Elderly patients with community-acquired pneumonia are not treated according to current guidelines

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ABSTRACT

INTRODUCTION: Community-acquired pneumonia (CAP) is a major cause of morbidity and mortality in elderly patients, and the most important cause of death in the developed world. Optimised treatment and care will benefit patients as well as the health economy. This study investigates in-hospital compliance with guidelines for treatment and care of patients with CAP.

MATERIAL AND METHODS: A retrospective nationwide study examining 100 patient records from 20 Danish hospitals regarding patients 65 years and older admitted for CAP.

RESULTS: A total of 74 patients with a mean age 81.6 years were included. The mean length of stay was 9.2 days, 30- and 90-day mortality rates were 12.2 and 17.6% and readmission rates 4% (seven days) and 9.5% (30 days). Severity assessment was made in two cases. Observations of vital parameters were unsystematic and the respiratory rate was measured only in six cases. Diagnostic tests and treatment initiation were mostly in accordance with guidelines. The mean number of days on intravenous antibiotics was 5.5. Nutrition and mobilisation were neglected or only sporadically addressed. No systematic plan for treatment and care was found.

CONCLUSIONS: While medical treatment mainly concurred with guidelines, a potential for reduced costs by early discharge planning and use of systematic assessment tools for site-of-care and treatment decisions was indicated. The lack of systematic interventions in the prevention and treatment of malnutrition and functional decline constitutes a threat to a success-ful final patient outcome.

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ORIGINAL ARTICLE

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The incidence of community-acquired pneumonia (CAP) is 442 per 100,000 person-years, and particularly elderly people are at risk [1]. Hospital admissions of patients with CAP are generally increasing, and in 2009 Denmark saw more than 11,000 persons over the age of 65 admitted to hospital with this diagnosis [2]. CAP is a major cause of morbidity and mortality in older patients, and the primary cause of death in the developed world [3]. Furthermore, CAP represents a substantial economic challenge [4], and optimised treatment and care will benefit both patients and society. International guidelines are developed for the management of CAP, and national guidelines concur with these, which should provide a national basis for uniform treatment [3, 5, 6]. However, a recent national cohort study [2] found regional differences in length of stay (LoS), readmission and mortality rates, which indicates a need for further investigation of differences in care and treatment of elderly patients with CAP.

Whereas CAP guidelines focus on diagnostic procedures and medical treatment, a number of other factors may affect the outcome. Many patients with CAP are frail elderly persons, who are particularly vulnerable due to low residual, functional capacity and often subject to functional decline during hospitalisation [7]. Moreover, malnutrition is common in this patient group, and the association between malnutrition and low functional level, increased morbidity and mortality is well-described [8]. Hence, mobilisation and nutrition are central areas for care quality in elderly patients with CAP [9]. Due to the complex needs of these patients, several healthcare services are involved in their care; thus, home-hospital-home transitions are critical [10].

The aim of the present study was to investigate in-hospital compliance with guidelines for treatment and care of elderly patients with CAP.

MATERIAL AND METHODS

A retrospective, descriptive nationwide study was conducted by audit of patient records.

Data generation

Patients > 65 years admitted to hospital for CAP in 2009 were identified through the Danish National Register of Patients (n = 11,322) [2], and a sub-sample of 100 patients was randomly selected from 20 comparable hospitals in different parts of the country. Patient records were requested from the hospitals and reviewed according to criteria for treatment and care in na-tional [5, 11] and international [3, 6] guidelines (**Table 1**). A structured data collection form was created to extract relevant variables. Information on co-morbidities, LoS, mortality and readmission rates was retrieved from The National Register of Patients and The Danish Civil Registry System. The Charlson Comorbidity Index [12] was applied

TABLE 1

Notes regarding guideline criteria for diagnostic and treatment procedures in the patient records.

Indicator	Patients n	Patients %	Duration, days, mean (range)	Mandell et al [3]	Woodhead et al [6]	DRS
Diagnostic procedures						
CURB65	74	2.7		Yes	Yes	Yes
X-ray thorax	74	96.0		Yes	Yes	Yes
Sputum culture	72	43.1		Optional[a]	Yes	Yes
Blood culture	72	71.0		Optional[b]	Yes	Yes
CRP and leucocytes	74	100.0		Yes	Yes	Yes
Diagnosis within 24 hours	69	88.5		No	No	No
Plan for treatment	74	40.1		No	Yes	No
Treatment initiated within 24 hours[c]	69	82.0		Yes	Yes	Yes
Systematic observationsd						
Respiratory frequency	74	8.0		Yes	Yes	Yes
SAT	74	52.7		Yes	Yes	Yes
Temperature	74	66.2		Yes	Yes	Yes
Blood pressure	74	58.1		Yes	Yes	Yes
Correction of AB according to resistance or clinical response	74	59.5		No	No	Yes
On IV AB	43		5.5 (1-15)	Yes	Yes	Yes

AB = antibiotics. CRP = C-reactive protein. CURB65 = (Confusion, Urea > 7 mmol/l, Respiratory rate > 30 breaths/minute, and low systolic (< 90 mmHg) or diastolic (< 60 mmHg) Blood pressure). DRS = The Danish Respiratory Society. IV = intravenous. SAT = blood saturation.
a) Only if good-quality specimen. b) Depending on severity. c) As precise time for AB drug delivery was not obtainable from the records, elapsed time from admission till note of prescription of drug was registered. d) No direct recommendations exist, but these parameters are mentioned as basis for decision-making related to switch to oral AB and discharge.

to calculate the impact of co-morbidities. Descriptive statistics were applied to identify compliance rates, and SAS 9.2 software was used.

Reliability measures

Four researchers (TL, HHK, CC, LLS) reviewed the patient records. The data collection form and its variables were discussed in the group until agreement was reached to assure consistency. All four reviewed four records independently and discussed the results until a consensus was established. The remaining records were split in two, the researchers working in pairs, and each record was reviewed by two researchers independently. Inter-rater divergences in results were discussed until consensus was achieved.

Trial registration: The Danish Data Register approved the project (J. No. 2010-41-5358).

RESULTS

National and international guideline criteria and the level of compliance with these, as established from the patient records, are presented in Table 1 and **Table 2**.

Co-morbidity, length of stay and mortality

A total of 74 of the 100 records contained the information relevant to investigation. The remaining records were excluded due to lack of sufficient recordings. The sample comprised an equal number of men and women with a mean age of 81.6 years (**Table 3**). More than three quarters suffered from one or more co-morbidities and more than half of the sample scored one or more on the Charlson Index. Mortality rates during admission, 30 and 90 days after discharge ranged from 12.2% to 17.6%. The mean LoS was 9.2 days. Four percent were re-admitted within a week and 9.5% within a month.

Diagnostic procedures

Severity assessment was carried out in two cases, and lack of sufficient data (e.g. respiratory rate) in patient records prevented reviewers from calculating CURB scores (Table 1). Tests for infection parameters were carried out shortly after admission and monitored throughout the stay. Chest radiographs were recorded within the first 24 hours. Diagnosis was made and treatment initiated within 24 hours in 82.5% and 88% of the cases, respectively; however, the exact time of the first dosage of antibiotics could not be established. The mean time on intra-venous antibiotic treatment was 5.5 days. Treatment was adjusted according to the patient's clinical response or susceptibility of the antibiotics in 59.5% of the cases.

Observations of temperature, blood pressure and saturation were recorded in all cases; how-ever, this was only done systematically in little more than half of the cases. Observations of respiratory frequency were mostly absent (Table 1).

Nutrition, mobilisation and discharge planning

Nutritional screening was carried out in 21.9% of the cases, and although reviewers estimated that 47% were at risk for nutritional deficiency (on the basis of information extracted from the records, e.g. age, infection, fever, weight, notes on the clinical assessment, results from blood tests) interventions were prescribed for only 16.9%. No systematic registration of intake was recorded (Table 2).

Functional level was assessed in 22.1% of the records and unsystematic notes on mobilisation to chair in 39.3%. Few patients received training by a physiotherapist, and mostly for respira-tory exercises. A rehabilitation plan was made in 4.8% of the cases. The mean time from ad-mission to notes on mobilisation was 3.4 days.

Plans for treatment and discharge were present, although in a rudimentary form, in 40.1% and 45.3% of the records, respectively. Discharge planning started a mean of three days before discharge. Community care was contacted a mean 6.3 days after admission. In 9.5% of the cases, a plan for nursing care was made; however, the plan addressed only one or two care needs, none providing a comprehensive care plan for the trajectory.

DISCUSSION

Overall, the diagnostic procedures and medical treatment were in accordance with national and international guidelines. Due to the hospital medical registration system being digital, information about the exact time of initiation of antibiotics and diagnostic tests was not available in the records. However, notes on diagnosis and initiation of intravenous (IV) therapy with antibiotics were present within the first 24 hours in almost all patient records. Guidelines recom-mend initiation of treatment within four hours from arrival; however, studies have raised doubt about the feasibility of this recommendation as a positive diagnosis may not have been established at that time [13].

Despite strong recommendations to the contrary [3, 6], systematic severity assessment was absent in the records; hence, an evaluation of relevance and sufficiency of treatment decisions was impaired. This concurs with findings in other studies [14-16]. Several studies have found significant differences in admission rates among hospitals and large representations of low-risk patients with CAP among hospitalised patients [15, 17]. Other studies have demonstrated too many or, conversely, too late admissions to the intensive care unit (ICU) [3]. An objective tool may support decision-making and clarify decisions, whether it is supported by the score or not. Systematic assessment enhances valid decision-making on site-of-care, IV or oral treatment, etc. It may therefore also contribute to an improved outcome for patients and in terms of health-care costs [3].

Although overall medical intervention seemed to comply with guidelines, it was not systematic. This was particularly the case for nursing care, where also important intervention areas were neglected or only sporadically addressed. Guidelines call for systematic and early planning [6], but no systematic plan for treatment or care was found, which possibly inhibits consistent quality in care and a timely discharge. Whereas physicians' notes generally described the treatment and clinical as well as paraclinical parameters well, nurses' recordings were generally unstructured and insufficient. This is a well-described problem [7, 8, 14, 18] and constitutes a problem not only for audits; the problem may also well inhibit quality of care and con-stitute a patient safety hazard.

Nutrition and mobilisation are central nursing areas and important for LoS, the pneumonia recovery process and for regaining previous functional level [9, 19]. Nursing notes on these are-as were rudimentary and retrospective, with insufficient assessment of risk of undernourishment or functional decline. No registration of intake, training or time out of bed was found, and physiotherapy was sparse. The lack of focus on and systematic intervention aimed at nutrition and mobilisation is criticisable as the impact of this on patient-related as well as economic out-comes is well-established. Low weight, recent weight loss and poor functional status are risk factors for the development of CAP [20]. Hence,

TABLE 2

Notes regarding guideline criteria for nursing care and rehabilitation in patient records.

Indicator	Patients n	Patients %	Duration, days, mean (range)	DNBH/ DIQAHC	Mandell et al [3]	Woodhead et al [6]	DRS
Written care plan	63	9.5		Yes	No	No	No
Nutrition				Yes	No	No	Yes
Screening performed	64	21.9					
BMI registered	62	29.0					
At risk for deficiency	53	47.2					
Interventions prescribed	58	17.2					
Systematic registration of intake	59	0.0					
Liquid therapy initiated	74	36.5					
Mobilisation and training				Yes	No	No	Yes
Functional level assessed	64	21.9					
Mobilised to chair	64	34.4					
Time out of bed registered	64	7.8					
Training by physiotherapist	74	14.9					
Time to mobilisation	18		3.4 (0-10)				
Physiotherapy	11		6.8 (2-18)				
Continuity				Yes	No	No	No
Rehabilitation plan drawn	63	4.8					
Discharge plan drawn	64	45.3					
Time from admission until community care is contacted	26		6.3 (0-27)				
Time from discharge planning start until discharge	29		3 (0-15)				

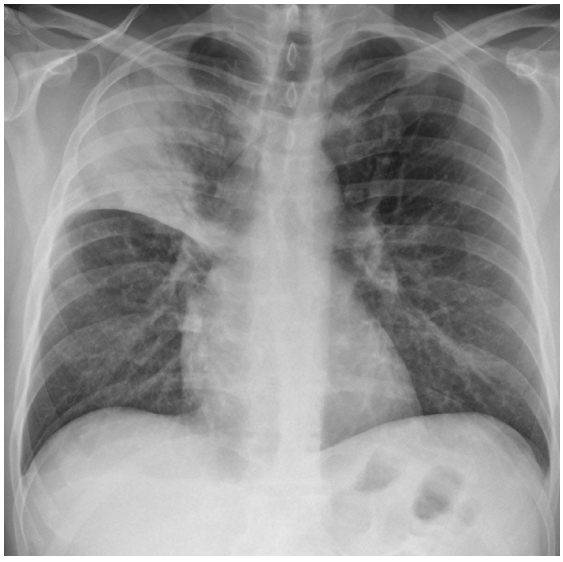
BMI = body mass index. DIQAHC = The Danish Institute for Quality and Accreditation in Health Care. DNBH = The Danish National Board of Health. DRS = The Danish Respiratory Society.

TABLE 3

Background data.

Women, %	50
Age, years, mean (range)	81.6 (66.5-105.8)
Co-morbidity, mean (range)	2.5 (0-11)
CIS, mean (range)	1 (0-9)
CIS, %	
0	48.7
1	27.0
2	16.0
> 2	8.0
Mortality, %	
During admission	12.2
30 days after discharge	13.5
90 days after discharge	17.6
Length of stay, days, mean (range)	9.2 (0-48)
Readmission, days, mean (range)	51.6 (1-173)
Readmission rate, %	
7 days	4.0
30 days	9.5

CIS = Charlson Index Score.



Community-acquired pneumonia is the major cause of morbidity and mortality in elderly patients.

many of these patients arrive malnourished and with reduced functions, and continue their inadequate intake. Stress response due to the infection in combination with bed rest and inactivity further contribute to functional decline. Torres OH et al found functional status to be an independent predictor for mortality in elderly patients with CAP. Mundy et al [9] demonstrated that early systematic mobilisation of patients with CAP may reduce LoS. Hence, systematic interventions aimed at increasing intake and mo-bility in elderly patients with CAP may benefit patient and economic outcomes.

This study was part of a cohort study including patients older than 65 years [2]. Our sample was slightly older than the cohort sample (mean age 79.4), and a higher proportion suffered from severe underlying diseases reflected in a high Charlson Index Score (CIS). Mortality rates were higher in our study. They were also higher than in the study of Kaplan et al, who found an overall in-hospital mortality rate of 10.6% among elderly CAP patients (mean age: 77 years) with rates increasing rapidly with age. Mortality in CAP increases with age and the slightly higher mean age in our sample may account for the higher in-hospital mortality rate.

LoS was almost two days longer than in the cohort study and the study of Kaplan et al. Our sample was older and patients suffered more co-morbidities; and a higher age and a higher CIS may be associated with increased LoS [2]. Substantial variation in LoS was found in the cohort study and is well-documented in the literature [14]. Fine et al found differences in LoS even after adjusting for co-morbidities and other factors, which suggests that differences in treatment practice were a determining factor. Thus, the LoS in our study may well reflect hospital culture regarding treatment and discharge planning as well as high age and co-morbidity. Early discharge planning may reduce LoS, but discharge planning generally started shortly before discharge, which indicates that there is room for improvement.

Early switch from IV to oral treatment may reduce LoS; however, there is no evidence to guide the time at which such a switch should be made [6]. The time to switch-over in our study was in concurrence with other studies [14]. The age and co-morbidity index was high and may lead to more severe conditions and a prolonged need for IV treatment. However, the routine for IV treatment is disputed, and several studies have demonstrated that patients at low as well as increased risk may well receive oral treatment from time of admission, provided they do not suffer from vital abnormalities or impaired gastrointestinal absorption.

No examples of a clinical pathway for treatment and care of CAP were found. Literature shows that evidence-based clinical pathways may reduce admission rates for low-risk patients, duration of IV therapy and LoS. Further, multidisciplinary approaches aimed at treating co-morbidities, functional problems and a well-planned discharge may decrease readmission rates A national, multidisciplinary clinical pathway seems called for.

Methodological considerations

Conclusions made upon audits of patient records are subject to several limitations. The results do not necessarily reflect the performed care, and interventions missing in the records may have taken place. Hospital registration systems prevented access to precise time of initiation of antibiotics, diagnostic tests, etc., and sparse and unstructured recordings of nursing care constituted a problem when assessing interventions aimed at mobilisation, nutrition and discharge planning.

Inter-rater reliability may be a limitation when reviewing patient records. The procedure in which all four researchers reviewed a number of records in conjunction and worked in pairs on the rest was a measure taken to enhance reliability.

CONCLUSION

This study demonstrated that, in general, medical treatment followed current guidelines, although a potential was identified for reduced costs by early discharge planning and use of systematic assessment tools for decision-making.

However, the absence of systematic interven-tions aimed at nutritional and functional needs constitutes a threat to successful patient outcome. With their complex disease and function-related problems, these patients need a multidisciplinary and comprehensive approach. A clinical pathway may support clinicians in decision-making and a systematic practice, thereby possibly achieving the quality in care that is needed.

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CONFLICTS OF INTEREST: Disclosure forms provided by the authors are available with the full text of this article at www.danmedj.dk.

A complete list of references can be ordered from the first author.

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