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SHORT REPORT

Epidemiology and outcome of older patients presenting with dyspnoea to emergency departments

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Abstract

Objectives: To describe the epidemiology and outcomes of non-traumatic dyspnoea in patients aged 75 years or older presenting to emergency departments (EDs) in the Asia-Pacific region.
Methods: A substudy of a prospective interrupted time series cohort study conducted at three time points in EDs in Australia, New Zealand, Singapore, Hong Kong and Malaysia of patients presenting to the ED with dyspnoea as a main symptom. Data were collected over three 72-h periods and included demographics, co-morbidities, mode of arrival, usual medications, ED investigations and treatment, ED diagnosis and disposition, and outcome. The primary outcomes of interest are the epidemiology and outcome of patients aged 75 years or older presenting to the ED with dyspnoea.
Results: 1097 patients were included. Older patients with dyspnoea made up 1.8% [95% confidence interval (CI) 1.7–1.9%] of ED presentations. The most common diagnoses were heart failure (25.3%), lower respiratory tract infection (25.2%) and chronic obstructive pulmonary disease (17.6%). Hospital ward admission was required for 82.6% (95% CI 80.2–84.7%), with 2.5% (95% CI 1.7–3.6%) requiring intensive care unit (ICU) admission. In-hospital mortality was 7.9% (95% CI 6.3–9.7%). Median length of stay was 5 days (interquartile range 2–8 days).
Conclusion: Older patients with dyspnoea make up a significant proportion of ED case load, and have a high admission rate and significant mortality. Exacerbations or worsening of pre-existing chronic disease account for a large proportion of cases which may be amenable to improved chronic disease management.

Keywords: emergency department, dyspnoea, epidemiology, older people

Key points

- Older patients with dyspnoea have a high burden of co-morbidity, a very high admission rate (83%) and significant mortality
- Exacerbations of chronic disease contributed to 46% of presentations, suggesting that some presentations could be avoided
- The significant mortality highlights the importance of early discussion with patients and their families about goals of care.

Introduction

Shortness of breath makes up 5.2% of emergency department (ED) case load [1]. In a Turkish study, dyspnoea was reported as the most common ED presenting symptom in older patients, accounting for 18.5% of presentations. [2] It has a wide range of possible causes. Some are cardio-respiratory in origin. They may be acute, such as pneumonia or pneumothorax. Others are an exacerbation of a chronic condition such as asthma, heart failure or chronic lung disease. [1,3–6] There can also be non-cardio-respiratory causes such as liver or kidney failure or an allergic reaction. [1,3–6]

In ED populations, clinical management is often based on knowledge of the likely disease patterns in a given population. There is a recognised shortage of high-quality, large-scale epidemiological data specific to ED patient populations to guide pathway development. [7] This is especially true for older people—a group in the population that is increasing and who have special management needs. High-quality data could help to better understand the distribution of causes of dyspnoea and the distribution of clinically relevant co-morbidity, plan services including hospital admission, hospital at home and residential care outreach services, and evaluate whether treatment complies with evidence-based guidelines.

The medical literature is dominated by disease-specific studies. This is understandable as the randomised controlled trial is regarded as the gold standard in clinical research. These trials try to reduce possible confounders. This usually means that patients with significant mixed disease or co-morbidity are excluded. This disproportionately affects older people. It may not be justified because older patients may require different therapeutic approaches for optimal outcomes.

The objective of the Asia, Australia and New Zealand Dyspnoea in Emergency Departments (AANZDEM) study was to describe the epidemiology of dyspnoea presenting to EDs in the Asia-Pacific region and its outcome. This substudy focuses on patients aged 75 years or older as this group is under-represented in research and is likely to have specific characteristics which may impact their treatment and outcome.

Methods

The methodology of the parent study has been published previously. [8] In summary, it was a prospective interrupted time series cohort study that included consecutive adult patients presenting to the ED with non-traumatic dyspnoea as a main symptom. It was conducted at three time points in 2014 (autumn, winter and spring) in 46 EDs in Australia, New Zealand, Singapore, Hong Kong and Malaysia. The decision as to whether dyspnoea was a main symptom was at the discretion of the assessing clinician. Overlap with other clinical features such as chest pain, fever and palpitations was allowed.

Data collected included demographics, co-morbidities, mode of arrival, usual medications, ED investigations and treatment in the ED, ED diagnosis, disposition from the ED and outcome. Data collection methods varied depending on local processes, systems and resources. Data could be collected prospectively, or by chart review or administrative coding.

The primary outcomes of interest of this substudy are the epidemiology and outcome of patients aged 75 years or older presenting to the ED with dyspnoea. We chose 75 years as the cut-off arbitrarily, as there is no universally accepted definition. This definition is consistent with recent recommendations. [8,9]

Analysis was by descriptive statistics, and χ^2 test for comparisons of proportions. A formal sample size calculation was not performed as this is a descriptive study. Reporting complies with the STROBE guidelines. [10]

Human research ethics approval was obtained for all sites according to local requirements. In most jurisdictions, patient consent for data collection was not required. Patient consent was required for some Queensland sites, so that component of the data is not consecutive.

Results

Forty-six EDs contributed data on 3,044 patients to the parent study; 1,097 patients were aged 75 years or older (36%). During the data collection periods, there were a total of 60,059 ED attendances of which older patients with dyspnoea made up 1.8% [1,097/60,059, 95% confidence interval (CI) 1.7–1.9%].

Patient characteristics are summarised in Table 1. Most patients (66.6%) arrived by ambulance. Median duration of symptoms was 2 days [interquartile range (IQR) 1–7].

Main diagnoses and outcomes are summarised in Table 2. When physicians were asked to provide a gestalt-based assessment of the likely cause of dyspnoea, in 49.7% of cases (545) clinicians considered the cause to be respiratory, 27.9% (306) cardiac in origin and in 9.3% (102) it was considered to have mixed cardiac and respiratory causation. The remainder were 'other' or as yet undetermined.

Hospital ward admission was required for 82.61% (95% CI 80.2–84.7%), with 2.5% (95% CI 1.7–3.6%) requiring intensive care unit (ICU) admission. In comparison, patients aged under 75 had a hospital admission rate of 52.1% (95% CI 49.9–54.4%) ($P < 0.001$). In-hospital mortality was 7.9% (95% CI 6.3–9.7%). In comparison, in-hospital mortality for those aged under 75 was 2.2% (95% CI 1.6–3%) ($P < 0.0001$). Median length of stay was 5 days (IQR 2–8 days).

Discussion

Dyspnoea is a common presenting symptom in older people and is often multifactorial. [2] Our data confirm that this group has a very high burden of co-morbidity and chronic medication usage. Although approximately

Table 1. Patient characteristics

Variable	Result (total $n = 1,097$)	Missing data
Age group (*n*, %)		
75–80 years	367 (33.5%)	0
81–85 years	324 (29.5%)	
86–90 years	249 (22.7%)	
>90 years	157 (14.3%)	
Gender (male, *n*, %)	517 (47.2%)	2
Country of origin (*n*, %)		0
Australia	671 (61.2%)	
Hong Kong	177 (16.1%)	
Singapore	163 (14.9%)	
New Zealand	68 (6.2%)	
Malaysia	18 (1.6%)	
Hypertension	719 (65.7%)	2
Dyslipidaemia	441 (40.5%)	7
Co-morbidities (*n*, %)		
Ischaemic heart disease	410 (37.6%)	5
COPD	368 (33.4%)	8
Heart failure	318 (29.2%)	7
Atrial fibrillation	318 (29.2%)	7
Diabetes	310 (28.4%)	7
Chronic renal disease	224 (20.6%)	7
Asthma	141 (13%)	8
Dementia	123 (11.3%)	9
Active malignancy	114 (10.5%)	8
Active or recent smoker (within 1 year)	65 (6%)	9
Immunosuppression	38 (3.5%)	9
Previous pulmonary embolism	32 (2.9%)	9
None of the above	41 (3.7%)	0
Regular medications (*n*, %)		
Statins	485 (44.3%)	3
Diuretics	423 (38.7%)	5
ACE inhibitors	400 (36.6%)	4
Aspirin	385 (35.3%)	5
Inhaled β sympathomimetic agents	379 (34.8%)	7
β-blockers	362 (33.2%)	6
Calcium channel blockers	268 (24.6%)	6
Inhaled corticosteroids	255 (23.4%)	7
Inhaled anticholinergics	242 (22.2%)	7
Long-acting anticoagulants	197 (18.1%)	9
Nitrates	166 (15.2%)	8
Oral hypoglycaemic agents	155 (14.2%)	7
Clopidogrel	142 (13%)	6
Cardiac glycosides	102 (9.4%)	8
Oral corticosteroids	86 (7.9%)	8
Aldosterone antagonists	74 (6.8%)	7
Insulin	67 (6.1%)	6
Home oxygen therapy	55 (5.1%)	7
Xanthines	25 (2.3%)	8
None of the above	120 (10.9%)	0

two-thirds of cases were considered primarily due to heart failure, chest infection and chronic obstructive pulmonary disease (COPD), the remainder included a very diverse range of diagnoses. This demonstrates the challenge posed by this presenting symptom in the older patient group.

That 83% of patients required hospital admission was a figure much higher than expected. The study did not explore reasons for this but they may include the complexity of co-morbidity and medication management, associated functional decline and social issues. Further research would be of value to explore the reasons for hospital admission in this cohort and whether alternatives to hospital admission, with its inherent risks of hospital-acquired infection, delirium and de-conditioning, are possible. These might include hospital at home and hospital outreach programmes or management in geriatric subacute units. [11,12] Some of the patients would have come from residential care facilities. We are unable to quantify this. With adequate and appropriate support (such as residential care outreach programmes), these facilities may also have been able to manage these patients *in situ*. This is challenged by the finding of recent

Table 2. Diagnoses and outcome

Variable	Result (total $n = 1,097$)	Missing data
ED main diagnosis (*n*, %)		0
Heart failure	278 (25.3%)	
Lower respiratory tract infection	276 (25.2%)	
COPD	193 (17.6%)	
Acute coronary syndrome	39 (3.6%)	
Asthma	36 (3.3%)	
Pleural effusion	27 (2.5%)	
Chest pain	25 (2.3%)	
Non-respiratory sepsis	24 (2.2%)	
Atrial fibrillation	23 (2.1%)	
Fluid congestion	23 (2.1%)	
Anaemia	18 (1.4%)	
Malignancy	15 (1.4%)	
Other non-COPD chronic lung disease	11 (1%)	
Hyperventilation/anxiety	9 (0.8%)	
Non-ACS cardiac condition	7 (0.6%)	
Pulmonary embolism	6 (0.6%)	
Upper respiratory tract infection	6 (0.6%)	
Pneumothorax (one patient prior COPD)	2 (0.2%)	
Allergy (non-asthma)	2 (0.2%)	
Other	49 (4.5%)	
No clear diagnosis in ED	28 (2.6%)	
Outcome (*n*, %)		2
Deaths in ED	8 (0.7%)	
Admitted to hospital (including ward, ICU and transfers for admission, but not including ED short-stay wards/units)	906 (82.6%)	
Admission to ICU	27 (2.5%)	
Discharge to home	157 (14.3%)	
Mortality (admitted patients only)	73 (7.9%)	
Length of stay for admitted patients (*n*, IQR)	5 (2–8)	54 (transfers)
Final hospital diagnosis for admitted patients (*n*, %)	$n = 880$	No data available for hospital transfers
Lower respiratory tract infection	236 (26.8%)	
Heart failure	230 (26.1%)	
COPD	170 (19.3%)	
Acute coronary syndrome	32 (3.6%)	
Asthma	27 (3.1%)	
Fluid congestion	23 (2.6%)	
Non-respiratory sepsis	20 (2.3%)	
Malignancy	18 (2%)	
Pleural effusion	15 (1.7%)	
Atrial fibrillation	13 (1.5%)	
Other non-COPD chronic lung disease	11 (1.3%)	
Chest pain	10 (1.1%)	
Anaemia	10 (1.1%)	
Pulmonary embolism	7 (0.8%)	
Hyperventilation/anxiety	(0.3%)	
Upper respiratory tract infection	3 (0.3%)	
Non-ACS cardiac condition	2 (0.2%)	
Pneumothorax (one patient prior COPD)	2 (0.2%)	
Allergy (non-asthma)	2 (0.2%)	
Other	35 (4%)	
No clear diagnosis	11 (0.3%)	

Australian research showing that more than half of all Australian aged care residents (57.6%) were in facilities that have unacceptable nursing staffing levels. [13]

The significant mortality in the cohort is not unexpected. This highlights the importance of early discussion with patients and their families to ensure that end of life care preferences are respected.

We did not collect data regarding speciality of admission, largely because of the lack of consistency of models and speciality availability across the study hospitals. That said, it could be argued that management by specialists in aged care may have benefits given the co-morbidity, medication management, frailty and social challenges of this cohort.

That exacerbation of chronic disease made up 46% of causes for dyspnoea raises the question of whether some of these were preventable by better community-based chronic disease management, especially through formal assessment of frailty [14].

Our study has some limitations that should be considered when interpreting its results. Dyspnoea in older people is commonly multifactorial so the assigning of a principal cause for dyspnoea may mask the complexity of diagnosis and management. The study sites were located in the South East Asia/Australasia geographical area and may not be generalisable to other regions. There may also be differences in healthcare access (in particular cost of attending an ED) between our cohort and those from other regions that influence how local populations use EDs and what types of illness present to them. The diagnostic categories were according to the treating ED clinician's judgement based on information available in the ED. It is possible that, with the availability of additional information obtained during hospital admission, the final hospital diagnosis may have been different. This, however, represents the 'real world' of emergency medicine practice. We were unable to assess patient severity (e.g. by triage scores) as quite different triage systems are used in the participating countries. There is a modest amount of missing data for some data items that may have influenced the results.

Conclusion

Older patients with dyspnoea make up a significant proportion of ED case load, and have a high admission rate and significant mortality. Chronic disease accounts for a large proportion of cases which may be amenable to improved chronic disease management.

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