AUDIT, RESEARCH AND GUIDELINE UPDATE

European hospital adherence to GOLD recommendations for chronic obstructive pulmonary disease (COPD) exacerbation admissions

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ABSTRACT

Understanding how European care of chronic obstructive pulmonary disease (COPD) admissions vary against guideline standards provides an opportunity to target appropriate quality improvement interventions. In 2010–2011 an audit of care against the 2010 'Global initiative for chronic Obstructive Lung Disease' (GOLD) standards was performed in 16 018 patients from 384 hospitals in 13 countries. Clinicians prospectively identified consecutive COPD admissions over a period of 8 weeks, recording clinical care measures on a web-based data tool. Data were analysed comparing adherence to 10 key management recommendations. Adherence varied between hospitals and across countries. The lack of available spirometry results and variable use of oxygen and non-invasive ventilation (NIV) are high impact areas identified for improvement.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is common throughout Europe and is an important cause of morbidity, mortality and consumes significant healthcare resources.[1] Life-threatening exacerbations of COPD are best treated in hospital, and by far the greatest proportion of the healthcare budget expenditure relates to hospital care. It makes sense to ensure hospital care of COPD exacerbations is managed optimally according to best practice guidelines. In 2010 the 'Global initiative for chronic Obstructive Lung Disease' (GOLD) strategy document with management guidelines for COPD exacerbation were updated.[2] There are no existing data on the adherence to guideline recommendations across Europe for patients admitted to hospital with an exacerbation. Understanding practice at a European level provides an opportunity for targeted quality improvement interventions that could make a significant difference to patient care. In 2010/2011 a European audit of the care of patients admitted to hospital was completed across 13 countries. We present data from that audit measured against key recommendations from the then GOLD strategy document.

AUDIT METHODOLOGY

This is described elsewhere in detail.[3] In summary, a prospective case ascertainment with retrospective case note audit was performed between September 2010 and April 2011 on all consecutive COPD exacerbation admissions over a collection period of 8 weeks in each self-selected hospital from 13 European countries that volunteered to participate via their national respiratory society. The dataset was agreed between the national respiratory leads and constituent societies via a modified Delphi process with two rounds. From this dataset, 10 process measures were identified which mapped to key recommendations from the 2010 GOLD strategy document.

Clinical data were entered by clinicians onto a bespoke multilingual web tool held by the European Respiratory Society. Data accuracy was improved by inbuilt data limits within the software. Data cleaning was undertaken by identifying outlying values and requesting contributing clinicians to re-examine their data sources to confirm or amend the data uploaded to the system. Compliance with the guideline recommendations was calculated from the dataset and further sub set analyses were then performed to explore the findings in detail. The software used was SAS V.9.3 (SAS Institute, Cary, North Carolina, USA).

AUDIT FINDINGS

A total of 384 hospitals from Austria, Belgium, Croatia, Greece, Malta, Poland, Republic of Ireland, Romania, Spain, Switzerland, Turkey and the UK provided complete clinical datasets. A total of 16 018 patients were included in the subsequent analysis. The subjects comprised 67.8% (10 865/16 018) men, mean age 70.8 (SD 10.8) years, mean forced expiratory volume in 1 s (FEV_1)% predicted 44.04 (SD 17.4)%, with a median of 1 prior COPD admission in the previous 12 months and a median of 1 comorbidity. Table 1 provides a summary of the median and interquartile range GOLD management recommendation adherence for cases, hospitals and by country. Altogether, 15.3% fulfilled all 10 recommendations.

Recommendation 1

For the diagnosis of COPD, spirometry is the gold standard: it is the most reproducible standardised and objective way of measuring airflow limitation

While spirometry is not advised during an admission, the results of previously performed tests and their accurate interpretation are vital in confirming the diagnosis at admission and in understanding the COPD severity. Clinical diagnosis without spirometry or poor interpretation of spirometry results may be incorrect leading to an inappropriate

Table 1 Summary of compliance with key audit standards

Audit standard	Compliance at case level (%)	Absolute case numbers	Median by hospital (%)	IQR by hospital (%)	Median by country (%)	IQR by country (%)
Spirometry result available at admission	59.4	9513/16 018	63.1	43.4–83.3	64.7	49.3–69.9
Arterial Blood Gas performed at admission	82.4	13 191/16 018	91.5	78.4–98.7	88.1	81.9–93.5
Chest radiograph performed at admission	98.6	15 790/16 018	100	98.6–100	99.0	98.0–99.4
Controlled oxygen therapy used	84.9	13 602/16 018	89.7	76.9–97.9	85.7	79.8–88.5
Short-acting bronchodilator use	91.1	14 594/16 018	95.9	89.1–100	91.4	80.3–94.7
Non-use of intravenous methylxanthines	85.7	13 742/16 018	96.8	83.3–96.	79.9	54.7–97.4
Systemic corticosteroids given	82.3	13 187/16 018	87.9	77.3–95.0	76.9	62.7–88.3
Antibiotics given if sputum purulence or IMV	90.5	8457/9347	93.5	85.7–100	89.5	86.3–93.6
NIV given if pH <7.35 and $PaCO_2$ >6 kPa	51.0	1133/2222	58.6	40–77.8	47.0	40.9–66.6
IMV given if pH <7.25 and $PaCO_2$ >8 kpa	15.4	73/473	50.0	33.3–100	31.6	22.2–44.4
Fulfilled all 10 recommendations	15.3	2444/16 018	16.6	9.09–25.0	10.1	5.18–17.8

IMV, invasive mechanical ventilation; NIV, non-invasive ventilation.

management plan. In all, 59.4% (9513/16 018) of admitted patients had a spirometry record available. For patients with a previous admission for COPD exacerbation 37.4% (2890/7734) still had no available spirometry results. When spirometry was available 12.9% (1226/9513) had non-obstructive FEV_1/forced vital capacity (FVC) ratios but were still entered into the audit and treated for exacerbation of COPD.

Recommendation 2

For patients that require hospitalisation, measurement of arterial blood gases is important to assess the severity of an exacerbation

A total of 82.4% (13 191/16 018) had an arterial blood gas (ABG) result recorded. Of these, 51.6% (6804/13 191) had oxygen partial pressure (PaO_2) below 8 kPa, 45% (5933/13 191) had $PaCO_2$ above 6 kPa and 18.6% (2452/13 191) presented with acidosis.

Recommendation 3

Chest radiographs (posterior/anterior plus lateral) are useful in identifying alternative diagnoses that can mimic the symptoms of an exacerbation

In all, 98.6% (15 790/16 018) admissions had a recorded chest radiograph. Of these, 22.5% (3555/15 790) were classified as a normal chest x-ray, 18.5% (2968/15 790) consolidation and 2.5% (399/15 790) showed lung cancer.

Recommendation 4

Oxygen therapy is the cornerstone of hospital treatment of COPD exacerbations

A total of 84.9% (13 602/16 018) received oxygen of whom 9.7% (1321/13 602) received high flow oxygen. Of the 2167 who did not receive oxygen 13.9% (302/2167) were significantly hypoxic with a PaO_2 of <8 kPa, while overall 95.5% (6433/6735) of all patients with PaO_2 <8 kPa did receive oxygen of some kind. In addition 60.9% (1480/2432) of patients not having an ABG test documented also received oxygen.

Recommendation 5

Short-acting inhaled β_2 agonists are usually the preferred bronchodilators for treatment of exacerbations of COPD. If a prompt response to these drugs does not occur, the addition of an anticholinergic is recommended.

A total of 91.1% (14 594/18 016) were treated with a short-acting bronchodilator during the admission, 84.6% (13 555/18 016) with a β_2 agonist and 12 406 (77.5%) with an anticholinergic.

Recommendation 6

Despite its widespread clinical use, the role of methylxanthines in the treatment of exacerbations of COPD remains controversial

A total of 14.2% (2276/18 016) received intravenous methylxanthines during the admission.

Recommendation 7

Oral or intravenous glucocorticosteroids are recommended as an addition to other therapies in the hospital management of exacerbations of COPD

Overall, 82.3% (13 187/16 018) patients received systemic steroids. Those with radiographic consolidation were less likely to receive steroids than those without consolidation (77.6% vs 83.4%).

Recommendation 8

Antibiotics should be given to: (a) patients with the following three cardinal symptoms: increased dyspnoea, increased sputum volume and increased sputum purulence; (b) patients with two of the cardinal symptoms, if increased purulence of sputum is one of the two symptoms; and (c) patients that requires mechanical ventilation (invasive or non-invasive)

In the audit 90.5% (8457/9347) patients with sputum purulence or mechanical ventilation received antibiotics, however 79.7% (5262/6606) without any of these also received antibiotics. Overall, 61.2% (9801/16 018) of patients were appropriately managed according to these guidelines.

Recommendation 9

Indications for non-invasive ventilation (NIV) include moderate to severe acidosis (pH <7.35) and hypercapnia ($PaCO_2$>6.0 kPa) without contraindications

Of patients with an ABG recorded, 16.8% (2222/13 191) fulfilled these criteria. Of these, 51.0% (1133/2222) received NIV, however a further 825 patients also received NIV but did not meet the ABG criteria, in effect 28.6% (825/2135) of all patients receiving NIV. Of those fulfilling the criteria but who did not receive NIV the main reasons recorded were: declined by the patient 4.3%, medical staff deemed patient unsuitable 28.3%, patient responded to conservative medical treatment 42.6%, 'other' reasons 10.1%.

Recommendation 10

Indications for invasive mechanical ventilation (IMV) include severe acidosis (pH <7.25) and/or hypercapnia ($PaCO_2$ >8.0 kPa)

In the audit population 15.4% (73/473) of patients with a pH <7.25 and a $PaCO_2$ >8 kPa received IMV. Of the 239 patients who died and who received NIV only 13 were escalated to IMV before death while for the other cases NIV was the ceiling of treatment.

DISCUSSION

This is the first ever audit of European hospital care of COPD admissions. There is a wide variation in management between hospitals and between countries. While many of the audit standards should be interpreted in the context of a guideline rather than a protocol the variation against some standards is of concern. Key areas of practice deserve further comment.

Accurate diagnosis is essential if the correct care pathway is to be followed. Spirometric results were not available in over 40% cases and in more than a third who had a prior admission, while in over 13% of cases where it was available the clinical interpretation was incorrect. Whether spirometry has or has not been previously performed, and whether the data may be held in primary or secondary care is not the issue, it is simply that it is not available to the responsible clinical team at a critical moment for the patient. The use of high flow oxygen, particularly in the absence of blood gas measurements, is poor practice as is the management of patients who are hypoxic without oxygen. Thirdly the use of ventilatory support in relation to ABG results is concerning. While it is not possible to state if this were correct practice at case level, overuse and underuse of NIV are suggested by the data. This view is reinforced by the IMV use in severe hypercapnic acidosis where only 15.4% of eligible patients received support and few patients managed using NIV, who subsequently died, received IMV.

While it is encouraging that a chest radiograph investigation was performed on admission in nearly all patients, blood gas tests in particular were not performed in a small but significant proportion. Critical care and oxygen therapy are guided by arterial pH, $PaCO_2$ and PaO_2 measurement. Antibiotic use is appropriately high in patients meeting all three Anthonisen criteria but is similarly prevalent in those patients who do not meet the criteria suggesting that use is not based on symptom criteria but given to most patients regardless.

This was a pilot study with data limitations[3] common to other audits collected from hospitals that volunteered to participate without purposeful sampling. Some cases entered did not meet the spirometric criteria for COPD and some major countries did not participate. This remains, however, the most comprehensive dataset to date collected from Europe and reflects 'real life' clinical practice with all its inaccuracies. The data raise concerns similar to the comprehensive previous UK and Spanish COPD audits.[4 5] Practice between European countries varies as does practice between hospitals within countries. Understanding care quality and deficiencies provides opportunities for targeted interventions that could produce significant patient benefits.

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Ethics approval The European Audit followed the European ethical requirements for scientific studies. All partners of the project accepted the general ethical rules of the ERS, particularly the rules on Competing interests and relationships with the Tobacco Industry, which was an exclusion criterion for individual participation as a national representative. Since there is no European Ethics Committee for audits, national societies ensured compliance with European and National ethical requirements. Some countries needed complex ethics agreements. Grants at the national level to support the audit had to be given as unrestricted grants to the national society without any further influence or interference of the sponsor on future results. An informed consent for the patients was created by the SC and an outline ethics committee protocol for those countries needing them. In the case of ethical dilemmas the Ethics Committee of the ERS was consulted.

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Online Annex 1

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