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ORIGINAL ARTICLE

The Prevalence of Oropharyngeal Dysphagia in Danish Patients Hospitalised with Community-Acquired Pneumonia

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Abstract Community-acquired pneumonia (CAP) and oropharyngeal dysphagia (OD) are prevalent conditions in the elderly. The aim of this study was to explore the relationship between CAP, OD, and frailty in patients admitted to a department of respiratory medicine at a regional hospital. The outcome was mortality during hospitalization and within 30 days of discharge and rehospitalization within 30 days of discharge. A total of 154 consecutive patients (54.5% male, mean age 77.4 years (SD 11.51)) hospitalized because of CAP from September 1, 2013 to March 31, 2014 at North Denmark Regional Hospital were included in this study. The volume-viscosity swallow test was conducted for each patient. A total of 34.42% patients presented with OD. Patients with OD and CAP presented significant differences in age, CURB-65, and dementia compared with those of patients with CAP alone. The majority lived in nursing homes, had a lower body mass index, Barthel 20 score, and handgrip strength, and had poor oral health compared with patients with CAP only. Patients with OD presented an increased length of stay in hospital ($P < 0.001$), intra-hospital mortality ($P < 0.001$), and 30-day mortality rate ($P < 0.001$) compared with those of patients with CAP only. Their rate of rehospitalization 0–30 days after discharge was also increased ($P < 0.001$) compared with that of patients with CAP only. Thus, OD is related to frailty and poor outcome.

Keywords Dysphagia · Community-acquired pneumonia · Prevalence · Mortality · Rehospitalization · Deglutition · Deglutition disorders

Introduction

Worldwide, community-acquired pneumonia (CAP) is an important cause of morbidity and mortality in elderly patients [1–4]. CAP is defined as an acute infection of the pulmonary parenchyma in a patient who has acquired the infection in the community. In Denmark, CAP is the fifth main cause of hospitalization and is the third cause of readmission after chronic obstructive pulmonary disease (COPD) and dehydration [5]. With the elderly population increasing and a higher risk of contracting pneumonia in this population, CAP is a challenge for the Danish health care service [6, 7]. Risk factors for CAP are increased age (>70 years), male sex, smoking, and oropharyngeal dysphagia (OD) [8–12].

Oropharyngeal dysphagia is classified under "digestive symptoms and signs" in the International Statistical Classification of Diseases and Related Health Problems (ICD-10, code R13). International Classification of Functioning, Disability, and Health classifies swallowing as "…clearing the food and drink through the oral cavity, pharynx and esophagus into the stomach at an appropriate rate and speed" [13]. Several studies have documented OD in

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patients with CAP as being associated with increased length of stay (LOS), rehospitalization, reduced quality of life and death [3, 11, 14].

Oropharyngeal dysphagia is a common and well-known condition among patients with acute neurological diseases, such as stroke and neurodegenerative disorders, such as Parkinson's disease and amyotrophic lateral sclerosis [15, 16]. One study of elderly patients with CAP documented a prevalence of OD of 91.7% [11]. Because disease prevalence increases with age and given age-related changes of the aero-digestive tract, which influences the ability to efficiently and safely swallow, eat, and drink, older adults are particularly vulnerable to OD [3, 17]. The result of OD may be aspiration, lack of oral intake, malnutrition, dehydration, death, or frailty [18–20]. Frailty as a term is widely used as a multidimensional syndrome of loss of reserves, such as physical ability, energy, health, and weight loss [21, 22]. Frailty often leads to rehospitalization within 30 days of discharge and death during hospitalization and within 30 days after discharge [23].

In Denmark, an increasing awareness of dysphagia and its consequences is emerging. In 2012, the Danish Patient and Safety Authority recommended the implementation of protocols for OD in hospitals and municipalities [26], and in 2015, the Danish Health Authority published the "National Clinical Guideline for Oropharyngeal Dysphagia," in which systematic screening of OD is recommended in at-risk populations [24]. However, these recommendations do not specifically address elderly patients hospitalized with CAP. In addition, OD is not mentioned in the Danish guidelines for CAP [25]. As OD is not systematically assessed in patients acutely hospitalized with CAP, it is not possible to obtain exact data to gain an overview of the prevalence of OD from the National Patient Register. Therefore, the primary aim of this study was to assess the prevalence of OD in Danish patients hospitalized with CAP. The secondary aims were to identify the risk factors for OD in patients with CAP and to investigate the association of OD in patients with CAP with LOS, rehospitalization within 30 days after discharge, mortality during hospitalization, and mortality within 30 days after discharge (Fig. 1).

The hypothesis was that patients with CAP and OD are older and frailer, have an increased LOS in the hospital, an increased frequency of rehospitalization, and higher mortality.

Materials and Methods

Study Design

A cross-sectional observational study with longitudinal follow-up was applied. Patients hospitalized with CAP were consecutively recruited from the Department of Respiratory Medicine at North Denmark Regional Hospital from September 1, 2013 to March 31, 2014. The following inclusion criteria were applied: $\geq$18 years old, temperature $>$38°, new infiltrate on chest X-ray, and increased C-reactive protein (CRP). One of the following clinical criteria was also applied for inclusion into the study: cough, dyspnea, pleuritic chest pain, expectoration, and tachypnea [25]. Patients transferred from an intensive care unit, and patients who had reduced cognitive awareness were excluded if they were not able to cooperate concerning the assessment of OD. Of 170 patients enrolled in the study, seven patients were excluded because they were unable to communicate and thus not able to participate in the test, and an additional nine patients did not want to participate in the study. Finally, 154 patients were included in the study. Rehospitalization was defined as rehospitalization due to any disease in the Northern Region of Denmark.

The study was presented to the North Denmark Regional Committee on Health Research Ethics (N-20130058). It was concluded that the study did not require approval from the committee. The study was conducted according to the Declaration of Helsinki and was approved by the Danish Data Protection Authority (2008-58-0028).

Procedure and Measurements

Baseline Data

Data were collected on body mass index (BMI), waist circumference (2 cm above the navel), level of oral hygiene (tooth brushing per day/week), tooth status (use of dentures), strength in both hands, circumference of the lower leg (15 cm above the lower edge of the patella), and circumference of the upper arm (lateral epicondyle + 10 cm). Age, gender, admission date, discharge date, first acute readmission within 30 days after discharge, and primary cause of admission were recorded from the National Patient Register.

Pneumonia and Comorbidity

The severity of pneumonia was determined via the CURB-65, a validated index measuring the severity of pneumonia and predicting mortality. The CURB-65 score is a part of the initial standard assessment procedure by the physician and consists of five factors: confusion, urea, respiratory rate, blood pressure, and age >65 years. The five variables, of which each receives a dichotomous one or zero score, are added to calculate an overall score from 0 to 5 [26, 27].

Medical information, including temperature, urea, C-reactive protein (CRP), respiratory rate, confusion and blood pressure at the time of hospitalization, and polymedication on discharge were recorded from the patients' electronic records.

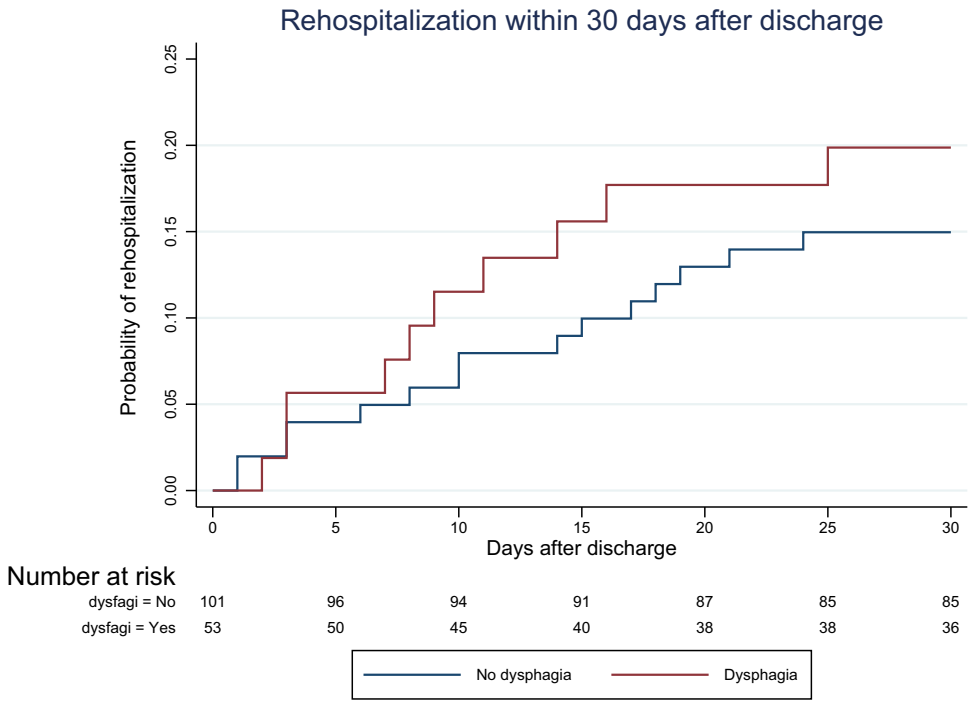

Fig. 1 Rehospitalization within 30 days after discharge

Comorbidity was measured using the Charlson comorbidity index (CCI) [28, 29], which consists of 19 disease groups, each with a significant mortality risk, including cancer, COPD or myocardial infarction. The higher the score, the higher was the risk. Scores were summed to a score between 0 and 31.

At hospitalization, antibiotic treatment was started according to the Danish guidelines for CAP [30].

Frailty

Frailty was indicated by the functional level before hospitalization using the modified Rankin scale [31], functional level at hospitalization with Barthel 20 [32–34], and comorbidity computed with the Charlson comorbidity index. The combined efforts of factors to illustrate frailty in this group of patients were as follows: dementia, admission from the nursing home, and handgrip strength measured using a Jamar dynamometer [35]. Reduced handgrip strength is an indicator for all-cause death [35, 36].

A diagnosis of dementia, admission from the nursing home, and handgrip strength were also part of the combined efforts of factors to illustrate frailty in this group of patients.

Oropharyngeal Dysphagia (OD)

OD was assessed using the Danish version of the clinical volume-viscosity swallow test (V-VST) [37] and was administered by experienced occupational therapists. The test assesses different types of viscosity and different volumes and identifies the presence or absence of dysphagia, and uses the terms safety and efficacy. The bolus volume was 5, 10 and 20 mL. The bolus viscosity was liquid viscosity (21.61 mPa.s), nectar viscosity (295.02 mPa.s) was achieved by adding 1.2 g of the thickener Resource ThickenUp (Nestlé HealthCare Nutrition) to 100 mL water, and pudding viscosity (3682.21 mPa.s) was achieved by adding 6.0 g of the thickener Resource ThickenUp to 100 mL water. Mineral water at a room temperature of 25 °C was used. Boluses of each volume and viscosity were offered to the patients with a syringe during the test to ensure an accurate measurement of the volume. Before the V-VST, a pulse oximeter was placed on the index finger and baseline readings were measured before starting the test. During the test, the following clinical signs of disordered swallowing function were observed: impaired labial seal, oral or pharyngeal residue, and multiple swallows per bolus. According to V-VST, the following clinical signs of impaired safety of swallowing were also observed: changes in voice quality, cough, or decrease in oxygen saturation $\geq$3% to detect silent aspiration [38]. One or more signs of impaired safety or efficacy indicated OD [39]. The original Spanish version of the V-VST has 83.7% sensitivity and 64.7% specificity for bolus penetration into the larynx and 100% sensitivity and 28.8% specificity for aspiration [37].

Patients who received antibiotics orally and were clinically stable and independently mobile were discharged [40].

Data Analysis

Descriptive statistics included the number and percentage of patients for categorical variables, and a median and interquartile range (IQR) for continuous variables. Differences between the two study groups were analyzed using Fisher's exact test for categorical variables and the unpaired *t* test or the Wilcoxon rank-sum test for continuous variables, whenever appropriate according to sample size and distribution. To compare continuous frailty parameters between the two groups' age and gender, adjusted *t* tests (ANCOVA) were conducted. The suitability of these models was assessed by Q–Q plots of the residuals, scatter plots of residuals versus fitted values, and to assess the homogeneity of regression slopes, a visual inspection of scatter plots of frailty parameters versus covariates with regression lines for each group was performed. In some cases, models of log-transformed frailty parameters were more suitable but did not alter the conclusions, and because the untransformed data are easier to interpret, we decided to report these parameters. The associations between dichotomous frailty parameters and the two groups were estimated as age- and gender-adjusted incidence rate ratios using modified Poisson regression with robust variance estimation [41]. The Kaplan–Meier method was applied to estimate the mean LOS with discharge as the event and censoring for death. *Z* tests were conducted to test for differences in LOS between the two groups. Log-rank tests were applied to test for differences in survival and rehospitalization between the two groups. Throughout the analyses, 95% confidence intervals (CIs) were reported, and a P value < 0.05 was considered statistically significant. Statistical analyses were performed with Stata Version 13.1 (Stata Corporation, College Station, TX, USA).

Results

As presented in Table 1, of 154 patients, 54.5% were males, the mean age was 77.4 (SD 11.51) years, and 34.4% (95% CI 27.3; 42.3) of the sample was diagnosed with OD. In the group of patients 70+ years, 37.1% of the patients

Table 1 Characteristics of patients with CAP and OD and patients with CAP

	Patients with pneumonia and OD $N = 53$ 34.42%	Patients with pneumonia $N = 101$ 65.58%	*P* value
Gender			
Male	33 (62.26%)	51 (50.50%)	0.177
Age			
Mean	80.90 (±10.58)	75.96 (±11.63)	0.011
<50	0	4	
50–69	7	19	
70–79	14	38	
80–	32	40	0.075
Point of origin			
House/apartment	36 (68.92%)	98 (97.03%)	
Nursing home	17 (32.08%)	3 (2.97%)	>0.001
Volume-Viscosity swallow test			
Impaired safety	50 (94.3%)		
Impaired efficacy	44 (83.0%)		
CURB65			
Confusion (yes)	23 (45.10%)	13 (13.54%)	>0.000
Urea (carbamid >7 mmol/L)	36 (70.59%)	40 (41.67%)	0.001
Respiratory rate ≥30/min	8 (16.0%)	7 (7.29%)	0.149
Blood pressure <90 mm Hg syst or ≤60 mm Hg diast	6 (11.76%)	15 (15.63%)	0.625
≥65 years	48 (90.57%)	89 (88.12%)	0.789
CURB65			
Mean	2.34 (0.872)	1.67 (0.879)	>0.001
0	0 (0%)	8 (8.33%)	
1	6 (12.00%)	32 (33.33%)	
2	27 (54.00%)	42 (43.75%)	

Table 1 continued

	Patients with pneumonia and OD $N = 53$ 34.42%	Patients with pneumonia $N = 101$ 65.58%	P value
3	12 (24.00%)	12 (12.50%)	
4	4 (8.00%)	2 (2.08%)	
5	1 (2.00%)	0 (0%)	
Dementia	12 (23.53%)	4 (4.12%)	0.001
COPD	22 (43.14%)	46 (47.42%)	0.729
Diabetes	5 (9.80%)	13 (13.40%)	0.606
Hemiplegic	4 (7.84%)	1 (1.03%)	0.048
CRP	95.25 (82.439)	111.85 (82.86)	
Smoker			
Smoker	9 (16.98%)	19 (18.81%)	
Former smoker	23 (43.40%)	55 (54.46%)	
Never smoked	14 (26.42%)	20 (19.80%)	
Unknown	7 (13.21%)	7 (6.93%)	0.191
Use of oxygen			
Yes	4 (7.55%)	11 (10.89%)	
No	42 (79.25%)	85 (84.16%)	
Unknown	7 (13.21%)	5 (4.95%)	0.191
Tooth status			
No denture	14 (26.42%)	41 (40.59%)	
Denture upper mouth	7 (13.21%)	17 (16.83%)	
Denture under mouth	0 (0%)	2 (1.98%)	
Denture	25 (47.17%)	38 (37.62%)	
Unknown	7 (13.21%)	3 (2.97%)	0.049
Oral hygiene			
2 times per day	24 (45.28%)	70 (69.31%)	
1 time per day	18 (33.96)	20 (19.80%)	
3–5 times per week	1 (1.89%)	4 (3.96%)	
1–2 times per week	1 (1.89%)	2 (1.98%)	
1 time per month	0 (0%)	0 (0%)	
Never	2 (3.77%)	1 (0.99%)	
Unknown	7 (13.21%)	4 (3.96%)	0.018
Weight	64.75 kg (±15.21)	73.63 kg (±22.02)	0.023
Height	169.15 cm (±9.55)	167.54 cm (±8.65)	0.586
BMI	22.66 (±5.05)	26.07 (±6.90)	0.005
Waist line	101.48 (±13.28)	105.89 (±19.17)	0.124
Polymedication by discharge	9.42 (±4.29)	10,20 (±11.72)	0.573
Temperature by hospitalization	37.76 (±0.98)	38.18 (±1.06)	0.022

The data are presented as number or mean (SD)

P values were calculated using unpaired t test and Fisher's exact test for the continuous and categorical variables, respectively

were diagnosed with OD. Patients with OD and CAP were discharged after a mean of 10.6 days (CI 8.77; 12.34) compared with 8.0 days (CI 6.87; 9.13) ($P = 0.018$) for patients with CAP. Patients with OD and CAP had a significantly poorer tooth status ($P = 0.049$) and oral hygiene ($P = 0.018$).

Frailty

As illustrated in Table 2, there was a significant difference between the group of patients with OD and CAP and the patients with CAP according to all the frailty parameters except for comorbidity.

Table 2 Frailty—difference adjusted for age and gender

	OD and CAP	CAP	Difference (OD-no dysphagia)	95% CI	*P* value	Age adjusted difference	95% CI	*P* value
Age	80.90 (10.58)	75.95 (11.63)	4.94		0.011			
Hand grip	12.65 (11.10)	19.56 (12.09)	−6.90	2.31;11.49	0.004	−5.57	−10.11;−1.03	0.017
Circumference leg	32.01 (4.77)	37.98 (12.58)	−5.97	−8.91; 3.02	<0.001	−5.75	−9.56; −1.94	0.003
Barthel 20	12.42 (6.41)	18.15 (2.43)	−5.73	−7.65; −3.82	<0.001	−5.51	−6.98; −4.05	<0.001
Modified Rankin Scale								
No symptoms	2 (3.8%)	20 (19.8%)						
No significant disability	2 (3.8%)	23 (22.8%)						
Slight disability	8 (15.1%)	25 (24.8%)						
Moderate disability	13 (24.5%)							
Moderately severe disability	18 (33.9%)	26 (25.7%)						
Severe disability	8 (15.1%)	0 (0%)						
Unknown	2 (3.8%)	1 (1.0%)			<0.001			
Charlson Comorbidity Index	5.65 (1.73)	5.49 (2.18)	0.16	−0.54; 0.85	0.666	−0.09	−0.77; 0.58	0.785
			Incidents rate ratio			*Age adjusted relative risk*		
Admission from nursing home	16 (30.2%)	3 (3.0%)	3.16	2.26; 4.43	<0.001	2.85	1.99; 4.09	<0.001
Dementia	12 (23.5%)	4 (4.1%)	2.54	1.73; 3.74	<0.001	2.41	1.62; 3.60	<0.001

Data are represented as number and as mean and 95% confidence interval (CI) for continuous variables. Independent *t* test for continuous variables and relative risk is estimated by poisson regression

Mortality

In the group of patients with OD and CAP, seven of the 53 patients (13.21%) died during hospitalization; in the group of patients with CAP, no patients died during hospitalization ($P < 0.001$). During the 30 days after discharge, ten patients with OD and CAP of 46 (21.74%) died, as illustrated in Table 3. In the group of patients with CAP, two patients out of 101 (1.98%) died ($P > 0.001$).

As illustrated in Table 3, the group of patients who died during hospitalization was characterized by a significant increase of mean age (8.57 years) and a non-significant decrease in Barthel 20 score and handgrip strength. There were no significant differences between the two groups concerning these variables.

Rehospitalization

As illustrated in Fig. 1 patients with CAP and OD were rehospitalized more frequently than patients with CAP.

Rehospitalized patients with OD and CAP had a significantly higher handgrip strength compared with that of rehospitalized patients with CAP only. There was no significant difference in all other variables as illustrated in Table 4.

The reason for rehospitalization was lung diseases and lung-related diseases for 80% of the patients with CAP and OD versus 63% for patients with CAP.

Discussion

This study aimed to investigate the prevalence of OD in CAP patients, to identify risk factors for OD and CAP, and to identify the frequency of rehospitalization within 30 days after discharge, mortality during hospitalization, and mortality within 30 days after discharge.

OD was prevalent in 37.1% of the patients aged 70+ years, and this study found that the risk factors for OD and CAP are increased age, living in nursing homes, severe CAP (CURB-65), dementia, poor dental status and oral hygiene, and poor level of mobility before hospitalization and decreased handgrip strength.

Frailty

Frailty correlates with vulnerability, poor outcome, and death [42, 43]. This study found that factors associated with OD are increased age, poor functional capacity, decreased handgrip strength, dementia, and admission from nursing homes. Other studies have documented this link with people living in a nursing home and OD and in independent people and OD [44]. The high prevalence of

Table 3 All-cause mortality during hospitalization and within 30 days

	OD Dead $N = 7$ (13.21%)	OD Alive $N = 46$ (86.79%)	*P* value
During hospitalization			
Age			
Age mean (SD? Eller 95% CI)	88.34 (81.49–95.18)	79.77 (76.62–82.91)	0.045
<70 year	0 (0%)	7 (15.22%)	0.575
≥70 year	7 (100%)	39 (84.78%)	
Gender			
Male	4 (57.14%)	29 (63.04%)	1.000
Barthel 20	9.83 (1.35; 18.32)	12.79 (10.86;14.70)	0.296
CURB65			
Mean	2.86 (2.02–3.69)	2.26 (1.99; 2.52)	0.091
0	0 (0%)	0 (0%)	0.425
1	0 (0%)	6 (13.95%)	
2	3 (42.86%)	24 (55.81%)	
3	4 (57.14%)	13 (30.23%)	
Charlson Comorbidity Index	4.83 (4.40; 5.26)	5.76 (5.21; 6.30)	0.224
Dementia	1 (16.67%)	11 (24.44%)	0.565
Hand grip	7.65 (−15.62; 30.92)	13.11 (9.12; 17.10)	0.423
Circumference under leg	33.5 (30.00; 37.00)	31.80 (30.26; 33.33)	0.419
Nursing home	4 (57.14%)	13 (28.26%)	0.139
Morse within 30 days after discharge	$N = 10$ (21.74%)	$N = 36$ (78.26%)	
Age			
Mean	80.78 (75.94; 83.03)	79.48 (75.94;83.02)	0.736
<70 year	1 (10%)	6 (16.67%)	1.000
≥70 year	9 (90%)	30 (83.33%)	
Gender			
Male	3 (30%)	26 (72.22%)	0.025
Barthel 20	11.11 (6.20;16.02)	13.24 (11.07;15.41)	0.364
CURB65			
Mean	2.2 (1.46; 2.94)	2.27 (1.99; 2.56)	0.815
0	0	0	
1	3 (30%)	3 (9.09%)	0.090
2	3 (30%)	21 (63.64%)	
3	4 (40%)	9 (27.27%)	
Charlson comorbidity index	6.7 (5.15; 8.25)	5.49 (4.92; 6.05)	0.060
Dementia	4 (40%)	7 (20%)	0.187
Handgrip	11.17 (3.58; 18.77)	13.63 (8.77;18.49)	0.616
Circumference under leg	31.55 (28.12; 35.00)	31.86 (30.05; 33.68)	0.870
Nursing home	3 (30%)	10 (27.78%)	0.589

Data are given as the mean and number (%) for categorical variables, and as mean and 95% confidence interval (CI) for continuous variables. Independent *t* test for continuous variables and Fisher's exact test for categorical variables

OD underlines the necessity of awareness of OD in patients hospitalized with CAP and indicates the need for systematic screening for OD. This will require a greater knowledge about OD among practitioners and nurses [45], which is also recommended in the Danish national guidelines for OD [24].

Mortality

Patients with OD and CAP presented significantly increased in-hospital and 30-day mortality rates compared with those of patients with CAP alone. A Danish multicenter study including elderly citizens admitted with CAP

Table 4 All-cause rehospitalization within 30 days after discharge

	OD and pneumonia Rehospitalized $N = 10$ (21.74%)	OD and pneumonia Not rehospitalized $N = 36$ (78.26%)	*P* value	Pneumonia Rehospitalized $N = 15$ (14.85%)	Pneumonia Not rehospitalized $N = 86$ (85.15%)	*P* value
Age						
Mean	74.13 (67.21–87.61)	80.86 (77.46–88.99)	0.174	74.73 (71.55–81.68)	77.41 (70.81–84.63)	0. 554
<70 year	3 (30.00%)	4 (11.11%)		2 (13.33%)	21 (24.42%)	
≥70 year	7 (70.00%)	32 (88.89%)	0.101	13 (86.67%)	65 (75.58%)	0.666
Gender						
Male	7 (70%)	22 (61.11%)		8 (53.33%)	43 (50%)	0.517
Barthel 20	19 (11–19)	13 (7–17)	0.080	18 (16–19)	19 (17–20)	0.141
CURB65						
Mean	2 (2–2)	2 (2–3)	0.362	2 (1–2)	2 (1–2)	0.572
0	0 (0%)	4 (0%)		0 (0%)	8 (9.76%)	0.475
1	2 (22.22%)	4 (11.76%)	0.759	5 (35.71%)	27 (32.93%)	
2	5 (55.56%)	19 (55.88%)		7 (50.0%)	35 (42.68%)	
3	2 (22.22%)	11 (32.35%)		2 (14.29%)	12 (14.63%)	
Charlson comorbidity index	6 (5–6)	5 (5–6)	0.895	5 (4–7)	5 (4–6)	0.579
Dementia	0 (0%)	11 (30.56%)	0.059	1 (6.67%)	3 (3.66%)	0.495
Handgrip strength	18.3 (8.23–27)	7.93 (5.1–12.06)	0.017	19.2 (16.23–20.73)	17.85 (11.6–23.06)	0.614
Nursing home	1 (10%)	12 (33.33%)	0.240	0 (0%)	3 (3.49%)	1.000
LOS (first hospitalization)						
Days	7.17 (5.31; 9.03)	10.21 (8.45; 11.96)	0.020	8.51 (5.34; 11.69)	7.90 (6.70; 9.11)	0.727

Data are given as number (%) for categorical variables, and as median (IQR) for continuous variables. Wilcoxon rank-sum test for continuous variables and Fisheŕs exact test for categorical variables. Three patients in the group of patients with OD and pneumonia and one patient in the group of patients with pneumonia were excluded due to incomplete CURB-65

[46] reported an in-hospital mortality of 11.5%. In our study, the group with CAP and OD showed an in-hospital mortality of 13.46% versus non-OD 0%. The multicenter study reported a 30-day mortality of 8.6%. The present study had 30-day mortality for patients with CAP and OD of 19.23% versus non-OD patients (1.98%), and clearly, OD is a risk factor for mortality among patients with CAP.

Rehospitalization

The group of patients with OD and CAP had a higher rehospitalization rate than the group of patients with CAP only. Patients with OD have a higher frequency of rehospitalization [11]. Patients with OD and CAP who were rehospitalized versus those not readmitted had a significantly stronger handgrip ($P = 0.004$). The group of patients rehospitalized with OD and CAP compared with rehospitalized patients with CAP only was characterized by a non-significant difference in decreased age, higher Barthel 20 score, less dementia, and from nursing homes. There may be more explanations. For example, patients living at their own residence may have greater difficulty in changing their eating habits than those living in nursing homes. Additionally, doctors and nurses may not rehospitalize elderly people with more CAPs but let the patients stay in nursing homes during treatment.

Limitations and Strengths

The main strength of the study is that the screening was performed in 95% of the patients and that the patients were consecutively included. A limitation of the study is the relatively small sample size, which can lead to type II statistical error.

Video fluoroscopy and fiberoptic endoscopic evaluation of swallowing are objective assessments of swallowing function. In our clinical setting, these assessments were not possible, and we used V-VST, as studies have shown, a strong correlation between video fluoroscopy and V-VST [37], and a dysphagia screening protocol with a standardized bedside screening decreases the risk of pneumonia. V-VST uses a decrease in oxygen saturation ≥3% to detect silent aspiration. A fall in oxygen saturation as a sign of silent aspiration is not a reliable indicator of silent aspiration [47]. Pharyngeal residue is one of the signs of swallowing disorders and can be visualized in video fluoroscopy; however, it is impossible to visualize in a bedside screening. V-VST has been recommended in other reviews [48, 49], but it has not yet been validated in Denmark.

The definition of CAP remains vague and unclear, and there is a risk that some of the patients were hospitalized with aspiration pneumonia that can be a subtype of CAP, such as HCAP, because some of the patients were hospitalized from a nursing home [50, 51]. The different subtypes make it very difficult to distinguish between the different types of pneumonia.

In this study, frailty is measured by the following parameters: functional capacity, handgrip strength, dementia, and admission from a nursing home. Some indexes that assess frailty include the clinical frailty scale, frailty index, comprehensive geriatric assessment, the vulnerable elders survey-13, the Groningen frailty indicator, and the geriatric 8 [52]. However, studies that document these tools are not amenable to routine use at the bedside, the diagnostic value of the instruments is poor, and the clinical value may be weak [53, 54].

Conclusion

More than one-third of all patients hospitalized in a Danish regional hospital with CAP had OD. Compared with patients with CAP alone, patients with CAP and OD showed a significant difference regarding parameters related to frailty: increased age, more were living in a nursing home, dementia and functional level before hospitalization, Barthel 20 score at hospitalization, decreased handgrip, circumference of the lower leg, and BMI. The mortality during hospitalization and the 30-day mortality among patients were significantly higher among patients with OD and CAP than among patients with CAP only. The rate of patients rehospitalized 0–30 days after discharge among patients with OD and CAP was higher than among patients with CAP only. The results of this study support a systematic investigation of dysphagia in elderly patients with CAP.

Compliance with Ethical Standards

Conflicts of interest The authors declare that they have no conflicts of interest.

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