The impact of nutritional status, physical function, comorbidity and early vs. late start in dialysis on quality of life in older dialysis patients.

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Abstract

Background: For the majority of the older patients in dialysis, the treatment will be lifelong. Thus, quality of life (QoL) is a crucial outcome. Our aim was to assess the QoL of older Norwegian dialysis patients and to investigate the impact of early (estimated glomerular fraction rate, eGFR ≥ 10ml/min) versus late (eGFR < 10ml/min) start in dialysis, comorbidity, nutritional status and physical capacity.

Methods: A self-report questionnaire including SF-36 (QoL) and the Subjective Global Assessment (SGA) (nutritional status) was mailed to all patients (n = 320) ≥ 75 years registered in the Norwegian Renal Registry (NRR) as being in dialysis by September 2009. Reply was received from 233 patients (73%). Medical data including comorbidities and eGFR at dialysis start (obtained for 194 patients) was retrieved from the NRR. Functional capacity was determined from the SGA.

Results: Compared to reports from younger dialysis patients, our patients scored poorer on all SF-36 subscales. Early start in dialysis was registered for 52 patients, 142 patients started late, 51.4% were well nourished (SGA A), 32.3% moderately malnourished (SGA B) and 16.4% were severely malnourished (SGA C). No significant association between any SF-36 scores and early vs. late start, nutritional status or comorbidity was found. Better physical function was significantly associated with better scores on all SF-36 scales.

Conclusions: Our results indicate that physical function is important to all QoL aspects. Increased focus on physical rehabilitation seems pertinent. Early start of dialysis treatment was not associated with better long term QoL scores.

Keywords: older, dialysis, quality of life

Introduction

For several reasons, the oldest patients are the fastest growing subgroup of the dialysis population in developed countries. The general population is aging and the survival of diseases associated with kidney failure improves[1,2]. Hence, the incidence of end stage renal disease (ESRD) in older adults is increasing [3], and also the acceptance of older patients onto dialysis [4]. The majority of the older patients will not be offered a renal transplant and will be subjects to lifelong dialysis. In general, Qol of dialysis patients seems to be substantially affected, especially the physical domains, which also declines over time[5-8]**.** Comparing groups of older and younger in dialysis, no difference has been found for the QoL mental domains. Results regarding physical domains are more diverse; superiority of scores from the older population as well as equality has been reported[9,10]. For the oldest dialysis patients (> 75 years), however, the physical scores seem to be poorer than for younger ones[7,11].

Over the last decades, there has been a trend in USA and Europe to start dialysis early, in particular among the oldest patients (age > 75 years)[12,13] European and American guidelines have recommended start in dialysis at estimated glomerular fraction rate, eGFR at 8 – 10 ml /min/1.73 m^2 [14,15]. Early start is in most studies defined as eGFR > 10 ml/min. Some studies indicate that early start is connected with a higher mortality [13,16], which may be explained by a larger proportion of older patients[17]. The only published randomised trial comparing early to late start of dialysis, the IDEAL study, found that neither survival nor quality of life improved by an early start[18]. To our knowledge no studies have addressed the impact of early start on QoL in older dialysis patients in particular.

Older age is associated with higher frequency of health related problems such as nutritional deficits, comorbidity and reduction in physical capacity. This may be attenuated in older ESRD patients [19-22] [23].

In general, nutritional deficits and protein energy wasting (PEW) are frequent problems in the dialysis population[24-26], and implies an increased risk of negative health outcomes such as mortality risk and QoL deterioration[27,28]. Comorbid disorders are common among dialysis patients > 75 years [21], and for haemodialysis patients in general, co-morbidity is found to be associated with mortality as well as QoL [29,30].

Decline in physical function is a feature of normal aging. Among older dialysis patients, a high prevalence of functional disability has been revealed [22]. Physical impairments are likely to affect QoL negatively, as has also been shown for younger hemodialysis patients[31,32]. There are few studies addressing these issues in the older dialysis patients, thus, the impact on QoL is poorly documented.

The aim of the present study was to assess the QoL of the Norwegian dialysis population aged 75 years or more, and to explore the impact on QoL of nutritional status, physical function, comorbidity and early vs. late start in dialysis.

Subjects and Methods

All patients ≥ 75 years (n=320) who, according to the Norwegian Renal Registry (NRR) were in dialysis by January 2009 and alive by September 2009 were asked to participate and mailed the study questionnaire (September 2009). A reminder was sent 2 weeks later. We received answers from 233 (73%).

Medical data were collected from the NRR and included data registered at start of dialysis treatment and in the Annual Report 2008. The NRR consists of data from all the dialysis centres in Norway. These centres are responsible for reporting data from patients with chronic kidney failure at start of dialysis and thereafter annually. Deadline for the completion of the annual data is by the end of March, thus The Annual Report 2008 includes data on biochemical parameters, blood pressure, medications, physical status, and new co-morbid diseases up to March 2009.

The questionnaire mailed to the patients in this study, included assessments of QoL and nutrition. QoL was measured with a Norwegian validated translation of the Medical Outcomes Study 36 item Short Form health survey (MOS SF-36)[33,34]. The SF-36 is a self-administered questionnaire that is widely used and validated in chronic dialysis patients of all ages[9,11,35-37]. The 36 items are summarised into 8 scales, physical function (PF), role physical function (RP), bodily pain (BP), general health (GH), vitality (VT), social function (SF), role emotional function (RE) and mental health (MH). For each scale the scores are transformed to scores ranging from 0 -100 (100= best possible health state) [38]. The patients' scores in this study were compared to normative data from the general Norwegian population of the same age and gender [33] and to younger Norwegian dialysis patients (mean age 59.6 years with mean dialysis vintage 16.8 months) [39].

We also used three items from The European Organisation for Research and Treatment of Cancer (EORTC QLQ-C30), i.e. the nausea-vomiting scale (2 items) and the appetite scale (1 item). These items are scored on a four point categorical scale ranging from "not at all" to "very much" transformed into 0-100 scales where the higher scores represent more symptoms [40]. The patients' score were compared to the general Norwegian population of the same age and gender[41].

Nutritional status was assessed by the Subjective Global Assessment of Nutritional status SGA [42], using a translated Norwegian version [43]. The SGA has two parts. The first includes questions on medical history (present weight, weight loss during the last 6 months, changes in food intake, gastrointestinal symptoms and physical capacity) and may be answered by the patients. The second part covering assessment of subcutaneous fat loss, muscle wasting and oedemas, should be filled in by health professionals. In this study, the questionnaires were mailed to the patient hence; the nutritional classification was therefore only based on medical history. Patients with a body mass index (BMI) > 24 who reported, stable weight or weight gain the past two weeks were classified as SGA A (well nourished). This classification was also used for patients with weight loss, < 5% but no gastrointestinal symptoms. Patients with BMI > 24 with weight loss 5-10%, were classified as SGA – B (moderately malnourished); while patients with BMI < 24 or BMI > 24 and weight loss > 10% were classified as SGA – C (severely malnourished)[44]. The classification was independently made by two trained reviewers, a nephrologist and a nutritionist respectively. In case of disagreement, the classification was discussed to reach consensus.

The patients' body mass index (BMI) was calculated according to standard formula (body weight (kg)/ height (m) ²). The patients' height was retrieved from the NRR data. Information about the patients' weight was available from the NRR at start of dialysis and the Annual Report 2008 as well as from the SGA (September 2009). BMI was calculated for the corresponding three points in time. To estimate weight changes (delta weight), we used weight at start of dialysis minus weight from the Annual Report.

To assess co-morbidity, we used medical data from the NRR, which records 6 possible co-morbid diseases at start of dialysis; left ventricular hypertrophy (LVH), coronary disease, peripheral vascular disease, cerebrovascular disease, diabetes mellitus type II and malignancy.

We divided the patients into 3 groups; 1) no comorbid disease, 2) 1-2 co-morbid diseases, and 3) ≥ 3 co-morbid diseases.

To determine physical function we used the scores from the SGA item where the patients are asked to rate their functional capacity into 4 categories (normal activity, able to be up, mostly sitting in a chair or mostly in bed), as well as the physical function scale from the SF-36.

We defined early start in dialysis at eGFR ≥ 10 ml/min and late start at eGFR< 10 ml/min.

Statistical analysis

Medical and demographic parameters and QoL scores were compared between groups defined according to gender, dialysis modality and early versus late start in dialysis. For the medical and demographic data, Students't-test was used to test for statistical significance. For the quality of life (SF-36) scores, which were not normally distributed, we used the Mann-Whitney U test. To ease the interpretation and the comparison to findings of other studies, the SF- 36 (QoL) scores are, however, presented in terms of group means.

Furthermore, the association between SF-36 scores and the following variables: early versus late start in dialysis, comorbidity, nutritional status (SGA classification) and physical capacity (SGA score and SF-36 physical functioning score) was tested by both the Kruska Wallis and the Wilcox rank sum tests. We also tested for trends in differences of SF-36 scores between groups defined according to comorbidity, SGA classification (A, B, C) and physical capacity using the Jonckheere (Kendall Tau) test.

The SPSS version 18 was used for descriptive statistic and the simple group comparisons, whereas the Stata version 12.0 was used for the tests of association and trends. Statistical

significance was defined as $p< 0.05$, and clinical significance for the difference between QoL scores was defined as a difference of 10 or more [45].

The study was approved by The Regional Committee for Research Ethics in Norway

Results

Demographics

A total of 233 dialysis patients were included, 67% men and 33% women (Table 1). For four of the patients dialysis modality was not registered (three men and one woman).

Insert Table I

Overall, 182 (79%) of the patients were followed by a nephrologist for more than four months prior to dialysis initiation (early referral). Early start of dialysis (eGFR$\geq$ 10 ml/min) was registered for 52 (23%) of the patients, 142 (62%) had a late start, whereas for 39 patients, the eGFR at start of dialysis was not recorded in the NRR (Table 1). Mean age at start of dialysis was 78.4 years (± 4.1), median age 78.0 years. There was no statistical significant difference in age between early and late starters ($p= 0.52$). The proportions of early and late start did not differ between genders or dialysis modality. And no significant statistical difference was observed in treatment months between early and late starters ($p=0.13$).

Co-morbidities at start of dialysis according to the NRR is shown in Table 1, 48 patients (21%) had no comorbidity, 128 (55%) had 1-2 comorbid diseases and 55 (24 %) had ≥ 3 co-morbidities. Data was missing for 2 patients. There were more diabetes mellitus in early starters both as primary kidney disease (17% vs. 6%) and as comorbid disease (38% vs. 20%) (Table 1).

The mean age of the patients registered in Annual report 2008 was 80.4 years, median 80.0 years; range (75 – 94 years) (Table 2). There was no age difference between genders or between groups according to dialysis modality (Table 2).

Insert Table 2,

HD patients had significant longer dialysis vintage than PD patients. Otherwise, no difference between genders, HD and PD patients or early vs. late start in dialysis was revealed. The use of both erythropoiesis stimulating agents (ESA) and statins increased from start of dialysis to the Annual Report 2008 (Table 1 and 2).

Nutritional status

Information about height was missing for 39 patients at start of dialysis treatment, only 4 missing at Annual report 2008. Mean BMI at start of dialysis, by the time of the Annual report 2008 and based on the SGA data (September 2009) was 25.1 (median 24.4, range 15.4- 44.3) (Table 1), 24.3 (median 23.9, range 13.5-41.3) (Table 2) and 24.3 (median 24.0, range 15.2-43.5) respectively. Although the BMI showed only minor changes from start of dialysis to the Annual Report 2008, a majority of the patients who had data available on both time points (n = 185) had experienced weight changes, equally with weight loss (49%) and weight gain (42%) (Table 3).

Insert Table 3

Completion of the SGA was missing for 13 patients; hence SGA status (A, B or C) could be determined for 220 patients (Table 3). SGA status A was present in 51.4 %, SGA B in 32.3% and 16.4 % were severely malnourished (SGA C).

There were no association between SGA status and eGFR at start of dialysis, serum cholesterol, treatment months, serum albumin and haemoglobin (Table 3).

Scores for EORTC QLQ-C30 items were available for 214 (92 %) of the patients. Nausea-vomiting scores were clinically significant higher for our patients compared to norm data[41], both for men and women, indicating more symptoms in our patients.

Quality of life outcomes

The SF-36 scores for the overall study population as well as scores according to gender, dialysis modality and early versus late start in dialysis are presented in Table 4.

Insert Table 4

There were 226 patients who completed the SF-36 form. Missing data for the various SF-36 subscales was observed for 7 patients (SF) to 20 patients (RE).

Compared to a Norwegian norm reference population of same age and gender [33], we found that both females and males reported clinically significant lower scores on SF-36 scales. These differences in scores were generally high, reaching 40 point for vitality (VT) (data not shown).

Compared to scores from a younger cohort of Norwegian dialysis patients, the women in our study reported clinically significant poorer physical function (PF), role physical function (RP) and role emotional function (RE), whereas our male patients reported clinically significant poorer scores for PF only (Table 4).

Except for statistically significant higher scores for social function among women compared to men, we found no clinically or statistically significant difference in QoL scores between

genders, patients starting early or late in dialysis, or between HD and PD patients (Table 4). Furthermore, comparing SF-36 scores between patients in the three comorbidity groups as defined, no clinically or statistically significant difference was found (data not shown). Overall, there were also only minor variations between the SF-36 scores of patients classified as SGA A, B and C (data not shown), and no statistically significant trend between SGA groups was observed.

Finally we compared the SF-36 scores between patients according to their own physical capacity ratings in the SGA questionnaire and found a clear statistically significant trend, i.e. the highest score for physical capacity corresponded to the highest score for SF-36, except for RE (Table 5).

Insert table 5

We found no linearity between any SF36 domains and treatment months (linear regression analysis and scatter-plots). We did regression analysis, and found no association between comorbidity, early vs. late start or nutritional status and SF 36 scores. These results are not reported because the SF36 scores in our study were not normally distributed.

Discussion

In this cross-sectional study addressing Norwegian dialysis patients $\geq$ 75 years of age, we found that quality of life as assessed by the SF-36 in general was poor. For all dimensions, the scores were substantially lower than scores from a norm population beyond 70 years of age [33], and most scores were also lower compared to younger Norwegian dialysis patients [39], in particular for physical domains. No significant association between the QoL scores and

comorbidity, early vs. late start in dialysis and nutritional status was found. All QoL domains were, however, clearly associated to the patients' physical function.

Few studies have hitherto addressed the impact of physical function on quality of life in older dialysis patients [32]. In younger dialysis patients, however, significant improvement of physical QoL domains as a result of training has been documented [31 46]. Similar results have been reported from a Cochrane review of training studies in elderly [47]. Our results indicate that physical function is highly important, not only to the physical, but also the mental QoL domains of older dialysis patients. Thus, maintaining these patients` independence and physical performance seems crucial to their overall wellbeing. An existing potential for rehabilitation through physical exercise, even for seriously ill patients, is documented among advanced cancer patients [48] as well as in a pilot trial of older haemodialysis patients [49]. Further studies on training interventions in older dialysis patients are advocated.

No difference in quality of life between early or late start in dialysis were observed in our study, the same conclusion was drawn from the IDEAL-study[18]. We found in our study population that there was no difference in age at start of dialysis or dialysis vintage between early and late starters. Our results, however, must be interpreted with caution due to a low number of patients starting early and a lower mean eGFR at start than reported from others, i.e. in 2010, mean eGFR at start for patients > 75 years in US was 12.2 ml/min, while in our study population the mean eGFR at start was 8.6 ml/min [4]. Furthermore we did not have any QoL registration at start of dialysis nor any longitudinal assessments. In a previous study early starters were found to have better QoL than late starters immediately after the initiation of dialysis treatment, but the difference disappeared after 12 months[6]. We cannot rule out that this would also be the case among our patients.

Opposed to studies on younger dialysis patients showing a positive correlation between nutritional status and SF36 physical composite score (PCS)[50,51], we found no significant association between QoL and SGA classification, unintentional weight changes or BMI. These findings should be interpreted with caution since the SGA classification depended only on patients` report without any clinical investigations. However, abridged version of SGA is used in other studies and has demonstrated sensitivity and specificity comparable to the full-length questionnaire[52-55]. A study on patients on hemodialysis indicated even that using only the nutrition impact symptoms score from the scored version of the questionnaire (patient-generated SGA (PG-SGA)) had discriminatory capacity comparable to that of a full PG-SGA score for identifying malnutrition risk in malnourished patients receiving hemodialysis[56]. BMI reflects weight, and both weight and weight changes can be a difficult parameter in dialysis patients because of the ultrafiltration and difficulties in estimating dry weight. However, many of our older dialysis patients had a low BMI, reduced food intake and unintentional weight loss, indicating that focus on nutritional status is highly important. We also found a high frequency of nutritional deficits in a small study on older dialysis patients (≥ 75 years) where bio-impedance spectroscopy, SGA and anthropometry were used as assessment tools[57]. To identify nutritional risks, we find that adding methods other than weight and BMI are necessary.

For younger dialysis patients, an association between comorbid conditions and QoL, specially for physical composite score (PCS) has been shown [30]. This finding was not confirmed in our study population. A limitation of the co-morbidity registration in our study is the lack of information about the severity of the disease. Our registration is based on counting comorbid diseases, the same as in comorbidity indexes like Davies[58,59]. Many conditions that are important for elderly were not registered, e.g. cognitive function, vision and hearing disability, chronic obstructive lung disease and depression. Thus, we cannot rule out that the

results would have been different with more a complete registration of co-morbid diseases. The frequency of comorbid disorders in our study, is, however comparable to registrations from the UK and France [21,60], and in the Broadening Options for Long-term Dialysis in the Elderly (BOLDE) study from UK, increasing co-morbidity was found to have a negative impact on QoL only when malnutrition was present [61].

The study was based on self-report and register data from NRR, and we had only access to NRR data from the patients who accepted to enter the study. Thus, a limitation of the study is the lack of information regarding the non-responders. However, the NRR includes all Norwegian patients starting in dialysis, there were few missing data compared to other renal registries[21,62], and we had a high response rate (73%). Overall, we find that our findings may be representative for older dialysis patients in general. We also find that more complete data on comorbidity as well as inclusion of longitudinal quality of life assessments could considerably improve the utility of this and comparable registries.

Our results confirm that the QoL of older dialysis patients is poor and that there is a room for improvement. As low physical capacity seems to have a profound impact on all QoL dimensions, increased focus on physical rehabilitation seems pertinent. In accordance with results from other trials, our findings indicate that the patient's long term QoL does not benefit from an early start of dialysis. Nutritional problems were frequent among our older patients. By the methods used in this study, we could not confirm any association between nutritional status and QoL. Increased focus on nutritional status seems, however, still necessary

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Table 1. Patients' characteristic at start of dialysis treatment

	All (n = 233)			Early start (n=52)			Late start (n=142)		
	Mean	(SD)	n	Mean	(SD)	n	Mean	(SD)	n
Age years	78.4	(4.2)		79.4	(3.7)		79.1	(3.4)	
eGFR at start, (MDRD), ml/min	8.63	(3.32)	194	12.82	(3.09)	52	7.09	(1.66)	142
Albumin				37.5	(3.9)		37.7	(4.5)	
Body mass index (BMI)kg/m²	25.1	(4.6)	194	2.1	(5.5)		24.5	(3.6)	
Hemoglobin g/L	11.1	(1,5)	194	10.9	(1.2)		11.1	(1.6)	
		n	(%)		n	(%)		n	(%)
Male		126			34	(69)		92	(65)
Female		57			8	(31)		49	(35)
Dialysis modality									
Hemodialysis (HD)		188	(82)		43	(84)		108	(78)
Peritoneal dialysis (PD)		41	(18)		8	(16)		31	(22)
Access HD									
Catheter		99	(43)		26	(50)		73	(51)
AV fistula		53	(23)		15	(29)		38	(27)
Unknown					11	(21)		31	(22)
Use of									
Erythropoiesis stimulating agents (ESA)		156	(67)		35	(67)		96	(68)
Statins		132	(56)		32	(62)		81	(57)
Primary kidney disease									
Glomerulonephritis		37	(16)		9	(17)		32	(23)
Pyelonephritis		15	(6)		3	(6)		10	(7)
Polycystic kidney disease		15	(6)		2	(4)		10	(7)
Renovascular disease		108	(47)		26	(50)		67	(47)
Diabetes mellitus		19	(8)		9	(17)		8	(6)
Others		40	(17)		3	(6)		15	(11)
Co-morbidity									
Left ventricular hypertrophy		60	(26)		15	(29)		55	(39)
Peripheral vascular disease		51	(22)		14	(27)		28	(20)
Cerebrovascular disease		41	(18)		13	(25)		18	(13)
Malignancy		46	(20)		8	(15)		35	(25)
Coronary disease		107	(46)		27	(52)		64	(45)
Diabetes mellitus II		56	(24)		20	(38)		29	(20)

Table 2. Patients' characteristics at the Annual report 2008

	All (n=233)		Early start (n= 52)		Late start (n= 142)		p-value[1]	Hemodialysis (HD) (n=188)		Peritoneal dialysis (PD) (n=41)		p-value[2]
	n	Mean	SD	Mean	(SD)	Mean	(SD)		Mean	(SD)	Mean	(SD)	
Hemoglobin g/L	230	11.6	(1,2)	11.8	(1.1)	11.5	(1.3)	0.23	11.5	(1.2)	11.7	(1.1)	0.28
Blood pressure, systolic	230	141	(22)	141	(22)	142	(23)	0.76	141	(22)	141	(18)	0.95
Blood pressure, diastolic	230	72	(12)	71	(13)	72	(12)	0.65	72	(13)	70	(9)	0.36
Cholesterol	226	4.3	(1.3)	4.2	(1.3)	4.4	(1.3)	0.64	4.3	(1.3)	4.2	(1.1)	0.53
Albumin g/L	229	37.8	(4.4)	37.5	(3.9)	37.7	(4.5)	0.85	37.1	(4.4)	37.4	(4.0)	0.55
BMI kg/m²	223	24.3	(3.9)	25.1	(4.0)	24,2	(3,8)	0.85	24.3	(4.0)	24.2	(3.4)	0.95
Treatment months[3]	230	36.7	(28.7)	24.5	(12.0)	27.7	(13.0)	0.13	38.9	(30.8)	27.2	(15,2)	0.019*
Dialyses per week (HD)	188	2.7	(0.5)	2.6	(0.6)	2.7	(0.5)	0.17					
Use of													
ESA; n (%)		206 (88)		44 (85)		126 (89)			169 (90)		36 (88)		
Statins; n (%)		143 (61)		36 (69)		80 (56)			112 (60)		30 (73)		

[1] Comparisons between early and late starters (Students' t-test)

[2]Comparisons between HD and PD patients (Students' t-test)

[3] from start in dialysis to 01.09.2009

* Statistically significant differences,

Comparing means between early vs. late starters and dialysis modality- t test

Table 3. Nutritional parameters according to SGA classification

	All (n=220)		**SGA A (n=113)**		**SGA B (n= 71)**		**SGA C (n=36)**		**P values**
	mean	**(SD)**	mean	(SD)	mean	(SD)	mean	(SD	
Se albumin g/L			38.3	(4.0)	37.2	(4.6)	37.3	(4.9)	0.59
Se cholesterol 2008			4.3	(1.2)	4,2	(1,2)	4,6	(1,6)	0.70
eGFR at start (ml/min)			8.5	(2.9)	8.8	(4.2)	8.5	(2.9)	0.84
Hemoglobin 2008 g/L			11.5	(1.2)	11.7	(1.2)	11.4	(1.3)	0.47
Treatment months			37.7	(31.2)	33.1	(24.2)	39.9	(30.5)	0.62
BMI kg/m² at start of dialysis			24.8	(3.8)	25.8	(4.9)	23.0	(2.7)	0.13
BMI kg/m² Annual report 2008			25.6	(3.7)	24.0	(3.4)	20.7	(2.9)	0.000[1]
Appetite loss (EORTC QLQ-C30) n=208	12.2[2]	(23.0)	13.2	(24.2)	11.1	(20.2)	13.5	(25.2)	
Nausea/vomiting (EORTC QLQ-C30) n=214	22.4[3]	(25.0)	19.0	(22.6)	29.4	(28.5)	24.7	(25.7)	
	n	**%**	n	%	n	%	n	%	
Weight loss	91	(49)	37	(41)	31	(56)	17	(56)	
Weight gain	77	(42)	44	(48)	19	(35)	11	(37)	

[1] statistical significant $p < 0.05$

[2] Scores from norm population: Appetite loss: male: 8.6, female: 15.3

[3]Scores from norm population: Nausea/vomiting scale: male: 3.3, female: 8.4

Table 4. Quality of life scores (SF 36) according to gender, dialysis modality and start in dialysis.

	All (n = 226)		**Male (n = 149)**		**Female (n = 76)**			**HD (n=167)**	**PD (n=33)**		**Early start (n= 45)**	**Late start (n= 124)**		***Norwegian dialysis pts. Male (n= 199)***	***Female (n = 102)***
	Mean	(SD)	Mean	(SD)	Mean	(SD)	p-value[1]	Mean	Mean	p-value[2]	Mean	Mean	p-value[3]	*Mean*	*Mean*
PF	40.9	(27.4)	40.5*	(27.4)	39.9*	(26.7)	0.93	41.5	37.8	0.62	39.9	40.2	0.80	*56.7*	*49.9*
RP	17.9	(32.8)	19.3	(34.2)	17.0*	(31.8)	0.65	19.3	11.1	0.07	16.7	15.4	0.95	*24.0*	*26.5*
BP	57.3	(30.2)	55.5	(29.4)	58.0	(31.7)	0.69	56.8	61.8	0.31	56.9	55.7	0.83	*60.1*	*52.7*
GH	45.7	(23.3)	44.8	(21.4)	48.5	(25.7)	0.40	46.3	44.2	0.74	50.0	44.7	0.12	*44.0*	*41.7*
VT	39.3	(22.2)	38.5	(21.0)	39.1	(22.2)	0.77	40.1	33.3	0.33	38.2	38.7	0.83	*44.4*	*42.9*
SF	63.0	(29.2)	60.1	(28.6)	68.0	(29.2)	0.04	61.5	70.5	0.10	58.7	63.5	0.30	*66.2*	*65.6*
RE	42.7	(43.7)	47.4	(44.5)	38.6*	(42.0)	0.22	43.8	40.7	0.62	41.7	45.3	0.76	*52.6*	*57.1*
MH	73.6	(20.2)	72.2	(20.3)	73.3	(17.6)	0.39	73.9	72.3	0.62	73.2	73.3	0.82	*75.5*	*72.6*

PF = physical function, RP = role physical function, BP = bodily pain, GH = General health, VT = vitality, SF = social function, RE = role emotional function, MH = mental health;

[1] Comparison between genders (Mann Whitney U test)

[2] Comparison between HD and PD (Mann Whitney U test)

[3] Comparison between patients starting early and late in dialysis (Mann Whitney U test)

* A difference in scores of 10 points or more between the study populations and scores reported from a younger Norwegian dialysis population (a clinically significant difference)

Table 5. SF- 36 scores according to physical capacity as rated in the SGA questionnaire

SF 36 scores	Normal N= 39		Some activities N= 77		Mostly in chair N= 76		Mostly in bed N= 6		P values[1]
	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)	
PF	47.6	(28.8)	40.0	(26.6)	37.7	(27.6)*	29.3	(32.4)*	0.042
RP	34.4	(40.1)	17.2	(32.5)	11.9	(28.1)*	0*		0.001
BP	67.0	(29.6)	57.7	30.0)	52.8	(29.0)*	27.7	(25.7)*	0.003
GH	51.5	(23.2)	45.8	(24.5)	43.2	(20.8)	29.8	(23.8)*	0.026
VT	45.5	(24.4)	39.4	(23.3)	35.8	(20.6)*	34.3	(20.7)*	0.040
SF	71.3	(32.1)	63.6	(27.8)	57.7	(28.2)*	57.1	(38.1)*	0.011
RE	57.9	(43.6)	36.9	(41.9)	41.8	(44.2)*	22.2	(40.4)*	0.095
MH	77.1	(21.7)	74.1	(20.9)	72.6	(17.8)	50.0	(20.7)*	0.029

*** > 10 points difference in SF 36 scores compared to the group with normal physical capacity**

[1] trend analysis (Jonckheere trend test)