continuity of care after discharge, identifying the factors associated with a lower likelihood of outpatient follow-up—longer length of hospital stay, prior hospitalization for COPD, older age, race/ethnicity, lower socioeconomic status, and ED admission—is essential.[120] Currently, GOLD recommends early follow-up within 1–4 weeks to determine patients' ability to cope with their usual environment, with an additional follow-up at 12–16 weeks to ensure return to a stable clinical state.[4] The importance of patient follow-up is also recognized by the UK National Institute for Health and Care Excellence, which recommends that clinicians should phone/visit patients at risk of readmission 24–72 hours after discharge.[121] Indeed, findings from a RCT involving 4140 patients admitted for an acute COPD exacerbation in hospitals across Canada demonstrated that contacting patients within 72 hours after discharge was associated with a reduction in readmission rates.[122] Therefore, if feasible, patients should be contacted within 72 hours following discharge from hospital or the ED. Telephone follow-up after hospital discharge for a COPD exacerbation has also been shown to improve patient satisfaction and compliance and reduce readmission rates.[123] Additionally, it has been reported that a pharmacist-led telephone follow-up following hospital discharge can reduce readmission rates and healthcare costs and positively impact patient beliefs about medications.[124] Although follow-up with a primary care clinician or pulmonologist within 30 days of a COPD exacerbation has been shown to lower the rates of ED visits and readmissions,[120] follow-up within 7 days provides the greatest benefit among patients with multiple comorbidities (high-risk patients)[125] and should be considered as the gold standard for delivering post-discharge care. However, current evidence that follow-up within 7 days and within 30 days of

discharge from hospital is associated with a reduced risk of readmission and mortality remains weak, compared with usual care.[126]

Given that access to healthcare services may be limited in certain circumstances, such as the COVID-19 pandemic, telehealth may be utilized to monitor patients remotely.[127] During such health emergencies, telehealth may offer continuity of care,[128] with the potential to reduce readmissions[129] following discharge from hospital/ED. Results from an RCT involving 116 patients hospitalized for a COPD exacerbation have shown that follow-ups using telehealth reduced HCRU and provided the additional benefit of optimizing the use of healthcare resources.[130] However, the quality of economic evidence demonstrating the cost-effectiveness of telehealth for patients with COPD remains poor,[131] emphasizing the need for further research in this area.

To further improve transitional care and patient outcomes, an interdisciplinary approach, driven by policies and best practices, should be adopted.[132,133] This approach is particularly relevant for hospitalized patients who exhibit complex multidimensional clinical COPD phenotypes[134] and a range of comorbidities[125] and may benefit from follow-up by a multidisciplinary team if required. If appropriate, patients should also be referred to a specialist HCP for further optimization of the treatment plan (See Step 7).

Step 6: Provide a Discharge Action Plan and Develop Patient/Caregiver Education Plans, Including Correct Inhaler Use

Inadequate communication and information transfer during hospital discharge are common occurrences that can have a detrimental impact on patient care.[135] Therefore, clear communication and ensuring patient and/or caregiver comprehension of discharge instructions are essential for optimizing treatment outcomes.[21,136] To this end, personally tailored action plans, which are structured, multicomponent, and personalized tools,[137] are an integral part of COPD self-management interventions, particularly after discharge, to support recovery and reduce unnecessary hospital readmissions.[138] COPD action plans promote prompt intervention during exacerbations by outlining steps that patients can take on their own to better manage their condition.[139] Indeed, results from multiple Cochrane systematic reviews have concluded that the use of COPD exacerbation action plans is associated with a reduction in in-hospital healthcare utilization, a lower probability of respiratory-related hospitalizations, and improvements in health-related QoL.[139,140] Effective use of tailored action plans also enables patients to monitor daily variations in symptoms and take appropriate action or contact their HCP as required.[141]

Despite the high burden and morbidity associated with COPD,[4] patients often have a poor understanding of their condition,[142] resulting in underreporting of exacerbations and subsequent delays in hospitalization and overall recovery.[143,144] In addition, many patients have poor knowledge of COPD and its etiology and are unaware that smoking and other respiratory exposures are a leading cause of the disease, unless specifically informed at the time of their diagnosis.[4,145] Consequently, a written action plan should be discussed and provided at the time of discharge, with its importance clearly communicated to patients and caregivers/family members. Crucially, action plans should be reviewed and updated at each follow-up visit as required,[4] with information provided on smoking cessation; control of breathlessness; nutrition; physical exercise; clearance of mucus from the lungs; inhaled medications, including the difference between maintenance and reliever medications; inhaler devices; inhalation techniques; importance of regular follow-up visits; and when to seek medical advice.[4,139,146] Action plans are available from the COPD Foundation,[147] the American Lung Association,[148] the Lung Foundation Australia,[149] and Asthma+Lung UK.[150]

Prior to discharge, patients and/or caregivers should also be provided with relevant information and education on the importance of adherence to prescribed treatment regimens, the correct use of maintenance and rescue/reliever medications, identifying exacerbation symptoms, and receive advice on avoiding triggers.[4,151,152] Additionally, it should be ensured that patients have the initial supply of inhaled medications and have been evaluated with the inhaler technique using the "teach-back" method.[4] The WHO has outlined a package of essential cost-effective interventions, including patient counseling, that can be administered to patients with COPD, even in low-resource settings.[152] This package provides guidelines and resources to improve the coverage of appropriate services for patients with non-communicable diseases, including COPD, within primary healthcare settings.[152]

Objective: Ensure Delivery of Care by a Specialist HCP Through Personalization of the Treatment Plan

Step 7: Individualize the Treatment Plan

To provide essential components of care and improve patient outcomes, evidence-based interventions, including the aforementioned pharmacological and non-pharmacological interventions,[4] should be administered through the adoption of discharge care bundles. Although the implementation of discharge care bundles may present some challenges,[153] with some studies reporting that their use did not reduce readmission rates or short-term mortality,[32,89] benefits have been observed in terms of a decrease in hospital health service utilization and hospital admissions on a longer period of follow-up beyond 30 days.[154] However, the simple existence of care bundles will be insufficient to drive improvements in clinical endpoints, unless it is successfully personalized (adapted) and effectively implemented.[155,156]

A notable drawback of discharge bundles has been the inconsistency in the extent of implementation.[33] Therefore, to enhance their effectiveness and elevate the quality of care, discharge care bundles should be designed with a thoughtful selection of individual components customized to meet the unique needs of patients.[157]

Importantly, the active involvement of all healthcare staff in the design and implementation of discharge care bundles is vital to ensure that the changes introduced are understood and the process followed.[158] Individually tailored interventions may be added to the discharge bundle by a specialist HCP; this should include spirometric evaluation and a detailed assessment of biomarkers, including phenotypic characterization, to further elucidate the pathogenic processes and pharmacological responses to therapeutic interventions.[4,159] A tailored approach to treatment optimization based on the level of symptoms and risk of exacerbations is recommended,[4] involving the identification of treatable traits. This approach represents a new paradigm for the management of airway diseases, whereby patients are individually treated for a specified set of problems, which may be pulmonary (eg, airflow limitation), extrapulmonary (eg, obstructive sleep apnea), or behavioral (eg, poor treatment adherence); subsequently, a broader approach for disease management is adopted.[160,161]

The Path Forward

To address recognized deficiencies in evidence-based recommendations and clinical practice, it is crucial to effectively develop and implement guidelines by engaging all stakeholders, including patients. This will ensure that hospital discharge recommendations lead to tangible shifts in clinical practice and advancements in public health. A recent review on COPD hospital discharge protocols also proposed the need for treatment optimization, pulmonary rehabilitation, and continuity of care such as the provision of a self-management plan, and emphasized the importance of proper implementation strategies to ensure that hospital discharge bundles are more effectively delivered to improve patient outcomes and reduce COPD readmission rates.[33] Approaches to achieving these key goals are summarized below.

Ensuring Effective Implementation

Promoting Dissemination and Awareness of Guidelines

Despite the availability of discharge recommendations for COPD exacerbations,[4,16] their global dissemination and integration into routine clinical practice remain poor,[18–20] particularly in LMICs.[34,74] Therefore, strategies for successful guideline implementation should include the following elements: dissemination, education and training, social interaction (including outreach and awareness campaigns), and decision support systems.[70] Prior analysis of the barriers to guideline implementation is necessary to tailor strategies to local healthcare settings, thereby fostering positive behavioral change.[70] As such, national thought leaders will need to drive COPD awareness and implementation programs, akin to the national action plans developed in Turkey,[162] by working with international and/or regional scientific societies.

In Turkey, the national action plan for managing non-communicable diseases, which includes dissemination of COPD guidelines, was implemented through collaboration with the Global Alliance against Chronic Respiratory Diseases (GARD),[162] a voluntary alliance of national and international organizations committed to reducing the global burden of respiratory diseases.[163] Thus, a collaborative network of international experts, national leaders, and international/regional scientific societies, including those in LMICs, represents an effective approach to prioritize and track the

implementation of this proposed protocol/guideline. To encourage widespread uptake by HCPs, roundtable discussions should be initiated to engage patient advocacy groups, primary care clinicians, pulmonologists, and other specialists, so that this protocol/guideline may be adapted to local healthcare settings.

Simplifying the Language of Guidelines and Standardizing the Definition of Exacerbations

Guideline uptake at the national and regional levels may be influenced by several factors, including effective communication of the content.[164] As such, optimizing the format and using simple, clear, and persuasive language in guideline development are essential to increase understanding and enhance retention.[164,165] In addition, the use of a standardized definition of an exacerbation is required to facilitate the assessment of therapeutic approaches and ensure an accurate differential diagnosis.[166–168] However, the commonly used definition relies exclusively on a patient's subjective perception of increased respiratory symptoms,[4] which varies from patient to patient and may overlap with other conditions,[166] making a differential diagnosis more challenging. Moreover, this definition does not include information about disease etiology and markers, with the severity of the exacerbation being determined after the event by an HCP. Such subjectivity introduces variability due to differences between clinicians and healthcare systems.[166] The Rome Proposal suggests that the use of easily measurable clinical variables at the point of care can assist in determining the severity of exacerbations.[166] This objective tool has been adopted by the GOLD recommendations[4] and has been validated in two recent real-world studies, demonstrating effectiveness in assessing the prognosis of patients with acute COPD exacerbations.[169,170]

Effective disease management also hinges on mutual understanding and good communication between the HCP and the patient, including a shared understanding of the terminologies used during consultations.[171] Of note, results from a multinational, cross-sectional study in France, Germany, Spain, Sweden, and the UK reported that only 1.6% of patients understood the term "exacerbation".[168] This study also reported that the term "exacerbation" was not routinely used or understood by patients, who preferred the use of simpler terms, such as "crisis", "chest infection", or "lung attack".[168] Such findings further underscore the need for a standardized definition of an exacerbation that can be easily comprehended by patients.[168] In addition to improving HCP-patient communication, there is a need to raise patient awareness about the significant impact, especially the psychological effects, of exacerbations.[168]

Conducting Feasibility and Pilot Studies

Effective integration of evidence-based recommendations into routine clinical practice requires coordinated efforts so that interventions may translate into improved patient outcomes.[172] This is particularly important given that many healthcare systems function under resource-constrained conditions.[172] Furthermore, limited understanding of the clinical applicability of interventions represents a barrier to guideline implementation.[70] Therefore, conducting feasibility and pilot quality improvement initiatives can provide valuable insights into the uptake of a guideline within organizations or healthcare settings by addressing uncertainties around the design and methods and determining the support needed to ensure successful integration.[173] Implementing the proposed discharge protocol/guideline as part of a quality improvement initiative at a pilot site may offer valuable insights into the barriers and facilitators affecting its successful integration into clinical practice. These learnings could inform further iterations before its implementation in other healthcare settings.

Improving COPD-Related Awareness

Although building a framework to ensure implementation using the aforementioned approaches is crucial to effective guideline/protocol implementation, poor disease awareness may hinder uptake at both the national and local levels. A lack of disease awareness is associated with poor COPD-related outcomes and impacts how patients perceive and manage their condition.[174] Consequently, raising disease awareness plays a pivotal role in promoting the early diagnosis of COPD and encouraging health-seeking behavior among patients.[174,175] Nevertheless, even as the prevalence of COPD continues to rise,[176] awareness about this debilitating condition remains poor among both patients and HCPs.[145,177] Indeed, results from a 2019 study that assessed public interest in COPD through an analysis of web queries via Google revealed that the condition is highly under-represented in comparison to its global prevalence and burden.[178] Additionally, primary care clinicians frequently misdiagnose COPD, a finding that

has been attributable to a lack of disease-related knowledge,[145,179] which negatively impacts patient outcomes.[180] Thus, there is an urgent need to raise the awareness of COPD by involving all stakeholders, including patient advocacy groups, the healthcare community, global and regional scientific organizations, and the pharmaceutical industry.

Engaging Stakeholders

To ensure that treatment guidelines positively influence clinical practice and public health, all stakeholders, including HCPs, policymakers, industry partners, pharmacists, patient groups, and scientific societies, will need to collaborate to build a framework for guideline implementation and address gaps in COPD care. This collaborative effort should encompass strategies for change management, customization of guidelines to fit local contexts, the development of concise and accessible versions of guidelines tailored to different healthcare settings, planning for feasibility studies and pilot programs to better understand the challenges and facilitators of guideline implementation, ongoing monitoring of progress through the identification of key performance indicators, and ensuring HCPs have adequate support, knowledge, and skills to implement the guideline. Finally, HCPs will need to proactively engage with policymakers to understand the economic motives for implementing the protocol/guideline so that uptake may be prioritized and policies tailored, as per local requirements. For instance, in smaller centers with scarce resources, certain steps such as optimizing the pharmacological treatment plan to ensure that patients receive combination of long-acting bronchodilator maintenance therapy, with or without ICS may need to be prioritized over others (such as, ensuring delivery of care by a specialist HCP through personalization of the treatment plan).

Conclusion

This international group of pulmonologists from a variety of settings, including LMICs, characterized gaps in disease management following COPD exacerbations and proposed a protocol/guideline to improve discharge-related care. Application and integration of this protocol/guideline into routine clinical practice can facilitate the delivery of evidence-based care, thereby improving COPD-related outcomes. To ensure successful implementation, the discharge protocol should be customized to account for local factors and, ideally, align with financial and personnel resources. This will require effective leadership, planning, management of resources, and collaboration among all stakeholders, to build a supportive climate that facilitates the implementation of and adherence to best practice care following COPD exacerbations. Ultimately, this strategy can ensure that hospital discharge recommendations lead to improvements in COPD care and public health.

Abbreviations

BTS, British Thoracic Society; COPD, chronic obstructive pulmonary disease; DMP, disease management program; ED, emergency department; GARD, Global Alliance against Chronic Respiratory Diseases; GOLD, Global Initiative for Chronic Obstructive Lung Disease; HCP, healthcare practitioner; HCRU, healthcare utilization; ICS, inhaled corticosteroid; LABA, long-acting β_2-agonist; LAMA, long-acting muscarinic antagonist; LMIC, low- and middle-income country; NHIA, National Health Insurance Administration; P4P pay for performance; QoL, quality of life; RCT, randomized controlled trial; UK, United Kingdom, US, United States; WHO, World Health Organization.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas. All authors took part in drafting,

revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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