

ORIGINAL ARTICLE

Level of adherence to the GOLD strategy document for management of patients admitted to hospital with an acute exacerbation of COPD

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ABSTRACT

Background and objective: The Global initiative for chronic Obstructive Lung Disease (GOLD) strategy document has been available since 2001. Little is known about level of adherence to the GOLD document among hospital-based health professionals assessing and managing inpatients admitted with an acute exacerbation of chronic obstructive pulmonary disease (AECOPD). The primary aim of the study was to evaluate the level of adherence among health professionals to GOLD.

Methods: A retrospective audit of medical histories was completed on a random sample of 240 patients admitted to hospital with a primary diagnosis of AECOPD within a calendar year. The audit evaluated adherence to GOLD recommendations on appropriateness of hospital and intensive care unit admissions as well as pharmacological and non-pharmacological management.

Results: High levels of adherence to indications for hospital admissions (97%), indications for intensive care unit admissions (100%) and prescription of bronchodilators (100%) were observed. However, antibiotics (45%) and oxygen therapy (68%) were over-prescribed. Adherence to non-pharmacological management was poor in areas such as smoking cessation (25%) and pulmonary rehabilitation referrals (16%). Patients admitted under the care of the respiratory team were more likely (odds ratio = 2.6, 95% confidence interval: 1.3–5.4) to be referred to pulmonary rehabilitation than patients admitted under the general medicine team.

Conclusions: Health professionals in the respiratory team had better adherence to GOLD as compared to health professionals in other teams. Nonetheless, pharmacological interventions were both appropriately prescribed and also over-prescribed, whereas non-pharmacological interventions were used rarely, suggesting a need for practice review in these areas.

SUMMARY AT A GLANCE

This study evaluated the level of adherence to the GOLD document among health professionals treating inpatients with an acute exacerbation of COPD. Pharmacological interventions were both prescribed appropriately and also over-prescribed, whereas non-pharmacological interventions were rarely recommended, suggesting a need to review practice in these areas.

Key words: acute disease, chronic obstructive, guideline adherence, inpatient, pulmonary disease.

Abbreviations: AECOPD, acute exacerbation of chronic obstructive pulmonary disease; CI, confidence interval; COPD, chronic obstructive pulmonary disease; ED, emergency department; GOLD, Global initiative for chronic Obstructive Lung Disease; ICU, intensive care unit; LABA, long-acting beta agonist; OR, odds ratio; SABA, short-acting beta agonist; SD, standard deviation.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a major cause of hospital admissions and the fifth most common cause of death in Australia.¹ Clinical practice guidelines aim to aid health professionals in their assessment and management of patients with COPD to improve patient outcomes and reduce costs of health care.²

The Global initiative for chronic Obstructive Lung Disease (GOLD) strategy document is widely used internationally by health professionals.^{3–5} Adherence to the pharmacological management recommended in the GOLD document has been shown to improve patient outcomes and reduce health-care costs.⁶ However, little is known about level of adherence to the GOLD document among hospital-based health professionals assessing and managing inpatients with an acute exacerbation of COPD (AECOPD).

Health professionals in hospitals tend to assess and manage patients with higher acuity compared to

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professionals in primary care and may have a different level of adherence to the GOLD document when managing an AECOPD. Furthermore, the GOLD document has different recommendations for AECOPD versus stable disease.⁴ As AECOPD is the second leading cause of hospital admission in Australia,⁷ it is important to evaluate adherence to the GOLD document among health professionals in hospitals in order to identify any areas for potential improvement of care. An additional factor to consider is whether there are differences in the level of adherence to the GOLD document for patients with an AECOPD admitted under different consulting teams.

The primary aim of this study was to investigate the level of adherence to the GOLD document for the assessment and management of inpatients with AECOPD.⁴ The secondary aim was to investigate if there were any differences between admitting medical teams in assessment and management of patients admitted to hospital with AECOPD.

METHODS

A retrospective audit was undertaken of patients admitted to two Australian metropolitan hospitals with a primary diagnosis of AECOPD. In the absence of a set of agreed standards for assessing and treating patients with an AECOPD across the hospitals, the internationally recognized 2011 GOLD document was used as the standard of measure in this audit.⁴

Audit tool development

A team including a respiratory physician and respiratory physiotherapists customized an audit tool for the purposes of this study. The tool was a 49-item 'yes/no/not applicable' question series used in conjunction with a data collection form and a list of explanatory criteria. A copy of the audit tool has been included as an online supporting document (Appendix S1). A 'yes' was applied if the documentation by any member within the multidisciplinary team fulfilled the criterion. The tool evaluated level of adherence among health professionals in four key areas: (i) assessment of need for hospital admission and (ii) intensive care admission, (iii) pharmacological and (iv) non-pharmacological management. All data were collected through audit of medical records and were completed by respiratory physiotherapists from June to December 2012. All physiotherapists received training on the audit tool and a trial audit was completed to ensure consistency in the team. A respiratory physician oversaw the data collection process.

Participants

A total of 405 patients were admitted from January to December 2011 with the relevant discharge diagnosis codes (DRG E65B and E65A). A web-based programme (<http://www.randomizer.org/>) was then used to randomly identify the 240 patients that were required for the audit in order to achieve a 5% margin of error in the results.⁸ COPD patients who were diag-

nosed with a primary diagnosis of pneumonia were excluded. Only the first admission for each patient within the calendar year was audited. This study received full ethics approval from the ethics committees of Western Health (QA2012.37) and La Trobe University (FHEC12/120).

Data analysis

Data were categorized according to the treating team: respiratory, general medicine or Emergency Department (ED). There were no hospital-specific protocols to determine admitting team for patients. A hospital admission was considered appropriate when the patient met at least one of the eight possible admission indicators in GOLD. An intensive care admission was considered appropriate when the patient met one out of the five potential admission indicators. The level of adherence to the GOLD document for each of the four key areas was expressed as the percentage of patients who fulfilled the recommendation. Non-adherence to medication prescriptions was expressed as the percentage of patients who were prescribed medication despite not meeting the recommendations. Comparisons between treating teams were analysed with analysis of variance, chi-square analysis and odds ratios (ORs), as appropriate.

RESULTS

Of the 240 patients, 125 were admitted under the general medicine team, 93 under the respiratory team, and 22 under the ED team. Two patients from the general medicine team and three from the respiratory team were admitted into the intensive care unit (ICU) at time of hospital admission prior to admission to their respective teams.

Demographic characteristics of patient population

The mean age of patients was 72.4 years (standard deviation (SD) 10.6), with a higher proportion of men (63%) (Table 1). Only 40% of patients had pulmonary function tests accessible on file, of whom, 85% (83/98) were classified as having moderate to severe airflow limitation according to GOLD criteria.⁴ Eighty-three (35%) patients were current smokers. The median length of hospital stay was 5 (range 1–48) days, with most patients (93%) discharged to their usual residence.

Patients admitted under the general medicine team were significantly older than those in the respiratory team by 7.8 years (95% confidence interval (CI): 4.7–11.1) (Table 1). There was a greater proportion of patients in the respiratory team who had an outpatient respiratory physician consultation prior to admission (62%) as compared to patients in the general medicine (22%) and ED teams (9%) ($X^2(2) = 46.1, P < 0.01$) (Table 1).

Level of adherence to hospital and ICU admissions

Of the 240 admitted patients, 232 (97%) met at least one admission indicator. The presence of increased

Table 1 Admission characteristics of patients admitted with AECOPD

Admission team	Overall (n = 240)	General medicine (n = 125)	Respiratory (n = 93)	Emergency department (ED) (n = 22)
Age (SD, 95% CI)	72.4 (10.6, 71.0–73.7)*	75.8 (9.5, 74.1–77.4)	68.4 (10.2, 65.7–70.1)	71.9 (9.1, 67.8–75.9)
Gender (M/F (%))	150/90 (63/38)	78/47 (63/38)	57/36 (61/39)	15/7 (68/32)
Severity of COPD (n (%))				
Mild	9 (4)	7 (6)	4 (4)	0 (0)
Moderate	37 (15)	18 (14)	16 (17)	3 (14)
Severe	43 (18)	13 (10)	29 (31)	1 (5)
Very severe	7 (3)	2 (2)	5 (6)	0(0)
No record	142 (59)*	85 (68)	39 (42)	18 (82)
Smoking status (n (%))				
Non smoker	11 (5)	6 (5)	4 (4)	1 (5)
Ex smoker	111(47)	55 (44)	49(53)	7 (32)
Current smoker	83 (35)	45 (36)	32 (34)	6 (32)
No record	35(15)	19 (15)	8 (9)	8 (32)
Home oxygen (n (%))				
No	198 (83)	109 (87)	69 (74)	20 (91)
Continuous	41 (17)	16 (13)	23 (25)	2 (9)
Exertional	1 (0.4)	0 (0)	1 (1)	0 (0)
Out-patient respiratory physician				
Yes/No (%)	153/87 (64/36)*	27/98 (22/78)	58/35 (62/38)	2/20 (9/91)
Physiotherapy referral during admission				
Yes/No (%)	152/88 (63/37)*	87/38 (70/30)	65/28 (70/30)	0/22 (0/100)
Discharge destination (n (%))				
Home	223 (93)	115 (92)	86 (92)	22 (100)
Inpatient rehab	4 (2)	1 (1)	4 (4)	0 (0)
Death	11 (5)	8 (6)	3 (3)	0 (0)
Others	2 (1)	1 (1)	0 (0)	0 (0)
Median length of stay (days (range))	5 (1–48)*	5 (2–23)	6 (2–48)	1 (1–2)

* Denotes significant differences ($P < 0.05$) between three teams (general medicine, respiratory and Emergency Department). AECOPD, acute exacerbation of chronic obstructive pulmonary disease; CI, confidence interval; COPD, chronic obstructive pulmonary disease; ED, Emergency Department; SD, standard deviation.

respiratory symptoms and new physical signs were the admission indicators fulfilled by most patients (Table 2). All five patients admitted to ICU met at least one admission indicator. Three patients who fulfilled the ICU admission criteria were not admitted into ICU as they had a not for resuscitation order.

Pharmacological management

Prescription of medication

Adherence to the GOLD document's recommendations regarding prescription of medications was high for patients requiring them (Table 3). Antibiotics (45%) and oxygen therapy (68%) were over-prescribed to patients who did not require them according to the GOLD document (Table 4). Among the 66 patients who were prescribed antibiotics against the recommendation of the GOLD document, 94% (64/66) of the patients either reported no sputum production (56%) or had no documentation of sputum production (37%). Of the patients who were prescribed

Table 2 Admission indicators met by patients

Admission indicators	% (Number of patients who met admission indicators/total patients)
Marked increased in intensity of symptoms	92 (221/240)
Severe underlying COPD	41 (98/240)
Onset of new physical signs (e.g. cyanosis, peripheral oedema)	68 (162/240)
Failure to respond to initial medical treatment	40 (95/240)
Presence of serious comorbidities	61 (146/240)
Frequent exacerbations	35 (85/240)
Older age	26 (62/240)
Insufficient home support	13 (32/240)

COPD, chronic obstructive pulmonary disease.

Table 3 Adherence to medication prescription as recommended in GOLD document

Type of pharmacological management	Adherence to medication prescription, % (number of patients given medication/total patients requiring medication according to GOLD)				
	Overall (n = 240)	General medicine (n = 125)	Respiratory (n = 93)	ED (n = 22)	Between-teams differences
SABA	93 (224/240)	92 (115/125)	96 (89/93)	91 (20/22)	$\chi^2 = 1.4, P = 0.5$
Short-acting anti-cholinergics	70 (169/240)	74 (92/125)	70 (65/93)	55 (12/22)	$\chi^2 = 3.3, P = 0.2$
Corticosteroids	89 (214/240)	74 (110/125)	74 (86/93)	82(18/22)	$\chi^2 = 2.5, P = 0.3$
Antibiotics	99 (154/156)	100 (81/81)	100 (64/64)	82(9/11)	$\chi^2 = 26.7, P = 0.05$
Oxygen	100 (35/35)	100 (28/28)	100(32/32)	100(4/4)	NA
Non-invasive ventilation	98 (47/48)	93 (13/14)	100 (34/34)	0 (0/0)	$\chi^2 = 2.5, P = 0.1$
Diuretics	98 (83/85)	96 (44/46)	100 (36/36)	100(3/3)	$\chi^2 = 1.7, P = 0.4$
Anticoagulants	99 (139/140)	99 (74/75)	100 (63/63)	100 (2/2)	$\chi^2 = 0.7, P = 0.7$
Beta blockers	100 (6/6)	100 (5/5)	100(1/1)	0 (0/0)	NA

* Between teams $P < 0.05$.

ED, Emergency Department; GOLD, Global initiative for chronic Obstructive Lung Disease; LABA, long-acting beta agonist; NA, not applicable; SABA, short-acting beta agonist.

Table 4 Non-adherence to medication as recommended in GOLD document

Type of pharmacological management	Non-adherence to medication prescription, % (number of patients given medication when not recommended by GOLD/number of patients prescribed with medication)				
	Overall (n = 240)	General medicine (n = 125)	Respiratory (n = 93)	ED (n = 22)	Between-teams differences
SABA	0 (0/224)	0 (0/115)	0 (0/89)	0(0/20)	NA
Short-acting anti-cholinergics	0 (0/169)	0 (0/92)	0 (0/65)	0(0/12)	NA
Corticosteroids	0 (0/214)	0 (0/110)	0 (0/86)	0 (0/18)	NA
Antibiotics	45 (98/218)	31 (36/117)	29 (26/90)	36 (4/11)	$\chi^2 = 0.3, P = 0.9$
Oxygen	68 (131/194)	72 (69/96)	63 (54/86)	67 (8/12)	$\chi^2 = 1.4, P = 0.5$
Non-invasive ventilation	15 (8/53)	25 (4/16)	11 (4/37)	0 (0/0)	$\chi^2 = 1.6, P = 0.2$
Diuretics	11 (11/104)	12 (6/50)	10 (5/51)	0 (0/3)	$\chi^2 = 0.4, P = 0.8$
Anticoagulants	18 (31/172)	17 (15/90)	20 (16/80)	0 (0/2)	$\chi^2 = 1.1, P = 0.6$
Beta blockers	0 (0/6)	0 (0/5)	0 (0/1)	0 (0/0)	NA

* Between teams $P < 0.05$.

ED, Emergency Department; GOLD, Global initiative for chronic Obstructive Lung Disease; LABA, long-acting beta agonist; NA, not applicable; SABA, short-acting beta agonist.

oxygen when it was not clear that they met recommendations for requiring it, 31% (40/131) had oxygen saturations above 88% when breathing room air at time of initial assessment, while the remainder had no record of their oxygen saturations on room air or arterial blood gas results within 30–60 min to support the need for oxygen therapy. There were no significant differences between the teams in terms of percentages of appropriate prescription of medications (Table 3).

Dosage of medication

Overall, there was poor adherence to dosage recommendations for oral prednisone and antibiotics across all groups. Only 8% of patients were prescribed the recommended dosage of 30–40 mg of oral pred-

nisone for the GOLD recommended 10–14 days. Eighty-four patients (39%) were prescribed oral prednisone for less than 10 days, and 105 patients (49%) were prescribed prednisone for longer than 15 days. Fifty-nine per cent of patients received the recommended dose of 5–10 days of antibiotics, while the rest received a longer duration course.

Non-pharmacological management

Level of adherence to the GOLD document in all areas of non-pharmacological management was low across the teams (Table 5). There was no documentation regarding advice given to patients or administration of vaccinations (Table 5). Only 17% (38/229) of patients were referred to pulmonary rehabilitation at time of discharge (Table 5). Twenty-one out of 83

Table 5 Adherence to non-pharmacological management as recommended in GOLD document

Type of non-pharmacological management	Appropriate management, % (Number of patients given management/number of patients requiring management)				Between-teams differences
	Overall (n = 240)	General medicine (n = 125)	Respiratory (n = 93)	ED (n = 22)	
Vaccinations administered/advice for discharge	0 (0/234)	0 (0/119)	0 (0/93)	0 (0/22)	NA
Prescription of nicotine patches to current smokers	25 (21/83)	16 (7/45)	44 (14/32)	0 (0/6)	$\chi^2 = 10.3, P = 0.06$
Referral to smoking cessation	8 (7/83)	7 (3/45)	10 (3/32)	17 (1/6)	$\chi^2 = 0.7, P = 0.7$
Advice given regarding exercise	8 (19/240)	11 (14/125)	5 (5/93)	0 (0/22)	$\chi^2 = 4.9, P = 0.08$
Referral to pulmonary rehabilitation	17 (38/229)	13 (15/117)	26 (23/90)	0 (0/22)	$\chi^2 = 10.8, P = 0.01$
Pulmonary function test at discharge	20 (45/229)	15 (18/117)	29 (26/90)	5 (1/22)	$\chi^2 = 9.4, P = 0.01$
Referral to respiratory outpatient post discharge	38 (87/229)	21 (25/117)	67 (60/90)	9 (2/22)	$\chi^2 = 52.9, P < 0.01$

* Between teams $P < 0.05$.

ED, Emergency Department; GOLD, Global initiative for chronic Obstructive Lung Disease; NA, not applicable.

current smokers (25%) were prescribed freely available nicotine patches, and seven (8%) were referred to smoking cessation programmes or given advice to stop smoking (Table 5).

When comparing level of adherence to non-pharmacological management between admitting teams, the respiratory team had a significantly higher level of adherence in terms of referral to respiratory outpatients, pulmonary rehabilitation and pulmonary function testing at time of discharge compared to the two other teams (Table 5). Health professionals in the respiratory team were more likely (OR = 7.4, 95% CI: 3.9–13.7) to refer to respiratory outpatients and more likely (OR = 2.1, 95% CI: 1.1–4.2) to refer to pulmonary function testing at discharge than the general medicine team. Patients in the respiratory team were also more likely (OR = 2.6, 95% CI: 1.3–5.4) to be referred to pulmonary rehabilitation post-discharge and more likely (OR = 4.1, 95% CI: 1.4–12.0) to be prescribed nicotine patches than patients in the general medicine team.

DISCUSSION

This audit identified gaps among health professionals when treating inpatients admitted with an AECOPD. While the majority of patients were appropriately admitted both into hospital and the ICU, adherence to non-pharmacological interventions was very poor. In addition, pharmacological interventions were appropriately prescribed, and also over-prescribed.

Despite strong evidence supporting the importance of non-pharmacological management in improving mortality rates and quality of life, and reducing both further exacerbations and hospital admissions,^{9–14} adherence among health professionals across the three admitting teams was consistently low. These findings confirm the findings of previous

clinical audits of low levels of adherence for referrals to pulmonary rehabilitation.^{15–21} Factors such as time constraints and lack of awareness about resources may be the reasons for the poor adherence.¹⁹

Time constraint may be the biggest barrier deterring health professionals in acute hospitals from providing non-pharmacological management. It has been cited as one of the barriers in primary care to the provision of smoking cessation advice to COPD patients who continue to smoke.¹⁹ A significant reduction in available hospital beds in Australia during the last decade is likely to have resulted in increased time pressures for hospital-based health professionals, resulting in the provision of brief but potentially suboptimal treatment for patients.²²

A high prevalence of ongoing smoking and low referral rates to both pulmonary rehabilitation and pulmonary function testing on discharge may be a result of health professionals being unfamiliar with availability of local resources despite their availability within the health network.^{15,19} This may also explain why patients in the respiratory team were almost three times as likely to be referred to pulmonary rehabilitation and pulmonary function testing at time of discharge. Health professionals in the respiratory team may be more likely to have specific training, to have greater familiarity with available resources and to be routinely involved in provision of pulmonary rehabilitation programmes as compared to health professionals in the general medicine team.^{18,19}

A lack of advocacy within the clinical setting may also be another explanation for the low level of adherence to non-pharmacological interventions.^{15,16,19} The use of promotion campaigns and advertising in improving adherence among clinicians in the area of smoking cessation counseling suggests that such strategies may be effective in improving adherence to non-pharmacological management.²³

Other ways of improving adherence to non-pharmacological management could include targeted education sessions about guidelines and referral processes for health professionals. In addition, the establishment of larger specialized respiratory units,²⁴ use of interactive educational tools and specific cue cards, the presence of hospital clinical champions,^{25,26} and improved communication between hospitals and primary care practitioners regarding patients who have been recently discharged with an AECOPD may also improve adherence to non-pharmacological management.²⁷

In terms of hospital admissions, the majority of these were deemed appropriate in this audit since the GOLD document does not specify the number of admission indicators that must be met before considering an appropriate hospital admission. While it seems that the indicators for hospital admission across all major guidelines are similar, the number of admission indicators that must be met before considering a hospital admission to be appropriate varies across guidelines.^{2,4,28,29} For example, while the majority of patients met at least one admission indicator based on the GOLD document, only 87% of these hospital admissions would be considered appropriate based on the local COPD-X guidelines, whereby at least two admission indicators are required.² As these guidelines are consensus based, future research efforts should ideally determine which admission criterion or combination of admission criteria can identify patients for whom a hospital admission is mandated.

In terms of pharmacological management, there was a tendency to over-prescribe antibiotics and oxygen therapy. Despite the availability of strong evidence regarding indications for antibiotics, these were over-prescribed to as many as 45% of the patients in this audit.³⁰ It is possible that doctors are prescribing antibiotics to meet the beliefs and expectations of patients even though they might not be clinically indicated.³¹

Another reason for poor adherence in dosage prescription may be that the GOLD document is primarily based on expert panel consensus rather than best available evidence. This means that health professionals may have questioned the recommendations in GOLD and chosen not to adhere. For example, strong recent evidence suggesting outcomes with a shorter course of 5 days of oral prednisone are equivalent to longer courses for patients with an AECOPD was not available at time of writing of the 2011 GOLD document, which recommended 10–15 days of oral prednisone.^{4,32} Hence, a shorter course of oral corticosteroid was considered as not adhering to the recommendations. However, further analysis of our data revealed that about half the patients (49%) were prescribed with oral prednisone for more than 15 days. This is more of a concern as there is strong evidence suggestive of adverse effects with no evidence of better outcomes for longer courses of prednisone in this situation.³³

A strength of this audit was the comprehensive investigation in all areas of recommendations in the GOLD document. This audit aimed to fill in the gaps

of previous audits through investigation of level of adherence in admission indicators and all aspects of pharmacological and non-pharmacological recommendations in GOLD.^{17,18,20,21,34} Our investigation in these areas identified a need to improve delivery of all aspects of non-pharmacological management.

This audit has some limitations. First, the findings from this audit were obtained retrospectively from medical records. Poor documentation especially in areas of non-pharmacological management may have led to a lower level of adherence to the GOLD document in these areas than occurred in practice. Second, audit of two metropolitan hospitals in Melbourne may not be representative of the level of adherence to GOLD throughout Australia. Third, the ambiguity in some of the recommendations in the GOLD document made it difficult to accurately assess the level of adherence in areas of pharmacological management. For example, the GOLD document recommended the use of anticoagulants based on the comorbidities that a patient with an AECOPD may have but did not specify what these comorbidities are. In addition, the document also recommended the use of beta-agonist and anticholinergics during an AECOPD but did not specify the exact dosage and frequency for these medications. This meant that while beta-agonists and anticholinergics were accurately prescribed to most patients in this audit, it was not possible to evaluate if these patients were receiving the appropriate medication dosages.

Lastly, identification of patients for this audit was conducted based on discharge diagnosis codes. Patients who do not actually have COPD may be coded as AECOPD as the coding was completed based on the clinical diagnosis of individual clinicians. However, as our methods and results were very similar to other recent reports in the literature, it is unlikely these limitations impacted our findings significantly.^{18,20,21}

In conclusion, our audit suggests that health professionals in the respiratory team were more likely to adhere to GOLD as compared to other admitting teams. Nonetheless, the levels of adherence to non-pharmacological management were very low. These results suggest areas of practice that may be addressed to improve the management of patients with AECOPD.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Appendix S1 Audit tool.