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Systematic comprehensive geriatric assessment in elderly patients on chronic dialysis: a cross-sectional comparative and feasibility study

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Abstract

Background: Elderly dialysis patients are prone to disabilities and functional decline. This aggravates their last period of life. It would be valuable to be able to preserve daily function and quality of life. Identification of domains requiring additional attention is not common practice in standard care. Therefore, we performed a systematic Comprehensive Geriatric Assessment (CGA) to assess physical and psychosocial function and tested its feasibility in daily practice. The CGA is used more frequently in the assessment of elderly cancer patients, and we therefore compared the outcomes to this group.

Methods: A cross-sectional, multicenter study, between June 1st and September 31st, 2009, in four Dutch outpatient dialysis units. Fifty patients aged 65 years or above who received dialysis because of end-stage renal disease (ESRD) were randomly included. We assessed the CGA during a systematic interview with patients and their caregivers. The cancer patients had had a similar CGA in an earlier study. We compared prevalences between groups.

Results: In the dialysis population (68.0% 75 years or above, 76.6% on haemodialysis) caregivers often observed behavioral changes, such as deviant eating habits (34.0%) and irritability (27.7%). In 84.4%, caregivers felt overburdened by the situation of their family member. Somatic and psychosocial conditions were frequently found (polypharmacy (94.6%), depression (24.5%)) and prevalence of most geriatric conditions was comparable to those in elderly cancer patients.

Conclusions: Geriatric conditions were highly prevalent among elderly dialysis patients and prevalences were comparable in both populations. The CGA proved feasible for recognition of these conditions and of overburdened caregivers. This could prevent further functional decline and preserve quality of life.

Background

In nephrology, a growing number of elderly patients receive renal replacement therapy because of end-stage renal disease (ESRD) [1]. Patients aged 75 years or more represent the fastest growing segment of the population starting dialysis [2-4]. This specific patient population is characterized by multi-morbidity, defined as the presence of two or more concomitant diseases, disabilities and geriatric conditions such as polypharmacy, sensory deficits, incontinence, low energetic falls, cognitive impairment and decreased social participation [3].

Functional decline, often defined as a deterioration in the activities of daily living (ADL), is a result of reduced physiological reserves [5]. Its presence in the elderly is often preceded or accompanied by geriatric conditions. The consequences of functional decline are decreased independence, lower quality of life, higher risk of

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institutionalization and death [6-9]. In ESRD, functional decline is observed in all patients, but elderly patients are at even higher risk than their younger counterparts [2,10-12]. In addition, the initiation of dialysis is associated with a substantial decline in functional status and dialysis patients are also more prone to develop cognitive impairment [2,13,14]. Consequently, for patients who are at increased risk of functional or cognitive decline, it is of the utmost importance that potential problems are recognized early to allow health care professionals to slow or prevent this decline [15]. From the patient's perspective, information regarding the presence of geriatric conditions and their impact on daily function could assist in the decision-making process when considering the most appropriate form of renal replacement therapy or when accepting non-dialysis therapy [16].

The Comprehensive Geriatric Assessment (CGA) is widely used in geriatric care, but outside this specialization, a CGA is not often applied. In oncology, the employment of the CGA is gaining interest, primarily in research settings. A CGA could be useful to identify individual older adults with ESRD who are on the trajectory of (progressive) functional or cognitive decline or for benchmarking purposes.

The aim of this cross-sectional study was to perform a systematic CGA to investigate somatic, psychological, functional and social function in a group of older dialysis patients. Secondly, we aimed to place our findings in a broader perspective by comparing our group to a population of elderly cancer patients who likewise suffered from an end-stage chronic progressive disease. Finally, we asked the multidisciplinary team for their opinion on the feasibility of the systematic CGA and the relevance of its outcome.

Methods
Design, setting and participants
This cross-sectional study was conducted between June 1st and September 31st, 2009, in four Dutch hospitals with dialysis facilities. Zaans Medical Centre, Zaandam; Westfries Gasthuis, Hoorn; and Tergooi Hospitals, Hilversum are teaching hospitals; the Academic Medical Center, Amsterdam is a tertiary university teaching hospital. All patients with ESRD aged 65 years or above, either receiving peritoneal dialysis or haemodialysis were eligible for participation. Patients were excluded if they had insufficient knowledge of the Dutch language. Nephrologists of the participating dialysis centres identified eligible patients, informed them personally and by patient information letter about the study and asked them for permission to be contacted by a research nurse from the Hans Mak Institute, an independent institute for quality management in the field of kidney diseases. If patients agreed, they were asked for written informed

consent for participation in the study by this research nurse. The medical ethics committee of Zaans Medical Centre approved the study.

Data from the ESRD patients (n = 50) were compared to the data from a Dutch population of acutely admitted (non-selected and consecutive) cancer patients aged 65 years and older (n = 292), in which the same systematic CGA was performed. The methods and results of that study were published elsewhere [17].

Data collection
Patients were visited at home by the research nurse between two dialysis sessions. Prior to the visit, she sent the patients two questionnaires by mail: one for the patient and one for the primary caregiver. During the home visit, she completed the postal questionnaires in a face-to-face interview and conducted assessments of cognition, decubitus and delirium. Data on the general demographics, dialysis and co morbidities of each patient were retrieved from the hospitals' medical charts.

Systematic CGA
The systematic Comprehensive Geriatric Assessment consisted of various validated tests and questionnaires on four domains of patient function: the somatic, psychological, functional and social domains. Table 1 summarizes the CGAs instruments used, including their cut-off values.

Feasibility of the CGA in daily practice
Feasibility of the CGA was assessed in an interview with the multidisciplinary team and in feedback panels. In each dialysis centre, a patient, a medical psychologist, a social worker, a nurse, and a nephrologist were interviewed by the research nurse about the relevance of the questionnaires' content and the team's need for screening instruments to assess elderly dialysis patients' vulnerability. This interview mainly addressed acceptability and feasibility of the CGA to the team. Logistics and acceptability of the CGA for the dialysis patients were discussed in two feedback panels of elderly patients. The first feedback panel consisted of dialysis patients who also took part in the interview with the multidisciplinary team. The second feedback panel consisted of elderly who advise the research team of Geriatrics in the AMC on research questions.

Statistical analysis
Statistical analyses were performed with SPSS software, version 16.0 (Statistical Package for the Social Sciences Inc., Chicago, IL). Standard descriptive statistics were used. Furthermore, dialysis patients were compared to elderly cancer patients for differences in co morbidities, polypharmacy and the outcomes of the systematic CGA. We

Table 1 Content of the systematic comprehensive geriatric assessment

Geriatric conditions	Measurement tool	Source	Range of scores (cut-off) used
Somatic geriatric conditions			
Polypharmacy	Number of different medications	medical chart	Ordinal, (≥ 5)
Malnutrition	Short Nutritional Assessment Questionnaire (SNAQ) [18]	patient	0 – 7, (≥ 2)
Obesity	Body Mass Index (BMI)	medical chart	Continuous, (>30)
Pain	Visual Analogue Scale (VAS) [19]	patient	0 – 10
Decubitus	Prevention and Pressure Ulcer Risk Score Evaluation (prePURSE) [20]	patient and nurse	0-46, (≥20)
Constipation	Constipation	patient	yes or no
Incontinence	Presence of incontinence	patient	yes or no
Falls	Two or more falls in the past three months	patient	yes or no
Co morbidity	Charlson co morbidity index [21]	medical chart	0–31
Functional geriatric conditions			
ADL functioning	Katz ADL index score [22]	patient and caregiver	0–6, (≥ 1)
IADL functioning	Modified Katz index [23]	patient and caregiver	0–9, (≥ 1)
Neurosensory deficits	Impairment of hearing and/or vision, regardless of use of glasses or hearing aid	patient	yes or no
Mobility	Requiring help or the use of a walking aid for mobility	patient	yes or no
Self-perceived Health status	EuroQol (EQ-6D) [24]	patient	6 items, (decreased if scored "severe" ≥ 1)
Quality of life	Visual Analogue Scale in EuroQol-6D [25]	patient	0–100
Psychological geriatric conditions			
Global cognitive state	Mini Mental State Examination (MMSE) [26]	patient	≤24/30
Cognitive impairment	Informant Questionnaire on Cognitive Decline in the Elderly-short form (IQCODE-SF) [27,28]	caregiver	16 items, score1 – 5, max score 80 (impairment if ≥ 63, or 3.9 (63/16))
Behavioural disturbances	Neuropsychiatric Inventory Questionnaire (NPI-q) [29]	caregiver	yes or no
Depressive symptoms	Geriatric Depression Scale-15 (GDS-15) [30]	patient	0 – 15, ≥6
Delirium	Confusion Assessment Method (CAM) [31]	nurse	0 – 4, item 1 and 2 plus 3 and/or 4
Social geriatric conditions			
Caregiver burden	Experienced Burden of Informal Care (EDIZ) [32]	caregiver	0 – 9, ≥ 4
Loneliness	De Jong-Gierveldschaal [33]	patient	≥3/11 indicates loneliness

tested for differences in the characteristics of the two populations using Student's t-tests and Chi-squared tests.

Results

Characteristics of ESRD patients

Fifty dialysis patients and their primary caregivers were interviewed. Baseline characteristics are reported in Table 2. Female patients constituted 26.0% of the population, and 68.0% of all patients were older than 75 years. Haemodialysis was applied in 77.0%, and 23.0% received peritoneal dialysis. The most prevalent geriatric condition was polypharmacy (94.6%). Other frequently observed conditions were hearing impairment (36.8%), malnourishment (32.7%), social or emotional loneliness

Table 2 Baseline results, demographics of community dwelling elderly on chronic dialysis

Variable	Patients n = 50
Age (%)	
65–74 yr	32.0
75–84 yr	58.0
> 85 yr	10.0
Male (%)	76.0
Years of education (mean/SD)	11.0 (3.7)
Highest level of education reached (%)	
Primary school or lower vocational training	33.3
Vocational training	33.2
Higher vocational training	20.8
University	4.2
Other	8.5
Dutch ethnicity (%)	96.0
Working situation (%)	
Retirement	96.0
Employed	4.0
Social status (%)	
Single	40.0
Living with partner or child	60.0
Living situation (%)	
Independent	81.6
Other*	18.3
Kind of dialysis (%)	
Haemodialysis	76.6
Peritoneal dialysis	23.4
Co morbidity	
Charlson co morbidity index score** (mean/SD)	4.6 (2.3)

SD standard deviation.
*Living situation other: home for the elderly or transitional care.
**Range 0–31; a higher score indicates more and/or more severe co morbidities.

Table 3 (Instrumental) Activities of Daily Living according to the modified Katz ADL index

Modified Katz ADL index question	% needs help
1. Bathing	18.0
2. Dressing	10.0
3. Combing hair	4.0
4. Toileting	4.0
5. Continence	8.2
6. Transfer bed-chair	10.0
7. Walking	27.0
8. Eating	0.0
9. Telephoning	4.0
10. Travelling	33.0
11. Shopping groceries	18.0
12. Cooking	18.0
13. Household keeping	50.0
14. Taking medication	0.0
15. Managing finances	6.0

behavioural problems, of which changes in appetite or eating behaviour were most prevalent (34.0%). In addition, depression or dysphoria, apathy, and irritability or emotional lability were all reported in over a fourth of our population. In 84.4% of patients, caregivers experienced care as a very large burden.

Prevalence of geriatric conditions in dialysis patients versus cancer patients

In Table 5, the geriatric conditions in dialysis patients were compared with those of 292 hospitalized cancer patients. Age was comparable between the two cohorts. The mean age in the dialysis patients was 77.1 years (SD 6.8 years) versus 75.7 years (SD 7.5 years) in the cancer

(30.6% combined) and depressive symptoms (24.5%). In this population, 24.0% of patients reported pain. (Instrumental) activities of daily life are presented in Table 3. The majority of difficulties were related to housekeeping, travelling and walking. The patients were relatively independent with regard to the basic activities of daily living, such as eating, toileting, bathing, dressing and walking.

On the visual analogue scale in the EuroQol-6D [25], patients rated their own health-related quality of life to have a mean score of 61.8 (range 0–100, SD 18.5), and 9.8% of patients scored having severe problems on one or more item of the EuroQol-6D. Co morbidity was highly prevalent, with a mean Charlson co morbidity index of 4.6 points (SD 2.3).

The results of the Neuropsychiatric Index (NPI) are shown in Table 4. Caregivers reported a number of

Table 4 Neuropsychiatric Inventory

NPI	% yes
Delusions	0.0
Hallucinations	2.0
Agitation/aggression	8.5
Depression/dysphoria	25.5
Anxiety	8.5
Euphoria	19.1
Apathy	25.5
Dis-inhibition	6.4
Irritability/lability	27.7
Aberrant motor behaviour	0.0
Night time behaviour disturbances	19.1
Change in appetite/eating behaviour	34.0

Table 5 Comparison of basic demographics and geriatric conditions between elderly dialysis patients and elderly cancer patients

Variable	Dialysis Patients (N = 50)	Cancer Patients (N = 292)	p-value
Age, mean (years) (95% CI)	77.1 (75.2–79.0)	75.7 (74.9–76.6)	0.23
Sex, male %	74.0	51.7	0.01
Somatic geriatric conditions			
Polypharmacy, %	94.6	48.0	<0.001
Moderately-severely malnourished %	32.7 (16/49)	46.0 (104/226)	0.09
Pain, %	24.0 (12/50)	64.8 (83/128)	<0.001
Decubitus, %	2.1 (1/47)	1.4 (2/139)	0.76
Constipation, %	6.3 (3/48)	22.1 (34/154)	0.001
Incontinence for faeces or urine, %	6.4 (3/47)	25.2 (67/266)	0.01
Falls (2 or more falls in last 3 months), %	10.4 (5/48)	12.7 (33/259)	0.65
Charlson co morbidity score, mean (95% CI)	4.6 (0.1–9.1)	5.6 (0.7–10.5)	
Functional geriatric conditions			
KATZ total", mean (95% CI)	2.0 (1.2–2.8)	3.3 (2.9–3.6)	0.01
≥ 1 limitations Katz, %	61.7	79.1	0.01
ADL impairment", %,	25.0 (12/48)	38.1 (106/278)	<0.001
mean, (95% CI)	0.5, (0.2–0.8)	0.8, (0.6–1.0)	
IADL impairment", %,	59.6 (28/47)	76.9 (196/255)	0.01
mean, (95% CI)	1.5, (0.9–2.1)	2.4, (2.2–2.7)	
Neurosensory deficit, %	44.4 (12/27)	26.0 (71/273)	0.04
Use of walking device, %	31.3 (15/48)	47.9 (134/280)	0.03
Decreased health related quality of life, %	9.8	12.0	NA,^
Euroqol VAS, mean, (95% CI)	61.8 (56.5–67.1)	NA	NA
Psychological geriatric conditions			
Cognitive impairment (MMSE ≤ 24), %	6.7 (3/45)	NA, *	NA
IQCODE score, mean, (95% CI)	3.1(2.9–3.3) (N = 34)	3.3 (3.2–3.4) (N = 205)	0.09
Cognitive impairment (IQCODE), %	5.9 (2/34)	15.7 (31/197)	0.13
Depressive symptoms, %	24.5	21.3	NA,^^
Delirium, %	0.0	27.4 (62/288)	<0.001
Social geriatric conditions			
Informal caregiver overburdened, %	84.4 (38/45)	43.8 (49/112)	<0.001
Number of geriatric problems, mean (95%CI)	5.9 (5.3–6.5)	5.3 (4.9–5.7)	0.47
No geriatric conditions found, %	2 (1/51)	8.2 (24/295)	0.03

95%CI 95% confidence interval.
"KATZ total score 0–15; ADL impairment: KATZ- questions 1, 2, 4, 5, 6, 8: score 0–6; IADL impairment: KATZ- questions 9–15: score 0–7; higher score means more impaired.
NA Not applicable.
^Quality of Life was assessed in ESRD patients by EuroQuol-6D and in cancer patients by EuroQuol-5D.
*MMSE unreliable due to many delirious patients.
^^Depression was assessed in ESRD patients by GDS-15 and in cancer patients by GDS-2.

patients. Compared to cancer patients, more dialysis patients were male (74.0% versus 51.7% (p = 0.01)). In both groups, the majority lived independently (81.6% versus 83.0%) and with partner or child (58.8% versus 60.1%), but cancer patients more often lived in a nursing home (p = 0.01).

Polypharmacy was more prevalent in dialysis patients, and pain was more prevalent in cancer patients (both p < 0.001). There was a significant difference in ADL impairment: 25.0% of dialysis patients had one or more ADL impairments, while this percentage was 38.1% in cancer patients (p < 0.001). Despite this, the burden of

care was higher in dialysis patients: 84.4% of informal caregivers of dialysis patients reported being overburdened compared to 43.8% for informal caregivers of cancer patients (p < 0.001).

In dialysis patients, neurosensory deficits were more prevalent compared to cancer patients. For the cohort of dialysis patients, a distinction was made between visual and hearing impairments, the latter of which was most prevalent (10.6% vs. 36.8%). Memory problems as recorded by the Mini Mental State Exam (MMSE) [26] were present in a high percentage in acutely admitted cancer patients (30.1%). Because of the concomitant high prevalence of delirium in these and because delirium influences MMSE scores, the MMSEs of these patients could not be compared to the MMSEs of ESRD patients. Global cognitive impairment as based on Informant Questionnaire Cognitive Decline – Short Form (IQCODE-SF) [27,28] score was present in 5.9% of the ESRD patients and in 15.7% of the cancer patients (p = 0.13).

On average, ESRD patients had 5.9 geriatric conditions (95% CI: 5.3–6.5), and 98.0% had one or more geriatric conditions. Cancer patients had 5.3 geriatric conditions on average (95% CI: 4.9–5.7), and 91.8% had one or more geriatric condition (p = 0.47).

Feasibility of the CGA

In the dialysis centres where this study was conducted, the nurse's regular, structured intake included an outline of existing problems. The questionnaires which were send to the patient and the care provider took one hour to complete, the interview by the research nurse at the patient's home took another hour. This was considered time consuming both by professionals and by patients. Patients and care givers appreciated the time spent and the attention that was given to the impact of ESDR on daily functioning. Furthermore, patients and caregivers thought the CGA could help the professionals to deal with their problems more adequately. Although the multidisciplinary team thought the CGA was extensive and time-consuming, all questionnaires were considered useful, with the exception of the Prevention and Pressure Ulcer Risk Score Evaluation (prePURSE) [20] to assess the risk of pressure ulcers and the Confusion Assessment Method (CAM) [31] for diagnosing delirium. The structured information regarding caregiver burden and detailed information on behavioural problems and depressive symptoms was considered particularly valuable. Some issues were perceived important by professionals, but were not addressed in the questionnaires. This concerned patients living alone or whose caregiver was deceased in combination with the lack of cooperation with care facilities that was sometimes experienced and problems with patient transportation by taxi.

Discussion

This systematic CGA of a cross-sectional cohort showed that geriatric conditions were highly prevalent in older ESRD patients. In addition to expected somatic problems, such as polypharmacy, malnourishment and hearing problems, many less anticipated problems in the psychosocial and functional domains were identified. Behavioural changes and disturbances were observed frequently and many caregivers felt overburdened by the care they provided to the primarily ADL-independent ESRD patient. Furthermore, depressive symptoms were highly prevalent, which have large impact on both patient and care giver. Geriatric conditions in both chronic diseases, ESRD and cancer, were comparable in terms of the number of geriatric problems, but they differed significantly in the rate of ADL-impairment, the burden of caregivers and pain score. The multidisciplinary nephrology team considered the CGA to be extensive and informative.

This study is a contribution to the growing number of studies addressing geriatric conditions in ESRD patients [13,15,34-36]. All these studies emphasize different aspects of geriatric conditions in ESRD patients. To our knowledge, this study is the first to use the instrument of a CGA to systematically address all relevant geriatric domains. In addition to their ESRD, our patients faced an average of six geriatric conditions. These problems were likely to influence health and quality of life. The awareness of these problems by health care providers can facilitate deceleration and prevention of further decline in these patients [12,34,37]. Furthermore, interventions that have limited impact on the expense and efficiency of care are available for several of the geriatric conditions identified [38]. An assessment like this systematic CGA and appropriate training to manage the identified geriatric conditions should be introduced simultaneously to improve patient outcomes. Although nephrology care units generally use a multidisciplinary approach for all patients, our study demonstrates that in the geriatric dialysis population, more attention is needed for the important and burdened role of caregivers. As only 25% of ESRD patients had one or more ADL-impairments, the burden of caregivers must primarily be due to other causes. Our hypothesis is that frequent dialysis treatments, changes in physical and mental capacity and the behavioural disturbances of their family member are important factors. The rate of depressive symptoms we found, 24.5%, is consistent with other studies, which state rates between 20 and 35% [13,39]. Behavioural changes such as depressive symptoms, apathy and irritability can all be manifestations of a depression and can weigh disproportionately heavily on caregivers. In addition, loneliness was highly prevalent in the dialysis patients. Therefore, one goal of the

multidisciplinary team should be to support caregivers in their task and thus prevent the social isolation of both caregivers and patients. This goal's importance is emphasized by the fact that social support and embedding are predictive factors for treatment success and mortality in ESRD patients [34,40,41].

This is the first study comparing ESRD patients to a group of elderly cancer patients. As in oncology, it may be useful to determine which factors influence the outcome and burden of treatment because treatment in ESRD is similarly intensive, expensive and has important side effects influencing health-related quality of life [42]. Earlier studies demonstrated that geriatric conditions were predictive of poorer health outcomes in both older ESRD and older cancer patients in outpatient settings [34,35,41,43-45]. In the present study, we have demonstrated that these geriatric conditions are equally prevalent in cohorts of ESRD and acutely hospitalized older cancer patients. We are convinced that the conclusion of Rao et al., who found that for older patients with cancer, geriatric care improved quality of life, likewise applies for elderly ESRD patients [46].

Some limitations of the study should be stated. First, the number of participants is small and may not be representative, which might make extrapolation to all older dialysis patients less convincing. Participants were asked by their nephrologists to participate. This may have caused some selection bias because physicians might be more reluctant to ask sicker patients or patients with major cognitive impairment to enrol. As a result, it is possible that our population reflects relatively healthy patients. This would imply that the outcome of a similar study in the total dialysis population might be even worse. On the other hand, even these 'healthy' patients experienced a large burden of unrevealed geriatric conditions, and they were comparable to acutely admitted cancer patients. For the aim of this study, which was to explore the feasibility of a new method, this possible selection bias is less relevant. In general, ESRD is associated with an increased risk of cognitive impairment, and the prevalence of both cognitive impairment and dementia is higher than in the general population [2,14]. Again, however, the selection process may have resulted in a lower than expected prevalence of these problems in our cohort.

Furthermore, when examining our cohort composition, it appeared that a relatively small number of women participated in the study; however, in comparing our rate to other studies, it is apparent that gender varies widely in ESRD study populations and that our study is no exception [13,38].

Our study cannot identify associations between geriatric conditions in elderly dialysis patients and their risk for poor outcomes in dialysis. This knowledge would be useful for planning care in advance and, when made available at earlier stages, could inform and assist patients and their caregivers in making decisions regarding treatment options in ESRD [3,15,38]. We have demonstrated that a large proportion of our patients required aid in their daily activities, and this requirement is likely to increase during ongoing treatment [13,47]. The burden of care experienced by caregivers was large, but our questionnaires were insufficient to support a more detailed understanding of the specific reasons behind this burden. Another limitation of our study is the comparison of outpatient dialysis patients with hospitalized cancer patients. It is likely that the cancer patients were more severely ill than the dialysis patients. In particular, the different scores on the item 'pain' and the Charlson co morbidity index score may be influenced by the difference in acute illnesses. However, despite this discrepancy, the spectrum of the conditions is informative regarding the geriatric conditions that the dialysis staff must anticipate. Finally, for this study, we applied the CGA at all patients who were eligible to participate. Although feasible for both patients, care givers and professionals, it was rather time consuming. This time was well spend for some patients, but less appropriate for others. For the patients in which most problems were found with the CGA, the CGA was probably most burdensome. On the other hand, this was not mentioned by them to the research nurse and the time spend on the CGA was well appreciated by the patient and their care givers. In future, we would like to enhance efficiency by finding methods to screen patients, to select dialysis patients for which a CGA is especially useful. This might also enhance support for the CGA in dialysis centres.

The strength of our study is that it demonstrates the feasibility and significance of a systematic CGA in dialysis patients, while at the same time revealing issues that are not yet covered in highly organized standard care. The multidisciplinary dialysis teams stated in their interview that questionnaires on social and psychological problems were especially informative. These could be added to the standard procedure in order to gather potential cues for improving care and quality of life. This study highlights the usefulness of general geriatric principles in offering multidimensional, holistic care to chronic patients on dialysis and achieving a balance between these principles and the more technical, highly efficient care offered in nephrology [38].

In the future, we would like to perform a prospective study on the efficiency and the effects of a systematic CGA on the outcome of dialysis treatment and on quality of life.

Conclusion

Elderly dialysis patients are prone to disabilities and functional decline, which aggravate their last period of

life. It would be valuable to be able to prevent further functional decline and to preserve quality of life. In this study, we tested a systematic comprehensive geriatric assessment for this purpose. Our systematic comprehensive geriatric assessment proves feasible to specify potentially modifiable problems and geriatric conditions that can decrease quality of life and that are easily missed if not specifically anticipated. Also, we conclude that elderly dialysis patients have a high number of geriatric conditions and that they are comparable to acutely hospitalized elderly cancer patients with regard to geriatric conditions, as an equally vulnerable population.

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Authors' contributions
JP, BB, MH, EB, LB and contributed to conception and design, or acquisition, analysis or interpretation of data, or both. JP drafted the article. JP, BB, MH, EB, MH, BM, SR provided intellectual content to the work described. All participated in revising the article and approved of the version to be published. All authors read and approved the final manuscript.

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