

Cumulated Ambulation Score to evaluate mobility is feasible in geriatric patients and in patients with hip fracture

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ABSTRACT

INTRODUCTION: Regaining basic mobility independence is considered important for elderly hospitalised patients. The Cumulated Ambulation Score (CAS) is a valid tool for evaluating these patients' basic mobility (getting in and out of bed, sit-to-stand from a chair and walking) in orthopaedic wards, and its use is recommended in Denmark for patients with hip fracture. The aims of the present study were to evaluate the feasibility of the CAS in a geriatric ward and to describe its use after hip fracture in Denmark.

MATERIAL AND METHODS: A total of 101 consecutive patients (with a mean age of 84.9 (standard deviation 7.2) years) were evaluated with the CAS upon admission and at discharge from a geriatric ward, while data concerning the use of the CAS after hip fracture were collected from national Danish reports.

RESULTS: All geriatric patients could be evaluated with the CAS. A total of 41% were independent in terms of basic mobility at admission and 83% of patients at discharge from the ward ($p < 0.001$). Patients who were not independent in basic mobility upon admission died more often during admission or were more often not discharged to their own home than patients who were independent in basic mobility. National data from the year 2010 showed that the CAS was reported by 21 (78%) of the 27 hospitals and used in 92% of the hospitals that will be treating patients with hip fracture in the future.

CONCLUSIONS: In geriatric wards, the CAS is a feasible tool for evaluating all patients' basic mobility, and we recommend that it be used in other settings and at all hospitals treating patients with hip fracture.

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Regaining independent mobility has proven crucial for elderly hospitalised patients to ensure their early return to previous lifestyle [1] and discharge directly to their previous residence after hip fracture surgery [2]. Consequently, there is a need for easily applicable measurements that allow clinicians to monitor the daily basic mobility level throughout the hospital stay. The Cumulated Ambulation Score (CAS) is a simple tool that serves

this purpose and it moreover facilitates interdisciplinary communication and has proven to be valid for the evaluation of patients with hip fracture, including those with impaired cognitive function [3, 4]. The CAS measures the level of independence in getting in and out of bed, sit-to-stand from a chair and walking with or without an appropriate walking aid – activities that often are or should be considered minimum criteria for a patient to be discharged to his or her own home. A strong correlation has been found between the CAS during the first post-operative days after hip fracture and discharge to previous residence and 30-day mortality [3]. In addition, the CAS has proven capable of detecting differences between patient groups in relation to anaemia, pain, type of fracture, age and previous functional level [2, 5-7], and it has been employed as an outcome measure in a randomized controlled trial [8] on the use of blood transfusion in patients with hip fracture. Finally, the CAS has been used for the evaluation of patients with total knee replacement [9, 10].

Furthermore, the CAS is recommended for the evaluation of basic mobility in the National Reference Program and since 1 March 2010 its use has also been advocated in the National Indicator Project (NIP) for patients with hip fracture in Denmark [11]. At present, the CAS is also being evaluated in 14 departments in the Swedish equivalent to the NIP, RIKSHÖFT.

Physiotherapists working in hospitals and communities are using different measurements to test patients. The Timed Up & Go (TUG) test [12] and the Chair Stand-Test (CST) [13] are among the most frequently used tests. These two tests have proven valid for a large number of patient groups and for the elderly in general, but a disadvantage of these tools is that they require that the patient can understand an instruction and is able to stand up from a chair and/or walk without assistance, which is not the case for all hospitalized patients [14, 15]. Thus, there is a need for a simple and easily applicable scoring system such as the CAS, which can be used to monitor the basic mobility level of all elderly hospitalised patients.

The purpose of this study was, first, to examine the

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 TABLE 1

Residential status and functional changes from admission to discharge for patients in a geriatric ward. Data are presented as number (% of total) and as median (25-75% quartiles).	Variable	Admission (n = 101)	Discharge (n = 93)	Admission + discharge	p
	Admitted from and discharged to own home	99 (98)	72 (77)		< 0.001
	<i>Independent in terms of</i>				
	Getting in and out of bed (CAS = 2)	59 (58)	77 (83)		< 0.001
	Sit-to-stand-to-sit in a armchair (CAS = 2)	66 (65)	85 (91)		< 0.001
	Walking with or without an aid (CAS = 2)	60(59)	84 (90)		< 0.001
	Basic mobility (CAS = 6)	41 (41)	77 (83)		< 0.001
	Timed Up & Go, seconds	64 (63) 26.5 (17.3-42.3)	65 (70) 20.0 (14.0-28.0)	55 (59)	
	<i>Number of sit-to-stands in 30 seconds</i>				
	Use of chair without arms	19 (19) 6 (6-9)	18 (19) 8.5 (5-10)	16 (17)	0.154
	Use of chair with arms	52 (51) 4 (3-6)	50 (54) 5 (3.75-8)	42 (45)	< 0.001

CAS = Cumulated Ambulation Score.

feasibility of the CAS in patients admitted to a geriatric ward; second, to describe the use of the CAS as a recommended indicator of basic mobility in the NIP for patients with hip fracture in the first registration period.

MATERIAL AND METHODS

Procedure

A total of 101 consecutive patients admitted to a 20-bed geriatric ward were enrolled in this descriptive cohort study from the beginning of November 2010 to the end of February 2011.

Patients performed the functional tests, the TUG [12] as fast as safely as possible, and the CST [13] during the first three days after admission and upon discharge to provide data for the national Danish geriatric quality database "Den landsdækkende kvalitetsdatabase for geriatri" [16]. In addition, patients were assessed with the CAS at the initial physiotherapy session and then approximately every third day until independence in basic activities was achieved or until discharge for those who did not reach this level. A national report was published with a view to describing, among others, the use of the CAS after hip fracture in Denmark between 1 March and 30 November 2010 [17].

Cumulated Ambulation Score

The CAS describes the patient's independence with regard to three activities (getting in and out of bed, sit-to-stand-to-sit from a chair, and walking). Each activity is assessed on a three-point ordinal scale from 0-2 (0 = Not able to, despite human assistance and verbal cueing, 1 = Able to, with human assistance and/or verbal cueing from one or more persons, 2 = Able to safely, without human assistance or verbal cueing, use of a walking aid allowed) resulting in a total daily CAS score ranging from zero to six [4].

Timed Up & Go-test

All patients were given a practice test followed by a

timed test [12] where we recorded the time (in seconds) it took each patient (as quickly and safely as possible) to rise from a chair with arms (chair seat height, 45 cm), walk 3 m to a line drawn on the floor, and return to the chair and sit down. The time was measured from a seated position (back against the backrest) with a stopwatch started on the command "ready – go" and stopped again when the seated position was regained. Patients used their normal walking aid (if any), and verbal cuing during the test was allowed if necessary, but no individual physical assistance was allowed.

Chair stand-test

The CST was performed with the person sitting on a chair (height 45 cm) without arms, but a chair with arms was used if the patient was unable to stand without the use of the armrests (modified CST). The patient was instructed to stand and sit from a seated position as many times as possible within 30 seconds in both versions [13]. The number of stands from the chair was recorded as the result.

The geriatric ward

A geriatric consultant most often refers patients at the geriatric ward from the acute care unit or other ward at the hospital. Geriatric patients admitted are characterized by multi-morbidity, need for medical examination and/or an impaired physical and cognitive level, which means that they cannot manage in their own homes under habitual conditions and therefore need a multidisciplinary rehabilitation intervention on a daily basis. Interdisciplinary conferences are held four times a week, where goals and plans for the patient's further rehabilitation are discussed. During hospitalization, patients receive physiotherapy 3-4 days during weekdays. The therapy focuses on improving their function, strength and balance. All patients are screened by an occupational therapist who assesses their need for rehabilitation of

ADL functions. This is followed by occupational training sessions, if relevant.

The National Indicator Project for patients with hip fracture in Denmark

Since 1 March 2010, the CAS has been recommended for the evaluation of basic mobility before the fracture and prior to discharge after hip fracture surgery as one of ten indicators for the quality of treatment for patients with hip fracture in the NIP [18]. Seven codes for specifying the CAS 0-6 levels are available for clinicians reporting to the NIP; a score of 0 points indicates that the patient is bedridden and a score of 6 that the patient has an independent basic mobility level. The use of the CAS was not obligatory, so the different hospitals treating patients with hip fracture in Denmark could choose to use other scores to evaluate basic mobility.

Statistics

Categorical data were analysed using chi-square test, while paired t-test or Wilcoxon Signed rank test was used to illustrate changes over time for continuous variables. $p < 0.05$ was used as significance level, and all analysis were performed with SPSS, version 19.0.

RESULTS

Geriatrics

The 101 consecutively admitted patients (74 women, 27 men) at the geriatric ward had a mean (SD) age of 84.9 (7.2) years. The primary reason for hospitalization was medically illness ($n = 56$, 55%), falls or decreased functional level ($n = 42$, 42%) and surgical illness ($n = 3$, 3%). Eight of the 101 patients died during hospitalization.

Most of the patients (99%) were originally admitted from their own home to the hospital, but 32 of the 101 patients had stayed at other hospital wards before being referred to the geriatric ward. Thus, the total length of hospital stay was a mean (SD) of 21 (15.5) days versus 17 (12) days in the geriatric ward. Forty-two of the 101 (41%) patients had a CAS level of independence (CAS = 6) at the initial physiotherapy assessment, while the independence level of the three CAS activities ranged from 58-65% at the initial assessment and had increased significant to 83-91% at the final assessment in the 93 patients who were alive at this time (Table 1 and Figure 1). Improvements ($p < 0.001$) were also noted for patients able to perform the functional tests, the TUG and the CST with armrests (modified) upon admission and at discharge (Table 1).

Patients not independent in terms of basic mobility upon admission (CAS < 6) died more often during admission (7 out of 8 who died were not independent) than those with a CAS = 6 upon admission, while in-hospital mortality was not significantly related to gender or age

($p > 0.5$). Correspondingly, patients with a CAS < 6 upon admission were more often not discharged to their own home (13 out of 19 not discharged to own home) than those who were independent.

Orthopaedics

The national NIP report [17] showed that in the first period, the CAS as a recommended indicator was being used in 21 (78%) of the 27 hospitals at which more than 10 patients with hip fracture were admitted (Table 2). Follow-up telephone contacts (August-October 2011) to the six hospitals with no reported CAS data prior to discharge showed that one hospital started using the CAS after this contact, as 1 January 2011 one hospital stopped treating this patient group, two hospitals used the CAS systematic, but data were not reported, and that two hospitals did not use the CAS and had no plans of doing so (Table 2).

Overall, the basic mobility level was measured prior to discharge in 3,990 (83%) out of a total of 4,821 patients older than 65 years of age when those who died during hospitalization were excluded (Table 2). The CAS was used in 78% out of the 3,990 patients whose basic mobility was measured. This figure varied from 52% to 99% of patients in the five Danish regions (Table 2). The CAS 0-6 data reported to the NIP showed that, on average, 62% of the patients were not independent in terms of their basic mobility (CAS < 6) upon discharge from hospital; a figure that ranged from 57% to 67% for the five regions (Table 2).

FIGURE 1

Percentage of patients independent in bed, chair and walk transfer, and basic mobility (Cumulated Ambulation Score (CAS) = 6) at time of admission and at discharge for geriatric ward patients.

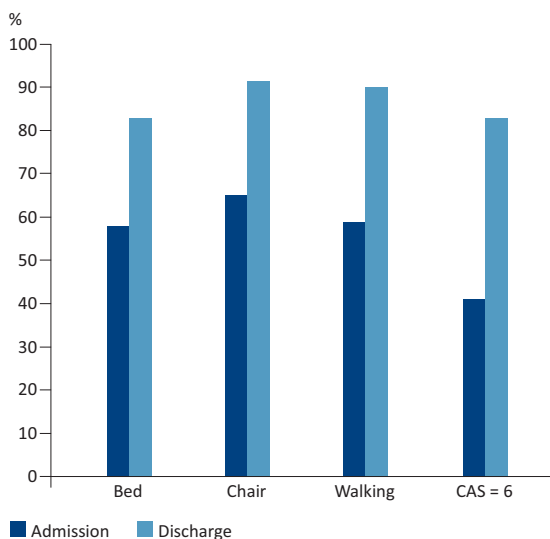


 TABLE 2

Use of the Cumulated Ambulation Score in the National Indicator Project for patients with hip fracture in Denmark from 1 March to 30 November 2010. Data are presented as number (percentage).

Region	Total	Capital	Zealand	South-Denmark	Central-Jutland	North-Jutland
All patients	5,143	1,434	810	1,196	1,097	606
Patients alive and discharged	4,821	1,321	757	1,133	1,038	572
Patients alive and with a basic mobility evaluation at discharge	3,990 (83)	1,007 (76)	596 (79)	1,003 (89)	961 (93)	423 (74)
Patients where the CAS was used for reporting basic mobility at discharge	3,099 (78)	994 (99)	508 (85)	520 (52)	665 (69)	412 (97)
Patients independent in basic mobility at discharge (CAS = 6)	1,161 (38)	374 (38)	203 (40)	188 (36)	218 (33)	178 (43)
Hospitals with more than 10 patients in the period	27	6	5	6	6	4
Hospitals not reporting the CAS 0-6 score	6		1 ^a	3 ^{b, c}	2 ^{c, d}	

CAS = Cumulated Ambulation Score

a) One hospital did not use the CAS, but do not treat patients with hip fracture after 1 January 2011.

b) Two hospitals did not use the CAS and have no plans of using the score.

c) One hospital in each of the two regions used the CAS systematically, but data were not reported to the National Indicator Project

d) One hospital did not use the CAS, but indicated that they would start using it after telephone contact from the first author of the paper.

In addition, the pre-fracture basic mobility level for which data were obtained by asking patients or their caregiver was reported in 3,812 (74%) of the total of 5,143 patients admitted during the registration period. The CAS had been used in 2,857 (75%) of the 3,812 patients [19].

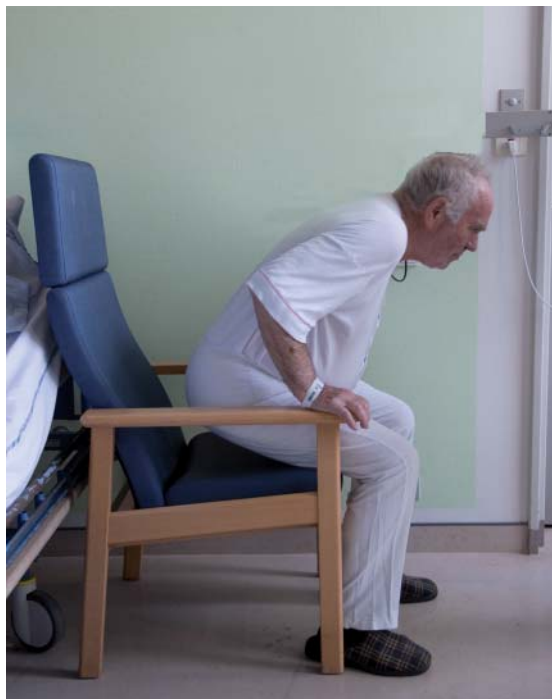
DISCUSSION

The CAS proved valid for monitoring the basic mobility of all 101 patients admitted within a four-month period, while approximately 60% of the patients were assessed twice with the TUG and/or the CST. Our findings show that patients who died in hospital or were not dis-

charged to their previous residence more often had a CAS < 6 upon admission than patients who were functionally independent.

Still, the CAS cannot stand-alone because it does not quantify the mobility level of patients who were independent in terms of basic mobility at the first physiotherapy assessment, and therefore is not able to monitor any improvements in their basic mobility level over time. We therefore propose that in addition to the two functional tests, the TUG and the CST (modified), "the geriatric test battery" be supplemented with the CAS which proved well-suited to measure changes over time for those able to perform. As the CAS is already being used in other patient groups, it should be considered an interdisciplinary score whose use may enhance communication between doctors, nursing staff, physiotherapists and other relevant staff members. The CAS is subsequently used as a physiotherapeutic tool for the initial, on-going and final assessment of all adult patients who are referred to physiotherapy at the study hospital.

The results of the first report that includes the CAS as a recommended NIP indicator for assessing the basic mobility level prior to discharge in patients with hip fracture in Denmark seem very positive. The score was thus used as an indicator at 21 out of 27 hospitals and in 78% of the patients whose basic mobility levels actually were reported. At present, patients with hip fracture are being treated at 25 different orthopaedic wards in Denmark, and if all departments using the CAS reported data to the NIP, then 23 out of 25 hospitals would contribute with comparable NIP data for the basic mobility level. This gives clinicians the possibility to measure the effect of changes in the treatment offered at each hospital and it allows comparison of results across hospitals. For such comparison to be valid, the CAS level prior to the fracture would have to be recorded as would the



Geriatric patient.
Photo by Jesper Westphal Nielsen.

CAS level at discharge. These data would allow comparison of the number of patients who were discharged from the orthopaedic wards with the same basic mobility level as the one they had before suffering a hip fracture.

The term "basic mobility at admission" is used in NIP forms as an expression of the pre-fracture mobility level. It cannot be excluded that on this basis some patients are given a wrong score that is lower than their natural level, and it is therefore recommended that the wording in the NIP schedules be changed to "Basic mobility prior to the present hip fracture".

Still, we find it remarkable that only 1,161 (37%) out of 3,099 patients assessed in terms of the CAS score in the five Danish regions had an independent basic mobility level (CAS = 6) at discharge from hospital as compared with 83% of patients in our geriatric series.

CONCLUSION

The CAS proved useful for the monitoring of basic mobility of all patients admitted to a geriatric ward, and CAS data should become part of the data in the Geriatric database in Denmark [20]. The CAS score may also be employed by other wards or rehabilitation units treating patients with basic mobility deficits. The CAS was widely used in its first period as a recommended NIP indicator for the reporting of basic mobility in patients with hip fracture, and it is used at the majority of Danish hospitals treating this patient group. We recommend that the CAS be made mandatory for NIP reporting of basic mobility level before hip fracture and upon hospital discharge.

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CONFLICTS OF INTEREST: none

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