ORIGINAL ARTICLE

Geriatric Patients With Cognitive Impairment

Patient Characteristics and Treatment Results on a Specialized Ward

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SUMMARY

Background: Hospitals are now faced with increasing numbers of cognitively impaired patients aged 80 and older who are at increased risk of treatment complications. This study concerns the outcomes when such patients are treated in a specialized ward for cognitive geriatric medicine.

Methods: Observation of a cohort of 2084 patients from 2009 to 2014, supplemented by a sample of 380 patients from the hospital cohort of the Longitudinal Urban Cohort Ageing Study (LUCAS) for the years 2010 and 2011.

Results: Geriatric inpatients with cognitive impairment tend to be multimorbid. Half of the patients studied (1031 of 2084 patients) were admitted to the hospital on an emergency basis. Complications arising on the ward that necessitated transfer elsewhere arose in 2.6% (51 of 2084 patients). Moreover, analysis of the sample of 380 patients from the LUCAS cohort revealed that the treatments they underwent during hospitalization were associated with an improvement of their functional state: their mean overall score on the Barthel index rose from 39.8 ± 24.3 (median, 35) on admission to 52.7 ± 27.0 (median, 55) on discharge. The percentage of patients being treated with 5 or more drugs fell from 98.2% (373/380) on admission to 79.3% (314/362) on discharge. The percentage receiving potentially inappropriate medications (PIM), as defined by the PRISCUS list, fell from 45% to 13.3%, while the percentage of drug orders and prescriptions involving PIM fell from 7.8% (327/4181) to 2.0% (53/2600). 70% of the patients were discharged to the same living situation where they had been before admission.

Conclusion: In this study, structured geriatric treatment in a cohort of older acutely ill patients with cognitive impairment was associated with improvement of functions that are relevant to everyday life, as well as with a reduction of polypharmacy. Controlled studies are needed to confirm the observed benefit.

► Cite this as:

von Renteln-Kruse W, Neumann L, Klugmann B, Liebetrau A, Golgert S, Dapp U, Frilling B: Geriatric patients with cognitive impairment—patient characteristics and treatment results on a specialized ward. *Dtsch Arztebl Int* 2015; 112: 103–12. DOI: 10.3238/arztebl.2015.0103

Persons aged 80 and older now account for a rising percentage of hospitalized patients (1). Concomitantly, there are also rising numbers of persons with cerebral dysfunction who are either overtly symptomatic with dementia or else have a latent cognitive impairment, e.g., a mild cognitive deficit (2–4, e1–e4). In case of acute illness such persons are at risk of suffering a worsening of dementia if already present, or else of developing manifest signs of a dementia syndrome that was previously only latent (5, 6, e5–e7). Health care workers in hospitals face the challenge of protecting such patients from the risk of complicated, prolonged treatment courses and from increased mortality (5, 6, e4–e7). Common complications of acutely hospitalized older persons with cognitive impairment include delirium (7, 8) and falls (9, 10, e8). These two types of unwanted event are closely associated, on the one hand, with multimorbidity and low functional competence (11), and, on the other hand, with medical interventions such as surgery and pharmacotherapy (12, e9).

The following measures can be helpful (4, 13–17):

- proactively identifying cognitively impaired patients at risk, e.g., at the time of emergency admission or in a preoperative check;
- staff training sessions;
- architectural and organizational changes so that dementia patients can be examined and treated in a calm environment that is not disorienting;
- close personal assistance of dementia patients by hospital volunteers;
- specific training programs in inpatient geriatric rehabilitation;
- specialized treatment units in acute-care hospitals;
- cooperation between geriatricians and other specialists.

A further preventive strategy is to avoid unnecessary transfers from nursing homes to acute-care hospitals (18).

Reported results of treatment on specialized wards have been inconsistent to date because of wide disparities among national health systems and among patterns of hospital admission (19–27).

Nonetheless, multiple published studies (some of which included only a small number of patients) have revealed improved functional outcomes, fewer

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BOX

Special aspects of the cognitive geriatric ward

- **Special characteristics:**
 - higher staffing
 - training of personnel in communication, validation, and dealing with aggressive behavior
 - regular outside supervision
 - guidelines for diagnostic testing, treatment, and structure of the patients' day
 - music therapy twice per week
- **Special equipment and furnishings:**
 - circular patient walkway
 - hidden exits and a floor coloring scheme that "bypasses" them
 - rooming-in option for relatives
 - treatment room on the ward
 - ultrasound diagnostics on the ward
 - home-like day room
 - bright lighting (e10, e11) – up to 450 lux measured at floor level – that leads with increasing brightness from the entrance into the ward areas (28)
- **Screening tests for cognitive impairment:**
 - Mini-Mental State Examination (MMSE) (e12)
 - Dementia Detection Test (DemTect) (e13)
 - Clock Completion Test (e14)
 - Confusion Assessment Method (CAM) (e15)

complications, and lower mortality rates. The first specialized geriatric ward in Germany was established at the Elisabeth Hospital in Essen in 1990 (by Prof. Nehen); since 2000, the number of such units has been growing steadily (28, 29), though very little information about them has been published to date (30–32).

The cognitive geriatric ward

A cognitive geriatric ward with 23 beds was established in November 2009 to treat cognitively impaired geriatric patients with acute somatic illness. It differs from the other wards of a geriatric clinic in several respects (*Box*); the processes of patient care otherwise resemble those of inpatient geriatric medicine in general, including comprehensive geriatric assessment and interdisciplinary treatment (e16). Special attention is paid to the difficulty of pain assessment in these patients (e17) and to their elevated risk of nutritional deficiencies (e18). Discussions between the patients' relatives and the medical and nursing staff take much more time here than on other geriatric wards, and the social service needs to work more intensively as well, with two team meetings per week because of the higher complexity of cases. In addition to routine preventive measures, special measures are taken to prevent falls (e19) and aspiration. On admission, each patient is screened for dysphagia by a speech therapist and then, if indicated, undergoes

rhinolaryngoscopy and speech therapeutic diagnosis to determine the appropriate treatment (e20). On-site consultation (for both examination and treatment) can be obtained from ophthalmologists, otorhinolaryngologists, and dentists, as well as from the gerontopsychosomatic liaison service (e21). The hospital's clinical ethics committee can also be consulted if necessary.

Patients can be referred to the cognitive geriatric ward from within the hospital with an electronic consultation request (processed within 24 hours), or from elsewhere by submission of the appropriate form followed by discussion with an attending physician. The basic criterion for admission to the ward is acute illness combined with cognitive impairment, be it of new onset, newly recognized, or pre-existing with acute deterioration. Patients who need a locked ward cannot be admitted to the cognitive geriatric ward and are referred instead to the inpatient gerontopsychiatric service.

The LUCAS consortium

The German Federal Ministry of Education and Research (*Bundesministerium für Bildung und Forschung*, BMBF) funded a total of six research consortia to study issues of health in old age from 2007 to 2010 and from 2011 to 2013 (e22). One of these is the interdisciplinary consortium called the Longitudinal Urban Cohort Ageing Study (LUCAS), which has its coordinating headquarters in the Albertinen-Haus (the geriatric and gerontological center at the University of Hamburg). LUCAS consists of a longitudinal cohort study and several component projects (33). It is intended to extend scientific knowledge in certain areas and thereby enable improvements in geriatric medicine. These areas prominently include:

- functional aging
- the loss or preservation of functional competence in various settings, including randomized controlled trials (e23).

One component project deals with a specific aspect of patient safety: fall prevention in geriatric inpatients (e24). Patients on the cognitive geriatric ward were included in the LUCAS cohort of hospitalized patients in 2010 and 2011 if they were at least 65 years old and stayed in the hospital for at least 48 hours.

Current questions

This article addresses two main questions: what features characterize patients on a cognitive geriatric ward? What is the outcome of treatment?

Data from the LUCAS hospital cohort were used to characterize patients because they contain information about falls and pharmacotherapy. This study was not planned in advance as a comparative study; thus, no power analysis was carried out beforehand to compute necessary case numbers. The evaluation was descriptive.

Methods

The department of geriatric medicine, with its 132 beds and capacity for treatment of 35 patients in the day

TABLE 1

Characteristics of 2084 patients on the cognitive geriatric ward and of the sample of 380 patients from the LUCAS hospital cohort

		Cognitive geriatric ward	Sample of the cognitive geriatric ward (first admissions only, age ≥ 65, stay ≥ 48 hr)		
		Total	Total	Women	Men
Characteristics of patients 2009–2014 and of patients from the sample of the LUCAS hospital cohort (2010–2011)					
Patients	N (%)	2084	380	225 (59.2)	155 (40.8)
Age; years	mean ± SD median (range)	81.6 ± 7.0 82.5 (56–102)	82.2 ± 6.8 82.9 (65.3–102.1)	83.5 ± 6.5 84.2 (65.7–102.1)	80.4 ± 6.7 80.7 (65.3–99.3)
Age in groups; N (%)	<65 65–69 70–74 75–79 80–84 85–89 90–94 95–99 100–104	21 (1.0) 71 (3.4) 245 (11.8) 425 (20.4) 564 (27.1) 496 (23.8) 219 (10.5) 40 (1.9) 3 (0.1)	– 17 (4.5) 42 (11.1) 75 (19.7) 119 (31.3) 85 (22.4) 30 (7.9) 10 (2.6) 2 (0.5)	– 6 (2.7) 15 (6.7) 41 (18.2) 70 (31.1) 63 (28.0) 21 (9.3) 7 (3.1) 2 (0.9)	– 11 (7.1) 27 (17.4) 34 (21.9) 49 (31.6) 22 (14.2) 9 (5.8) 3 (1.9) –
Women	N (%)	1245 (59.7)	225 (59.2)	225 (100)	0 (0)
Number of diagnoses	mean ± SD median (range)	11.7 ± 4.6 11 (2–42)	11.4 ± 3.9 11 (3–31)	11.3 ± 3.8 11 (4–31)	11.5 ± 4.0 11 (3–22)
Length of stay; days	mean ± SD median (range)	16.2 ± 6.8 16.0 (0.03–47.1)	17.6 ± 7.3 17 (2–51)	17.8 ± 7.1 18 (2–51)	17.4 ± 7.6 17 (2–46)
PCCL ^{*1}	mean ± SD median (range)	2.7 ± 1.3 3 (0–4)	2.9 ± 1.2 3 (0–4)	2.9 ± 1.2 3 (0–4)	3.0 ± 1.2 3 (0–4)
Patients who died on the ward	N (%)	118 (5.7)	18 (4.7)	12 (5.3)	6 (3.9)
Surviving patients ^{*2} ; of whom discharged; N (%)	own home nursing home overall ^{*3} back to nursing home ^{*4} newly in nursing home ^{*4} short-term facility ^{*4} hospital ward ^{*5} geriatric day clinic inpatient rehabilitation	1 946 1365 (70.1) 500 (25.7) – – – 51 (2.6) 22 (1.1) 8 (0.4)	362 186 (51.4) – 68 (18.8) 33 (9.1) 42 (11.6) 24 (6.6) 6 (1.6) 3 (0.8)	213 105 (49.3) – 47 (22.1) 18 (8.4) 31 (14.5) 10 (4.7) 1 (0.5) 1 (0.5)	149 81 (54.4) – 21 (14.1) 15 (10.1) 11 (7.4) 14 (9.4) 5 (3.4) 2 (1.3)
Special characteristics of the sample from the LUCAS hospital cohort on the cognitive geriatric ward (380 patients)					
Patients with multimедication (≥ 5 drugs prescribed on admission)	N (%)	–	373 (98.2)	219 (97.3)	154 (99.4)
ADL status on admission (Barthel Index [e26]); points	mean ± SD median (range)	–	39.8 ± 24.3 35 (0–100)	40.0 ± 25.1 37.5 (0–90)	39.5 ± 23.0 35 (0–100)
ADL status on discharge (Barthel Index [e26]); points	mean ± SD median (range)	–	52.7 ± 27.0 55 (0–100)	52.6 ± 27.9 55 (0–100)	52.8 ± 25.7 44 (0–100)
Cognitive screening, MMSE score (e12) on admission; N (%)	test not possible 0–23 points 24–30 points	–	136 (35.8) 203 (53.4) 41 (10.8)	82 (36.4) 117 (52) 26 (11.6)	54 (34.8) 86 (55.5) 15 (9.7)
Mobility, TUG (e27) on admission; N (%)	test not possible <20 seconds 20–29 seconds ≥ 30 seconds	–	291 (76.6) 21 (5.5) 33 (8.7) 35 (9.2)	166 (73.8) 15 (6.7) 20 (8.9) 24 (10.7)	125 (80.6) 6 (3.9) 13 (8.4) 11 (7.1)
Tinetti stance and gait test (e28) after admission; N (%)	test not possible >23 points 20–23 points <20 points	–	52 (13.7) 19 (5.0) 20 (5.3) 289 (76.1)	36 (16.0) 9 (4.0) 8 (3.6) 172 (76.4)	16 (10.3) 10 (6.5) 12 (7.7) 117 (75.5)
LUCAS fall-risk screening in hospital (9) on admission; N (%)	elevated fall risk no data	–	283 (74.5) 4 (1.1)	166 (73.8) 3 (1.6)	117 (75.5) 1 (0.6)

^{*1} Patient clinical complexity level (PCCL) as defined in the G-DRG (German Diagnosis Related Groups), Version 2014 (Definitionshandbuch Band 1, Institut für das Entgeltsystem im Krankenhaus [InEK] GmbH).

^{*2} This number does not include patients who died in the hospital after transfer to another ward.

^{*3} Includes both returning and new patients, because the routine hospital data do not distinguish between these two possibilities.

^{*4} Separate data entry and documentation for the LUCAS hospital cohort.

^{*5} Transferred from the cognitive geriatric ward to another hospital ward because of cardiopulmonary failure, acute arrhythmia, myocardial infarction (n = 11), stroke (n = 7), peptic ulcer with acute hemorrhage (n = 5), acute renal failure (n = 3), status epilepticus (n = 2), mechanical ileus (n = 2), pulmonary embolism, spontaneous pneumothorax, colon carcinoma, complicated cholelithiasis, ischemic colitis, septic shock, and thyrotoxicosis.

LUCAS, "Longitudinal Urban Cohort Ageing Study"; ADL, activities of daily living; MMSE, Mini-Mental State Examination; TUG, Timed Up & Go Test

clinic and 10 in outpatient geriatric rehabilitation, is a component of an academic teaching hospital of the University of Hamburg's faculty of medicine, located in the Northwest District of Hamburg, Germany (250 000 inhabitants). About 60% of the department's inpatients are admitted from the hospital's emergency room and the associated overnight ward, or else from the other hospital departments, while 30% are transferred from other hospitals in and around Hamburg, and 10% are admitted directly.

Data sources and data acquisition

The medical controlling department provided socio-demographic data, ICD diagnoses, and patient clinical complexity level (PCCL) values for all patients admitted from 1 September 2009 to 31 May 2014.

The documentation of the LUCAS hospital cohort consisted of the standardized fall records (e19). Fall prevention measures based on individual risk (e25) are described in detail in one of the eReferences (e19). A documentation assistant extracted information from the medical records, including sociodemographic data, patients' functional status with regard to the activities of daily living (the Barthel Index [BI]) (e26), the Mini-Mental State Examination (MMSE) (e12), the Timed Up & Go Test (e27), the Tinetti test of stance and gait (e28), and the LUCAS fall-risk screening (9). In addition, the patients' complete medication lists at admission and discharge and the medications given 24 hours before any incident of falling were documented. All data were entered into a specially constructed database. Prof. Thürmann of Wuppertal put the PRISCUS list at our disposal even before its publication and thus enabled us to assess potentially inappropriate medication (PIM) in these patients (34).

The study of the LUCAS hospital cohort (BMBF registration numbers 01ET0708 and 01ET002A; German Clinical Trials Registry number [DRKS-ID]: DRKS00004721) was performed in accordance with the Helsinki Declaration and "good clinical practice" and was approved by the Hamburg Ethics Committee (PV-2980). Descriptive data analysis (mean, standard deviation [SD], median, and range) was performed with the aid of SPSS 12.0.1, SPSS Inc., 1989–2003.

Results

Patients admitted to the cognitive geriatric ward (2009–2014)

Out of a total of 2136 hospitalizations, 52 were re-hospitalizations of patients who had been on the ward previously (2.4%). The 2084 initial admissions were of 1245 women (59.7%) and 839 men (40.3%) (Table 1). Due to acute medical problems, every second patient (49.5%) was admitted to the hospital on an emergency basis. Overall, patients were admitted to the cognitive geriatric ward from:

- the same hospital, excluding the other wards of the hospital's geriatric service (46.5%, after 9.3 ± 9.1 days of hospitalization [mean, SD]; median, 6.9; range, 0.2–103)
- other hospitals (32.5%)

- direct admissions (10%)
- other geriatric wards (11%).

Diagnoses and treatment—The most common principal diagnoses were:

- internal medical (non-neurological) diseases (52%), including cardiovascular diseases (31%) and infections (15%), most commonly pneumonia, urinary tract infection, and sepsis
- trauma (29%)
- neurological diseases (15 %).

Cognitive dysfunction was documented on admission in 1664 patients (80%); the remaining patients could not be adequately assessed on admission. A comprehensive neuropsychological examination was performed during the course of the hospitalization. According to the documented diagnoses, 974 patients suffered from a dementing disease (47%) and 22% from delirium. One-third had a complicated hospital course (659 patients, 31.6%; ICD codes T81 and Z95 and the diagnosis "mental and behavioral disturbances due to the use of sedative hypnotics"; ICD code F13, 5% of patients with complicated hospital courses). 957 patients had therapeutically relevant fluid and electrolyte disturbances (45.9%), and 242 (11.6%) had dysphagia that required treatment.

The work of the interdisciplinary team is classified in the Operations and Procedures Key (*Operationen- und Prozedurenschlüssel* [OPS]—the German modification of the International Classification of Procedures in Medicine) as "complex geriatric treatment" and fulfills the relevant structural and procedural requirements (e29). The percentage of patients who underwent complex treatment up to and including May 2014 was, on average, 67%. The mean length of stay fluctuated within the range of 15 to 18 days from year to year over the period 2009–2014. Mortality on the ward was 5.7% (118/2084).

70.1% of surviving patients (1365/1946) were discharged back to their pre-hospital living environment, and 25.7% to old age or nursing homes (500/1946). 51 were transferred to other hospital services for further care because of new illnesses (72.5%) and complications, including 8 patients with new fractures and 2 who were transferred to an inpatient psychiatric service. Treatment was stopped in 20 patients (Table 1).

The sample from the LUCAS hospital cohort (2010–2011)

The patients in the sample from the LUCAS hospital cohort for the years 2010–2011 were comparatively multimorbid (PCCL 2.9 ± 1.2 , median 3, range 0–4) and functionally impaired; nearly all were taking multiple medications. Only one in 10 did not meet formal criteria for cognitive impairment on admission screening. Three out of four were bedridden and/or not examinable for minimal mobility. Three-quarters were screened at risk of falling (Table 1).

Diagnoses—Internal medical diseases were the most common diagnoses (60.0%); one-third of these were cardiovascular diseases, and one-quarter were infections. More than three-quarters of patients admitted because of trauma (28%) had fractures, mainly

TABLE 2

Drug orders (including medicines to be taken on demand) and indications in 380 patients (LUCAS hospital cohort, 2010–2011) on the cognitive geriatric ward, on admission and discharge

		On admission	On discharge
Patients, 1 st admission, age ≥ 65 years, length of stay ≥ 48 hr	N	380	362
Patients who died on the ward	N (%)	–	18 (4.7)
Number of drugs ordered	mean ± SD median (range)	11.0 ± 3.4 11 (2–22)	7.2 ± 3.1 7 (1–18)
Patients with ≥ 5 drugs ordered	N (%)	373 (98.2)	287 (79.3)
Patients with PIM according to the PRISCUS list (34); N (%)	no PIM orders 1 PIM order >1 PIM order	136 (35.8) 171 (45.0) 73 (19.2)	314 (86.7) 43 (11.9) 5 (1.4)
Number of PIM orders / total drug orders	N (%)	327/4181 (7.8)	53/2600 (2.0)
Antiparkinsonian drugs; N (%)	total orders	55/4181 (1.3)	64/2600 (2.5)
	levodopa, benserazide (combination)	28/55 (50.9)	37/64 (57.8)
	levodopa, carbidopa, entacapone (combination)	8/55 (14.5)	6/64 (9.4)
	amantadine (or sulfate)	7/55 (12.7)	6/64 (9.4)
	levodopa, carbidopa (combination)	4/55 (7.3)	5/64 (7.8)
	rotigotine	3/55 (5.5)	5/64 (7.8)
	pramipexol	2/55 (3.6)	2/64 (3.1)
	tiapride	2/55 (3.6)	1/64 (1.6)
	entacapone	1/55 (1.8)	2/64 (3.1)
Dugs for dementia; N (%)	total orders	31/4181 (0.7)	40/2600 (1.59)
	rivastigmine	15/31 (48.4)	24/40 (60.0)
	donepezil	13/31 (41.9)	13/40 (32.5)
	galantamina	3/31 (9.7)	3/40 (7.5)
Orders for the top 20 drugs / total drug orders	N (%)	2690/4181 (64.3)	1571/2600 (60.4)
Number of drug orders by indication (N) and percentage of top 20 drugs (%)	cardiovascular* ¹	1266 (47.1)	963 (61.3)
	central nervous system	620 (23.0)	243 (15.5)
	peripheral analgesic	340 (12.6)	112 (7.1)
	gastrointestinal	270 (10.0)	223 (14.2)
	metabolic* ²	194 (7.2)	30 (1.9)

*¹ including thrombosis prophylaxis

*² including IV treatment: Ringer's solution, NaCl, KCl, CaCl, normal saline SC adapted to oral fluid intake
LUCAS, "Longitudinal Urban Cohort Ageing Study"; PIM, potentially inappropriate medication

of the hip, or else of the axial skeleton. 12% of the diagnoses were of neurological diseases, mostly cerebrovascular.

Medications—Nearly all patients were taking multiple medications on admission, with an average of 11 medicines (including medicines to be taken on demand); 79.3% were still taking multiple medications on discharge (Table 2). Table 3 contains a list of the top 20 drugs, most of which are used to treat cardiovascular diseases. The percentage of drug prescriptions that

were for substances affecting the central nervous system decreased by 58% from admission to discharge; for neuroleptic drugs, the corresponding figure was 65%. Benzodiazepines were no longer among the top 20 prescribed drugs at the time of discharge (Table 3). The percentage of patients taking PIM, according to the PRISCUS list, decreased from 64.2% on admission to 13.3% on discharge. The five most common PIM taken on admission were zopiclone (n = 145) and immediate-release nifedipine (n = 95), followed by acetyldigoxin

TABLE 3

The top 20 drug orders (including medicines to be taken on demand) and indications for 380 patients (LUCAS hospital cohort, 2010–2011) on the cognitive geriatric ward, on admission and on discharge

Top 20 drug orders and indications; N (%)		Admission 2690	Discharge 1571
Cardiovascular – including thrombosis prophylaxis	glycerol trinitrate	192 (7.1)	–
	acetylsalicylic acid	178 (6.6)	178 (11.3)
	metoprolol	149 (5.5)	146 (9.3)
	certoparin sodium	134 (5.0)	47 (3.0)
	enoxaparine	125 (4.6)	61 (3.9)
	ramipril	121 (4.5)	124 (7.9)
	simvastatin	100 (3.7)	92 (5.9)
	torasemide	97 (3.6)	97 (6.2)
	nifedipine* ¹	95 (3.5)	–
	amlodipine	75 (2.8)	75 (4.8)
	hydrochlorothiazide* ²	–	44 (2.8)
	spironolactone* ²	–	35 (2.2)
	furosemide* ²	–	34 (2.2)
	phenprocoumon* ²	–	30 (1.9)
CNS-active – benzodiazepines, sedatives	zopiclone* ¹	160 (5.9)	–
	lorazepam* ¹	88 (3.3)	–
– neuroleptic drugs	melperone	187 (7.0)	46 (2.9)
	haloperidol* ¹	54 (2.0)	–
	risperidone* ²	–	36 (2.3)
– centrally acting analgesics	tilidine, naloxone (combination)	131 (4.9)	56 (3.6)
– antiparkinsonian drugs	levodopa, benserazide (combination)* ²	–	37 (2.3)
– antidepressants	citalopram* ²	–	38 (2.4)
	mirtazapine* ²	–	30 (1.9)
Peripherally acting analgesics	metamizole sodium	340 (12.6)	112 (7.1)
Gastrointestinal	pantoprazole	186 (6.9)	124 (7.9)
	macrogol, NaCl, NaHCO ₃ , KCl (combination)	84 (3.1)	99 (6.3)
Metabolic – including IV solutions	Ringer's solution (NaCl, KCl, CaCl) ¹	149 (5.5)	–
	normal saline* ¹	45 (1.7)	–
	levothyroxine sodium* ²	–	30 (1.9)

*¹ Drug not among the top 20 at discharge; at discharge: nifedipine (n = 1), zopiclone (n = 15), lorazepam (n = 15), haloperidol (n = 5), Ringer's solution (n = 15), NaCl (n = 10)

*² Drug not among the top 20 on admission; on admission: hydrochlorothiazide (n = 42), spironolactone (n = 25), furosemide (n = 35), phenprocoumon (n = 27), risperidone (n = 37), levodopa, benserazide (combination) (n = 28), citalopram (n = 27), mirtazapine (n = 23), levothyroxine sodium (n = 28)

LUCAS, "Longitudinal Urban Cohort Ageing Study"

(n = 12), clonidine (n = 11), and haloperidol (n = 11); these five drugs accounted for 274 out of a total of 327 orders for PIM (83.8%). The five most common PIM still being taken on discharge were acetyldigoxin (n = 13), zopiclone (n = 11), amitriptyline (n = 4), clozapine (n = 4), and haloperidol (n = 3).

Falls—In twelve months, patients on the cognitive geriatric ward fell more often than those on other geriatric wards. Also, these patients more frequently

suffered recurrent falls and fractures. Nearly half of all fall sequelae led to diagnostic and therapeutic interventions (*Table 4*).

Discharge—On discharge, the patients' functional status was higher than on admission to an extent that was relevant to everyday living, as revealed by a rise in the overall BI score from 39.8 ± 24.3 (median, 35; range 0–100) to 52.7 ± 27.0 (median, 55; range 0–100). Particular improvement was seen with respect to

TABLE 4

Falls in 380 patients of the cognitive geriatric ward compared to 1455 patients on other geriatric wards (LUCAS hospital cohort, 2010–2011)

		LUCAS hospital cohort	
		Cognitive geriatric ward	Other geriatric wards (without palliative unit)
Patient characteristics			
Patients: first admission, age ≥ 65 years, length of stay ≥ 48 hr	N	380	1455
Age; years	mean ± SD median (range)	82.2 ± 6.8 82.9 (65.3–102.1)	81.3 ± 6.9 81.9 (65.3–100.9)
Women	N (%)	225 (59.2)	1 008 (69.3)
Length of stay; days	mean ± SD median (range)	17.6 ± 7.3 17 (2–51)	18.1 ± 6.9 18 (2–49)
Patients who died on the ward	N (%)	18 (4.7)	36 (2.5)
ADL status on admission (Barthel Index [e26])	mean ± SD median (range)	39.8 ± 24.3 35 (0–100)	47.2 ± 21.2 50 (0–100)
Cognitive screening, MMSE score (e12) on admission; N (%)	test not possible 0–23 points 24–30 points	136 (35.8) 203 (53.4) 41 (10.8)	424 (29.1) 212 (14.6) 819 (56.3)
Mobility, TUG (e27) on admission; N (%)	test not possible <20 seconds 20–29 seconds ≥30 seconds	291 (76.6) 21 (5.5) 33 (8.7) 35 (9.2)	769 (52.9) 87 (6.0) 215 (14.8) 384 (26.4)
Tinetti stance and gait test (e28) after admission; N (%)	test not possible >23 points 20–23 points <20 points	52 (13.7) 19 (5.0) 20 (5.3) 289 (76.1)	97 (6.7) 55 (3.8) 84 (5.8) 1 219 (83.8)
Mobility at the time of fall; N (%)	independently ambulatory ambulatory with walking aid ambulatory with personal help not ambulatory	184 20 (10.9) 75 (40.8) 29 (15.8) 60 (32.6)	170 25 (14.7) 73 (42.9) 28 (16.5) 44 (25.9)
LUCAS fall-risk factors in the hospital (9); N (%)	history of fall in the past 2 months mental alteration unsafe mobility	207 (55.9) 361 (95.8) 95 (51.5)	741 (52.2) 460 (32.3) 914 (63.3)
ADL status on discharge (Barthel Index [e26])	mean ± SD median (range)	52.7 ± 27.0 55 (0–100)	64.5 ± 23.2 70 (0–100)
Falls			
Patients who fell; N (%)	with at least one fall multiple falls (at least two)	97 (25.5) 42 (11.0)	141 (9.7) 33 (2.3)
Age of patients who fell; years	mean ± SD median (range)	81.5 ± 6.4 81.5 (66.8–102.1)	80.6 ± 6.7 81.1 (65.5–97.9)
Falls; N (%)	single falls multiple (at least two) falls	191 55 (28.8) 136 (71.2)	182 108 (59.3) 74 (40.7)
Site of fall; N (%)	patient room shower/bath/toilet elsewhere on ward off the ward	141 (75.4) 21 (11.2) 24 (12.8) 1 (0.5)	134 (74.9) 34 (19.0) 6 (3.3) 5 (2.8)
Consequences of fall; N (%)	pain laceration, abrasion, hematoma fracture	45 (23.6) 39 (20.4) 5 (2.6)	38 (20.9) 56 (30.8) 1 (0.5)
Interventions/falls; N (%)	analgesia, wound care consultation for examination diagnostic imaging	68 (35.6) 12 (6.3) 12 (6.3)	55 (30.2) 6 (3.3) 7 (3.8)

LUCAS, "Longitudinal Urban Cohort Ageing Study"; TUG, Timed Up & Go Test; ADL, activities of daily living; MMSE, Mini-Mental State Examination

transfers, walking, eating, and washing. 254 of the 362 surviving patients (70.2%) were discharged to their previous living situation (home or nursing facility), 42 to inpatient short-term nursing care (11.6%), and 33 (9.1%) to a nursing home, having lived at home before admission (*Table 1*). The mortality in the sample from the LUCAS hospital cohort was higher than on other wards of the geriatric clinic—4.7%, compared to 2.5% (*Table 4*).

Discussion

These empirical findings reveal that the cognitively impaired (often demented) patients acutely hospitalized on the cognitive geriatric ward were highly multimorbid. Accordingly, they were often given multiple drugs, mainly for cardiovascular conditions. Every other patient was admitted to the hospital as an emergency, and around 30% had a complicated hospital course. 2.6% of patients developed complications of already treated or newly acquired diseases that necessitated transfer.

The patients in the sample from the LUCAS hospital cohort had much lower overall BI scores than those on other wards, reflecting lower functional competence in everyday living (median, 35 vs. 50 points) (e30). These patients were intensively compromised, probably representing severe frailty (e31). Patients on the cognitive geriatric ward had a higher mortality than those on other wards, as has been reported previously by other researchers. Direct comparisons with previous studies are difficult due to different routes of admission. Nonetheless, there are some consistent findings across studies. Patients are highly multimorbid and often suffer from severe functional impairment.

The current findings correspond with those of previous reports (19, 25, 26, 31, e32) and small-scale case-control studies (32, e8) showing that treatment on a cognitive geriatric goes along with functional improvement to an extent that is relevant to everyday living, particularly with respect to mobility. This study confirms that the condition of cognitively impaired geriatric patients can indeed improve under routine hospital conditions (e33), as long as they are managed by an interdisciplinary therapeutic approach.

Moreover, the sample from the LUCAS hospital cohort reveals a higher rate of falls, in accordance with the 25% to 27% fall rates reported in other studies (31). Over the period of data collection, twice as many high-risk patients from nursing facilities (e34–e37) were transferred to the cognitive geriatric service as were transferred to other wards (18% versus 9%). Although an increase in the number of low beds and movement sensors is planned, such technical aids do not absolve from activating nursing care and multimodal fall prevention (35). The number of hospitalized patients at risk of falling is expected to rise (1, e38).

Physical restraint of patients is not an acceptable alternative to multimodal fall prevention and must remain an absolutely exceptional measure. Restraint carries its own risks and stands in the way of the therapeutic goal of remobilization (36, e39–e41). Patients

who must still be restrained because all other nursing measures fail are transferred to a psychiatric ward or else taken home by their families. This was why treatment was terminated in 20 patients, usually on the day of admission or the day after.

Medication review is a routine part of geriatric care; it is the responsibility of the treating physicians (37) and a part of fall and delirium prevention (e42–e45). In the present study, it was the routine medication review, rather than any targeted intervention, that led to a reduction of the patients' intake of medications affecting the central nervous system and of potentially inappropriate medications (PIM), as defined by the PRISCUS list. The latter was still unpublished, and unknown in our hospital, when the LUCAS project began. Immediate-release nifedipine was still being prescribed (38) on admission as a reserve medication for hypertensive crisis, but was no longer prescribed at the time of discharge (*Table 3*). Many geriatric patients take multiple cardiovascular drugs simultaneously; such regimens should be regularly reviewed, in particular for same pharmacodynamic effects (e46). The question whether PIM cause unwanted effects associated to geriatric patients' functional competence, in particular, is of high importance (39). The functional level of geriatric patients must be carefully considered in view of the difficulty of predicting adverse drug effects (e47).

70% of the inpatients on the cognitive geriatric ward were discharged back to their pre-hospital living situation. Our experience suggests that up to half of all patients discharged to short-term nursing care probably also returned to living arrangements as before. Because of limited resources, the patients' further course after discharge was not documented in this study; nor was the perspective of relatives caring for the patients. It is important to bear in mind, however, that the patients and their caring relatives (if any) constitute a unit of central importance for treatment (24, e48).

The cognitive geriatric ward is still under change, in a continual learning process. Although inpatient treatment represents only a short-term intervention (2, e49), certain aspects of patient safety are of particularly high practical importance in this setting (e50), and must be considered carefully as part of the overall interdisciplinary treatment approach (40).

Perspective

In the future, comparative, multicenter controlled trials should be performed to study the effects of specialized geriatric treatment. Risk adjustment for patient characteristics and case mix will be indispensable in the interpretation of findings.

It is already clear in everyday medical practice that inpatient geriatric treatment should be integrated into an overall interdisciplinary concept (40), in which all resources are rapidly available, to ensure that high-risk geriatric patients receive adequate treatment. It is also clear that the proactive management of patient safety hazards in the hospital must be given a high priority for these high-risk patients. Aside from purely medical and

KEY MESSAGES

- Acute confusion in an older patient is a medical emergency.
- Acutely ill, cognitively impaired geriatric patients are highly multimorbid and very often prescribed multiple drugs.
- Their hospital stays tend to be complicated by incident new diseases and/or complications of diseases which led to hospitalization.
- Systematically structured geriatric care improves functions that are relevant to everyday living, reduces drug exposure (including to potentially inappropriate medications), and enables a high percentage of patients to return to their pre-admission living situation.
- The cognitive geriatric ward is an option for the care of acutely somatically ill older patients with dementia and delirium.

technical considerations, improvements are also needed in the structure, logistics, and organization of care. These tasks are the responsibility of all professionals involved, who should make a continuous and sustained effort to fulfill them (2).

Acknowledgement

The hospital expressly thanks the Max and Ingeburg Herz Foundation in Hamburg for its longstanding support of the patient care and research activities of the cognitive geriatric ward. Thanks are due to the ward team for outstanding interdisciplinary work: Katharina Pollach and Katja Bleinagel (representing the nursing staff), Caren Wittmershaus, Thomas Scharfschwerdt, Marcus Thomas, Katrin Düwel-Steps, Wiebke Tauschek, Cordula Höfinghoff, Alexander Rösler, Joachim Bahlmann, and Marco Schnieders. The LUCAS subproject No. 6 thanks Prof. Thürmann for placing the PRISCUS list at its disposal before publication.

Conflict of interest statement

The authors declare that no conflict of interest exists.

Manuscript received on 14 July 2014, revised version accepted on 21 October 2014.

Translated from the original German by Ethan Taub, M.D.

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ORIGINAL ARTICLE

Geriatric Patients With Cognitive Impairment

Patient Characteristics and Treatment Results on a Specialized Ward

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