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ORIGINAL RESEARCH

The cost of dysphagia in geriatric patients

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Objectives: To estimate the annual cost at the hospital and in the municipality (social care) due to dysphagia in geriatric patients.

Design: Retrospective cost analysis of geriatric patients with dysphagia versus geriatric patients without dysphagia 1 year before hospitalization.

Setting: North Denmark Regional Hospital, Hjørring Municipality, Frederikshavn Municipality, and Brønderslev Municipality.

Subjects: A total of 258 hospitalized patients, 60 years or older, acute hospitalized in the geriatric department.

Materials and methods: Volume-viscosity swallow test and the Minimal Eating Observation Form-II were conducted for data collection. A Charlson Comorbidity Index score measured comorbidity, and functional status was measured by Barthel-100. To investigate the cost of dysphagia, patient-specific data on health care consumption at the hospital and in the municipality (nursing, home care, and training) were collected from medical registers and records 1 year before hospitalization including the hospitalization for screening for dysphagia. Multiple linear regression analyses were conducted to determine the relationship between dysphagia and hospital and municipality costs, respectively, adjusting for age, gender, and comorbidity.

Results: Patients with dysphagia were significantly costlier than patients without dysphagia in both hospital (p=0.013) and municipality costs (p=0.028) compared to patients without dysphagia. Adjusted annual hospital costs in patients with dysphagia were 27,347 DKK (3,677 EUR, 4,282 USD) higher than patients without dysphagia at the hospital, and annual health care costs in the municipality were 46,044 DKK (6,192 EUR, 7,209 USD) higher.

Conclusion: Geriatric patients with dysphagia were significantly costlier for both hospital and municipality costs compared to geriatric patients without dysphagia.

Keywords: elderly, swallowing disorders, cost analysis, hospital, municipality

Plain language summary

Dysphagia is a swallowing disorder, and the consequences may be aspiration, malnutrition, dehydration, social isolation, frailty, or death. The prevalence of dysphagia in geriatric patients is high, 50%, yet the costs of patients with dysphagia are unknown. Several studies document an increased length of stay in hospitals, high frequency of rehospitalization, and very high rates of mortality. Therefore, it is assumed that the costs for patients with dysphagia will be higher than for patients without dysphagia, hence the interest to bring focus on dysphagia. The current project estimates the annual mean cost of geriatric patients with dysphagia compared to geriatric patients without dysphagia. It concerns the patients hospitalized in the hospital and in the municipality (social care), including home care, training, and nursing. The results show

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that patients with dysphagia are, on average, significantly costlier than patients without dysphagia, both at the hospital and in the municipality. In the analysis, the data are adjusted for age, gender, and comorbidity. It is suggested that future research shall (potentially) clarify whether early screening for dysphagia could lead to reduced costs at the hospital and in the municipality.

Introduction

The prevalence of dysphagia is high in elderly patients. Studies show a high prevalence of dysphagia in, for example, patients with Parkinson's disease (68%), Alzheimer's disease (85.8%), and adults aged 65 years and older (up to 40%), and more than 60% of elderly institutionalized patients are identified with dysphagia.[1–3] Furthermore, as the number of people aged 65 years and older increases, the prevalence of diseases in the elderly population has generally increased over time. This will begin to pose challenges for the health care systems; therefore, it can be argued that dysphagia, and the costs thereof, should be brought into focus.[4,5]

A definition of dysphagia is "difficulties moving food from the mouth to the stomach."[6] Dysphagia is not a disease like others diseases, and a remarkable problem is an underestimation of how big a problem dysphagia is. A study shows that a large percentage of the patients having dysphagia is typically not diagnosed or treated. Reasons can be that the clinician fails to document all the patients' diagnoses or that dysphagia can be overlooked when it is not severe enough or not relevant for the current hospitalization.[7,8]

Dysphagia is also seen to have an impact on the patients' quality of life and psychological well-being by inducing low mood and even depression. Because of difficulties in swallowing, this parameter is especially affected during social activities that include eating. The elderly are seen to exhibit anxiety and panic while eating, and as a result, they may isolate themselves. The consequences of dysphagia may be aspiration, malnutrition, dehydration, social isolation, frailty, or death.[1,9]

To the best of our knowledge, no studies report specific information regarding the cost in geriatric patients with dysphagia. However, a study shows significantly higher costs for all inpatients diagnosed with dysphagia aged 45 years or older[10] and in stroke patients as well.[11] Several studies document an increased in hospital, high frequency of rehospitalization, and a very high rate of mortality.[7,12,13] It is assumed, therefore, that the costs for patients with dysphagia will be higher than for patients without dysphagia, which is why it is of interest to bring into focus. The costs may be related to hospitalization and also to the costs in the municipality (social care) before and after hospitalization. This study aimed to identify the cost of dysphagia in geriatric patients in Denmark, both in the hospital and in the municipality, controlling for age, gender, and comorbidities. The annual health care costs in the hospital and the municipality were compared in geriatric patients with dysphagia versus geriatric patients with no dysphagia 1 year before hospitalization, including the hospitalization where the patients were screened for dysphagia.

Materials and methods

This clinical retrospective prevalence study included patients consecutively hospitalized in the geriatric department of the North Denmark Regional Hospital. Data collection was carried out from March 1, 2016, to August 31, 2016. All patients who fulfilled the inclusion criteria of being 60 years old and older, hospitalized for a minimum of 24 hours, and able to cooperate in the test for dysphagia were included.

Data collection

Of 418 patients identified at the geriatric ward, 105 were excluded due to delirium, severe dementia, discharged within 24 hours, did not want to participate, were transferred to another department or hospital, were terminal, or deceased during hospitalization. This study included only patients living in three municipalities (Hjørring, Frederikshavn, and Brønderslev); therefore, the final study sample consisted of 258 patients (54% female, mean age 83.12 [SD: 7.78]). The patients were screened for dysphagia by experienced occupational therapists with the Volume-Viscosity Swallow Test and the Minimal Eating Observation Form-II conducted for each patient to assess dysphagia.

The Volume-Viscosity Swallow Test measures dysphagia with a volume of 5 mL, 10 mL, and 20 mL and the viscosities of water, nectar, and pudding.[14] The nectar viscosity was achieved by adding 1.2 g of the thickener Resource ThickenUp (Nestlé HealthCare Nutrition) to 100 mL of mineral water, and pudding viscosity was achieved by adding 6.0 g of the thickener. 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, and the saturation was measured with a pulse oximeter. One or more signs of impaired safety or efficacy indicated dysphagia.[14]

The Minimal Eating Observation Form- II scale includes nine items in three subscales: ingestion (eg, sitting position, manipulation of food on the plate, transport of food to the mouth), deglutition (eg, manipulation of food in the mouth,

swallowing, difficulties chewing), energy and appetite (eg, eats less than 3/4 of served portion, energy, appetite). Each item is scored with zero indicating normal eating or one indicating eating difficulty in each item.[15,16]

Comorbidity was measured by a Charlson Comorbidity Index score (CCI score) evaluating the 1-year mortality risk in patients. The higher the score, the higher the risk of mortality.[17,18] Functional status was measured by Barthel-100, and a higher score indicates a higher level of functional status.[19,20]

The collection of data on costs was performed following approval by the relevant authorities. The annual mean costs per patient at the hospital and in the municipality were calculated for patients with and without dysphagia. Costs for general practitioners and medicine were not included due to lack of access to data. The hospital costs were calculated based on detailed registrations of inpatient and outpatient hospital activities per patient including information on relevant Diagnosis Related Groups (DRG) cost weights (according to the Danish DRG, and Danish Ambulant Grouping System). The DRG cost weights are calculated for each diagnosis based on the average hospitalization. The hospital is paid the average cost for the reported diagnosis. The municipality costs were calculated based on registrations for the number of hours of nursing, home care, and occupational and physiotherapy for each patient multiplied by a mean hourly unit per hour per type of municipal health care service. The unit costs cover the total average municipality costs including overhead, all calculated based on unit costs from Hjørring and Frederikshavn Municipality. Unit costs for home care were DKK 384, for training DKK 686, and for nursing DKK 790. All costs were collected and calculated in Danish Krone (DKK), and the main results are reported as DKK and converted to EUR (1 EUR =7.44 DKK) and USD (1 USD =6.37 DKK).

Data analysis

The data analysis was based on the intention-to-treat principle, where the included patients remained in the study group in which they were placed. Differences between patients with dysphagia and patients without dysphagia were tested using the two-sample *t*-test. *p*-values were tested two-sided with an α value of 0.05. The association between the hospital and the municipality costs was examined with a multiple linear regression analysis, generalized linear model (GLM), adjusting for relevant variables (age, gender, and CCI). Assumptions for GLM were analyzed and met. The choice of distribution and link were tested. All data analyses were performed using STATA 14 (Stata Statistical Software: Release 14, StataCorp LP, College Station, TX, USA).

Ethics approval

The study was approved by the Danish Data Protection Authority (2015-200) and by the North Denmark Regional Committee on Health Research Ethics (N-20160007) which concluded that the study did not require patient informed consent to review their medical records.

Results

Sample characteristics

As presented in Table 1, the mean age of patients with dysphagia was 83.6 years, and 52.8% were female. The mean age of patients without dysphagia was 82.7 years, and 54.9% were female. The two groups did not differ significantly in terms of age, gender, CCI score, and number of hospital days. As illustrated in Table 1, patients with dysphagia had a significantly poorer functional level ($p<0.001$), lower body mass index score ($p=0.001$), and a lower average number of repetitions in the sit-to-stand test ($p=0.05$) compared with the patients who did not have dysphagia.

Association between dysphagia and costs

By the unadjusted analysis, the patients with dysphagia were significantly costlier than patients without dysphagia in both hospital ($p=0.013$) and municipality costs ($p=0.028$) 1 year before hospitalization, including the hospitalization where the patients were screened for dysphagia. After adjustment by GLM, patients with dysphagia were significantly costlier in both hospital ($p=0.013$) and municipality costs ($p=0.028$). The unadjusted and adjusted results are summarized in Table 2. Adjusted, the patients with dysphagia are DKK 27,347 (3,677 EUR, 4,282 USD) costlier than patients

Table 1 Characteristics of patients with dysphagia and no dysphagia

Characteristics	Dysphagia n=125	No dysphagia n=133	*p*-value
Female, n	66 (52.8)	73 (54.9)	0.738
Age, year	83.58 (8.3)	82.70 (7.3)	0.367
CCI score	2.38 (1.9)	2.30 (2.2)	0.768
Number of hospital days	9.90 (11.7)	8.32 (7.4)	0.194
Barthel-100 score[a]	36.40 (19.4)	53.86 (21.5)	0.001
BMI score[a]	24.56 (5.1)	27.67 (5.2)	0.001
Sit-to-stand test[a]	0.71 (2.35)	1.76 (3.79)	0.05

Notes: Data shown as n (%) or mean (SD). [a]Missing data: Barthel-100 score; intervention group based on 94 patients and control group is based on 88 patients. BMI score; intervention group is based on 52 patients and control group is based on 65 patients. Sit-to-stand test; intervention group is based on 70 patients and control group is based on 75 patients.

Abbreviations: CCI score, Charlson Comorbidity Index score; BMI score, body mass index score; SD, standard deviation.

Table 2 Unadjusted and adjusted outcomes in DKK

Costs	Dysphagia	No dysphagia	Unadjusted difference	Adjusted difference	*p*-value
Mean hospital (SE)	108,793 (10,638)	79,222 (6,058)	29,752	27,347 (11,000)	0.013
Mean municipality (SE)	151,796 (17,856)	113,901 (14,610)	37,896	46,043 (20,923)	0.028

Note: Costs are reported in 2016 Danish Krone (DKK).
Abbreviation: SE, standard error.

without dysphagia at the hospital, and DKK 46,043 (6,192 EUR, 7,209 USD) more costly in the municipality.

Discussion

The present study aimed to investigate the cost at the hospital and in the municipality in geriatric patients with dysphagia versus geriatric patients without dysphagia 1 year before hospitalization controlled for age, gender, and CCI. The analyses did not adjust for functional status (Barthel-100), body mass index score, and sit-to-stand test since these, from a clinical perspective, do not fulfill the criteria for being confounders. Instead, these variables are seen as independent risk factors for an increase in costs.[21] In our patient sample, dysphagia was significantly associated with higher costs at the hospital and in the municipality. Dysphagia in geriatric patients causes severe complications, which lead to frailty and institutionalization, increasing the costs.[1] In this study, both the hospital and municipality costs are calculated as an annual mean cost, whereby seasonal variation in the costs during a year are taken into account. The study was conducted to present a naturalistic real cost of dysphagia; however, because of the high percentages of excluded patients, this is difficult to conclude. In accordance with the choice of perspective, costs from the general practitioner in the primary sector should have been included. The primary sector covers the general practitioner and home care. It might be possible to argue that including costs in the primary sector and medical costs would give a more precise insight into whether patients with dysphagia are costlier compared to patients without dysphagia in the primary sector. The limitation of not including costs in the primary sector and medical costs probably underestimates the costs. Because patients with dysphagia have a lower functional level, need more home care, and are more often hospitalized than geriatric patients without dysphagia, the costs are probably underestimated. Bonilha et al.[11] document that patients with post-stroke dysphagia are costlier in terms of hospital, nursing home, and home health, and this can support our hypothesis regarding the underestimated costs. Studies also suggest that patients with dysphagia have a longer length of stay.[7,13] Hospital costs in Denmark are settled per hospitalization and not per day, which supports the underestimation of hospital costs for patients with dysphagia. The costing perspective of this study is Danish society, which is the primary payer through the tax where the government pays for all public health services at the hospital. The hospital is paid in accordance with the registered DRG and allows all citizens to be treated equally.[22]

Several studies suggest that dysphagia can be an overlooked disease and patients are not diagnosed and treated ideally.[7,8,10,11] This study included all hospitalizations, both relevant and not relevant for dysphagia, over the last year starting on the date of screening, which can result in both an underestimation and overestimation of the costs. It would have been optimal if only the hospitalizations related to dysphagia were included in the study, but dysphagia is typically hidden under other diseases making it almost impossible to retrieve the specific hospitalizations related to dysphagia. Even though this is a limitation of this study, the result is seen to be representative of the included patients due to the assumption that patients with dysphagia are diagnosed with several conditions and, in general, are costlier compared to other studies.[10,11] In the absence of cost studies, it is unclear which clinical practices and patient-related variables contribute most to the cost of dysphagia management.

In 2016, 19,356 patients were registered in the Danish database for geriatric patients.[23] These patients are not systematically screened for dysphagia, but with the results in the present study, it can be assumed that 9,388 (48.5%) of the hospitalized patients had dysphagia. With this assumption, the annual total cost for patients with dysphagia at the hospital is approximately DKK 1,021 billion compared to DKK 790 million for patients without dysphagia. Adjusted, geriatric patients with dysphagia are approximately DKK 257 million costlier annually than patients without dysphagia at the hospital. Additionally, the annual total cost for patients with dysphagia in the municipality is approximately DKK 1,425 billion compared to DKK 1,135 billion for patients without dysphagia in the municipality. Adjusted, geriatric patients with dysphagia are approximately DKK 432 million costlier annually than patients without dysphagia in the municipality.

In the present study, patients with delirium and dementia were not screened and included in the study, which may have influenced the result. This is supported by a study documenting that the risk of dysphagia considering delirium and dementia are 59.4% and 73.8%, respectively.[12] The gold standard for assessing for dysphagia is videofluoroscopy or fiberoptic endoscopic evaluation of swallowing. Both methods can detect silent aspiration, which is not possible with the bedside screening that was used in this study. The prevalence of dysphagia is therefore assumed underestimated.

A cost-effectiveness analysis of an exercise program that focuses on the muscles of the neck in patients having chemotherapy with side effects such as swallowing disorders has been conducted. A Markov model showed that the probability of the exercise program being cost-effective was 83%, with a threshold of 20,000 pounds per quality-adjusted life years compared to usual care. This indicates that exercise during dysphagia has an effect and it could, therefore, be of interest to investigate exercise as a treatment for dysphagia.[24]

Conclusion

We determined the cost at the hospital and in the municipality for geriatric patients with dysphagia to be significantly higher than for geriatric patients who did not have dysphagia. Future research should calculate all costs and also attempt to reveal whether an early screening for dysphagia at the hospital or in the municipalities can lead to savings.

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Disclosure

The authors report no conflicts of interest in this work.

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