

Original Article

Profile of the acutely admitted geriatric patient

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ABSTRACT

INTRODUCTION. The prevalence of age-related physiological impairments and conditions may influence clinical practice protocols on care delivery, risk assessment and current facilities. We aimed to characterise the acutely admitted geriatric patient using medical records and comprehensive assessments performed within 24 hours of admission.

METHODS. Patients aged ≥ 65 years were included from the acute ward at Bispebjerg Hospital, Denmark, ($n = 1,071$). Body composition was investigated using bioelectrical impedance analyses. Physical function was assessed using handgrip strength and sit-to-stand ability. Cognitive impairment and malnutrition were assessed using questionnaires. Self-reported fall incidents within the year leading up to the admission were obtained. Clinical information was obtained from medical records.

RESULTS. Severe comorbidity and polypharmacy were present in 58% and 73% of the cohort, respectively, with men showing a higher prevalence of severe comorbidity. Moderate-to-severe cognitive impairment and risk of severe malnourishment were present in 27% of the patients. Low muscle mass and muscle strength were present in 33% and 47% of the patients, respectively, and low muscle strength was more prevalent in men than women. More than 50% of the patients had fallen within the past year.

CONCLUSIONS. Along with highly prevalent multimorbidity and polypharmacy, we demonstrate that a substantial number of patients are cognitively and functionally impaired, are malnourished and have low muscle mass. Thus, they are at high risk of falls and deconditioning during hospitalisation.

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TRIAL REGISTRATION. Not relevant.

In 2018, patients aged ≥ 65 years constituted $> 45\%$ of all hospital admissions in Denmark [1]. With an increase in the proportion of older people in the general population, Danish healthcare is facing increased pressure in years to come. Acute illness in older patients is often accompanied by pre-existing geriatric conditions such as impairments in physical function, malnutrition, polypharmacy and decreased cognitive function prior to hospitalisation. These conditions, in turn, are predictors of adverse outcomes such as increased length of hospital stay, admission to residential care and mortality [2, 3]. Furthermore, impairments in instrumental activities of daily living, impairments in cognitive function, malnutrition and comorbidities are independent risk factors of functional decline during hospitalisation [4].

The acutely admitted geriatric patient population represents an extremely heterogeneous group with varying levels of physical and cognitive function, differences in body composition and a diverse range of medical conditions. The prevalence of various physical and cognitive impairments and conditions related to increased age may influence clinical practice protocols regarding care delivery, risk assessment, current facilities at acute and geriatric wards, and staff training to facilitate identification of patients at risk [5].

We aimed to describe the profile of the acutely admitted geriatric medical patient through comprehensive measures of physical function, body composition, malnutrition and cognitive status while utilising data obtained from the medical records regarding diagnoses, polypharmacy and residential status.

Methods

Setting and population

This study is based on the Copenhagen PROTECT study, which included 1,071 patients aged ≥ 65 years who were acutely admitted to the Acute Medical Ward at Bispebjerg Hospital between November 2019 and November 2021 [6]. Exclusion criteria were inability to communicate in Danish, terminal illness, holders of a temporary civil registration number, inability to provide informed consent, judged medically contraindicated by health professionals, isolation-requiring droplet or airborne infection, or being admitted for > 24 hours prior to baseline assessment [6]. In total, 3,363 patients were assessed for eligibility among whom 826 declined participation and 1,466 patients were excluded based on the above-mentioned exclusion criteria. Assessments were performed within 24 hours of admission. Written informed consent was obtained from all patients. The study was approved by the local ethics committee of Copenhagen and Frederiksberg, registered with Clinicaltrials.gov (NCT04151108) and conducted in accordance with the Declaration of Helsinki.

Body composition

Muscle mass was investigated using direct segmental multi-frequency bioelectrical impedance analyses (Inbody S10; BioSpace Co., Ltd, Seoul, South Korea) and reported as appendicular lean mass adjusted for height², denoted the Skeletal Muscle Index (SMI). Low muscle mass was evaluated using the cut-offs $< 7.0 \text{ kg/m}^2$ and $< 5.5 \text{ kg/m}^2$ for men and women, respectively, as suggested by the European Working Group on Sarcopenia in Older People [7].

Muscle strength and physical function

Handgrip strength was assessed using a hand-held dynamometer (Model SH1001; SAEHAN Corporation, Yangdeok-Dong, Masan, South Korea) as the highest value of three attempts with the dominant hand, as previously described [6]. Low hand grip strength was evaluated using the cut-offs $< 27 \text{ kg}$ and $< 16 \text{ kg}$ for men and women, respectively [7]. Physical function was evaluated as the sit-to-stand ability and categorised as i) ability to rise from a chair with the arms folded across the chest, ii) ability to rise using the armrest or iii) inability to rise independently from a chair [6].

Self-reported data

Cognitive impairment was evaluated by use of the Orientation, Memory and Concentration test, and patients were classified as having no cognitive impairment, mild impairment, moderate impairment or severe impairment [8]. Self-reported current smoking was classified as a dichotomous variable (current smoker/non-smoker). Self-reported fall incidents within one year of admission were classified as no falls within the one year, 1-3 falls, or ≥ 4 falls. Risk of malnutrition was assessed in a subsample ($n = 658$) using the Short Nutritional Assessment Questionnaire and reported as no malnourishment, moderately malnourished or severely

malnourished [9].

Data from medical records

Information about the patient's number of medications was assessed by counting all medications prescribed in the system, except for multivitamins, supplementary nutrition, eardrops, eyedrops, temporary antibiotic treatment, and lotions and ointment from the initial medical anamnesis. Polypharmacy was reported if the number of medications was > 5 [6]. Comorbidity was evaluated using the Charlson Comorbidity Index (CCI), with a CCI of 1-2 constituting mild comorbidity, 3-4 constituting moderate comorbidity and ≥ 5 constituting severe comorbidity [10]. Residential dependency before admission was defined as either living in the patient's own home or a nursing home. Additionally, patients living in their own homes were classified as co-habiting or living alone.

Statistics

Descriptive statistics were performed to determine mean values, variance and prevalence rates of outcomes and reported as mean \pm standard deviation or relative frequency (%). Differences in patient characteristics between the sexes were investigated using independent t-tests, χ^2 , and Z-tests of proportions with p values were adjusted according to the Bonferroni method. Statistical significance was set at $p < 0.05$. Data were analysed using IBM SPSS Statistics, version 25.

Trial registration: not relevant.

Results

Patient characteristics are presented in **Table 1**. The mean age was 78.8 years; 53% were female, and $> 90\%$ were admitted from their own homes. Polypharmacy was present in 71-75% of the acutely admitted patients, with no sex differences. More than half of the patients were found to have a CCI score ≥ 5 , with a significantly higher proportion in male than female patients. Moderate malnourishment was present in 8.8% and 10.2% of female and male patients, respectively. Severe malnourishment was present in 24.3% and 30.6% of female and male patients, respectively. Moderate-to-severe cognitive impairment at admission was present in 25-28% of the patients, with no sex differences. A significant sex difference was observed in residential status, with 50.2% of male patients living alone, whereas 79.6% of female patients lived alone.

TABLE 1 Characteristics of acutely admitted geriatric medical patients.

	Men (N _m = 503)	Women (N _w = 568)	p value between sexes
Age, mean ± SD, yrs	77.6 ± 7.3	79.9 ± 8.1	< 0.001
Height ^a , mean ± SD, cm	174.8 ± 6.3	158.5 ± 6.2	< 0.001
Weight ^b , mean ± SD, kg	77.6 ± 16.5	65.3 ± 15.3	< 0.001
Smoking ^c , %	23.5	19.9	0.18
Dementia diagnosis, %	7.6	5.6	0.20
<i>Charlson Comorbidity Index, %</i>			0.013
Mild comorbidity	3.8	2.8	
Moderate comorbidity*	33.8	42.4	
Severe comorbidity*	62.4	54.8	
EWS at admission, mean ± SD	2.5 ± 2.4	2.4 ± 2.4	0.33
Polypharmacy at admission, %	71.2	74.5	0.23
<i>Malnourished at admission^d, %</i>			0.12
Moderately	10.2	8.8	
Severely	30.6	24.3	
<i>Cognitive impairment at admission^e, %</i>			0.39
None	27.6	30.3	
Mild	47.2	41.6	
Moderate	19.1	21.8	
Severe	6.1	6.2	
<i>Residential status^f, %</i>			< 0.001
Living alone*	50.2	79.6	
Co-habiting*	49.8	20.4	
<i>Residential dependency, %</i>			0.15
Own home	93.8	90.7	
Nursing home	6.2	9.3	

EWS = Early Warning Score; SD = standard deviation.

*) Between the 2 groups across categories.

a) n = 799.

b) n = 750.

c) n = 969.

d) n = 658.

e) n = 976.

f) n = 987.

Anthropometric and functional characteristics are presented in **Table 2**. The mean SMI was 7.6 ± 1.3 and 6.1 ± 1.2 for men and women, respectively, and men had a significantly higher SMI than women. A low SMI was present in approximately 33% and 32% of men and women, respectively, with no differences between the sexes. The mean HGS was 27.0 ± 8.9 and 17.1 ± 6.2 for men and women, respectively, with men displaying a significantly higher HGS than women. Low HGS was present in approximately 51% and 44% of men and women, respectively, and men had a significantly higher prevalence of low HGS. Approximately 31% of the patients included in the study were unable to rise from a chair without using the armrest, and another 12-13% were unable to rise independently. The predominant type of walking aid used was a walker or a rollator, used in 37% and 48% of men and women, respectively. Around 55% of all acutely admitted older patients had fallen within one year of

their admission. Among these, 17% had had ≥ 4 falls within one year.

TABLE 2 Anthropometric and functional characteristics of acutely admitted geriatric medical patients.

	Men (N _m = 503)	Women (N _w = 568)	p value between sexes
<i>Use of walking aid^a, %</i>			
No walking aid*	37.6	31.5	0.04
Supported by furniture	6.7	8.2	0.30
Walking cane	19.3	15.2	0.15
Walker/rollator*	36.8	48.3	< 0.001
Wheelchair/scooter	10.4	9.7	0.84
<i>SMI^b</i>			
SMI, mean \pm SD, kg/m ²	7.6 \pm 1.3	6.1 \pm 1.2	< 0.001
Low SMI, %	33.4	32.3	0.76
<i>HGS^c</i>			
HGS, mean \pm SD, kg	27.0 \pm 8.9	17.1 \pm 6.2	< 0.001
Low HGS, %	50.5	43.6	0.03
<i>Fall incidents within the last year of admission, %</i>			0.98
0	44.9	45.3	
1-3	38.4	37.7	
≥ 4	16.7	17.0	
<i>Sit-to-stand ability^d, %</i>			0.95
Able to rise independently from a chair	57.2	56.1	
Able to rise from a chair using the armrest	30.6	31.0	
Not able to rise independently	12.2	12.9	

HGS = hand grip strength; SD = standard deviation; SMI = Skeletal Muscle Index.

*) Between the 2 groups across categories.

a) n = 978.

b) n = 640.

c) n = 1,030.

d) n = 630.

Discussion

The description of the acutely admitted geriatric patient may influence clinical practice protocols regarding care delivery, risk assessment and current facilities at the acute and geriatric wards.

Comorbidity, polypharmacy and cognitive impairment

Multimorbidity assessed by CCI is associated with increased mortality and is a well-known predictor of hospitalisation, readmission, reduced functional status, lower quality of life and risk of functional decline during hospitalisation [4, 11]. We showed that acutely admitted geriatric patients are highly comorbid. Patients with multimorbidity are particularly challenging due to increased vulnerability, complex disease management and

prevalence of polypharmacy. These conditions may, in turn, lead to poor medication management and adverse drug events [12]. Polypharmacy was prevalent in > 70% of the cohort. This appears to be a large proportion compared to a previous study, using the same definition of polypharmacy, conducted in the general public, which found a prevalence of 51% in older Danish citizens \geq 75 years of age [13]. This discrepancy may possibly arise from differences in the study population as the geriatric patients may represent a more frail and comorbid segment of the general older Danish population. A recent randomised clinical trial found that a comprehensive medication review decreased the number of medicines and improved health-related quality of life and four-month survival in Danish geriatric outpatients [14], highlighting the benefit of cross-sectoral communication and medication reviews when treating acutely admitted geriatric patients.

Moderate-to-severe cognitive impairment was present in around one in four of the patients in the present study. This is consistent with a previous study, which found that cognitive impairment was present in 26% of older patients presenting at the emergency department [15]. Whether the cognitive impairment observed in our study was caused by delirium or a more habitual cognitive impairment remains unknown. Nonetheless, cognitive impairments will reduce the patient's ability to adequately recognise and communicate medical symptoms and potential side effects of medication. Furthermore, cognitive impairments are associated with longer hospitalisation, increased mortality and an increased susceptibility to in-hospital falls and functional decline during hospitalisation [16].

Malnutrition, anthropometry and physical function

Our data confirm that malnourishment is a common syndrome. Malnutrition is associated with reduced muscle mass. This, in turn, is associated with decreased physical function, cognitive impairments, medical complications and a reduced effect of medical treatment during hospitalisation [17]. Furthermore, malnutrition or being at risk of malnutrition is associated with an increased risk of functional deconditioning during hospitalisation [4].

Sarcopenia, the combination of low muscle strength and muscle mass, is recognised as a common geriatric syndrome and is associated with adverse outcomes such as risk of falling, disability, disease, cognitive impairment, lower quality of life and mortality [7]. We demonstrated that low muscle mass was present in approximately a third of the patients, while low muscle strength was present in 51% and 44% of the acutely admitted men and women, respectively. Furthermore, many patients needed assistance when walking, with a stroller being the predominant walking aid used in this population. Notably, measures of physical function are not only affected by muscle strength and muscle mass but also involve balance, other neurological inputs, cardiovascular factors and motivation. We demonstrated that many patients could not rise from a chair without using the armrest or receiving personal help. As these patients depend on others for transfer and walking, there is an increased need for healthcare personnel to facilitate their mobility recovery as these patients are also at increased risk of deconditioning during hospitalisation [4, 18]. Furthermore, immobilisation during hospitalisation increases the risk of deep venous thrombosis, urinary incontinence and pressure ulcers [18]. More than half of the patients in our study had fallen within one year of their admission. A history of falling, urinary incontinence and walking instability are all risk factors for in-hospital falls [19]. Thus, designing acute and geriatric wards to manage and consider the considerable number of patients at risk of falling is of utmost importance.

Limitations

This study included patients aged 65-102 years with varying levels of cognitive and physical function. Even so, characteristics of the acutely admitted geriatric patient may vary across regions and nations. In addition, terminal patients were excluded from the study, and the prevalence of the abovementioned conditions could

therefore be higher. Another possible limitation of the study is the use of self-reported data, which may potentially be affected by recall bias. Regarding self-reported falls, remembering the exact time of prior falls within the year leading up to admission may be problematic. Lastly, it is not possible to establish causation for the abovementioned conditions.

Conclusions

It is essential for the healthcare system to acknowledge the special needs of acutely admitted geriatric medical patients due to an increasing ageing patient population. Comorbidity, polypharmacy, malnutrition, cognitive impairment and reduced physical function were all highly prevalent in our population of acutely admitted elderly patients. As these are all independent risk factors for functional decline during hospitalisation [4], it is safe to assume that the combined effect of these conditions can be extremely detrimental. Unsurprisingly, 35% of older patients lose independence in one activity of daily living (ADL) as a result of medical illness and hospitalisation [20]. Developing a new ADL dependency represents a considerable challenge for both patients and healthcare personnel. As this challenge is only expected to increase with the rise in the geriatric patient population, special emphasis should be placed on early identification of risk factors and mobilisation of older patients at risk during and after their hospitalisation.

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