CHAPTER 7

FACTORS ASSOCIATED WITH THE COURSE OF HEALTH-RELATED QUALITY OF LIFE AFTER A HIP FRACTURE

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Arch Orthop Trauma Surg.(2016) Jul;136(7):935-43

Abstract

Introduction

The number of hip fracture patients is expected to grow the forthcoming decades. Knowledge of the impact of the fracture on the lives of elderly could help us target our care. The aim of the study is to describe HRQoL (Health Related Quality of Life) after a hip fracture and to identify factors associated with the course of HRQoL in the first postoperative year.

Methods

335 surgically treated hip fracture patients (mean age 79.4 years, SD 10.7, 68 % female) were included in a prospective observational cohort. HRQoL was measured with the SF-12 Health Survey, composed of the Physical and a Mental Component Summary Score (PCS, MCS) at admission (baseline) and at three and 12 months postoperatively. Eleven predefined factors known to be associated with the course of HRQoL were recorded: age, gender, physical status, having a partner at admission, living in an institution, pre-fracture level of mobility, anemia, type of fracture and treatment, delirium during hospital stay and length of stay.

Results

HRQoL declined between baseline and three months, and recovered between three and 12 months. PCS HRQoL did not recover to baseline values, MCS HRQoL did. Age younger than 80 years, ASA classification I and II, higher prefracture level of mobility, intracapsular fracture and treatment with osteosynthesis (compared to arthroplasty) were associated with greater initial decline in PCS HRQoL, none of the recorded factors were significant for decline in MCS HRQoL.

Conclusion

Both PCS and MCS HRQoL declined after a hip fracture and PCS did not recover to baseline values. Healthier patients may need extra care to prevent them from having a steep decline in postoperative PCS HRQoL and arthroplasty should be considered with low threshold.

Introduction

The number of hip fracture patients will keep growing, with an estimated increase in Europe form 615.000 in 2010 to 815.000 in 2025 (+32%) due to demographic changes. [1] Hip fracture patients suffer from a decline in mobility [2, 3] and loss of independence [4, 5] in the first year after the fracture treatment. The large and increasing number of hip fracture patients in combination with the large impact on patients' daily living activities stresses the importance of analysis of factors associated with postoperative outcome in these patients.

Previous studies have shown that the Health-Related Quality of Life (HRQoL) score decreases after a hip fracture, whereas the Physical health Component Summary Score (PCS) decreases more than Mental health Component Summary Score (MCS). [6–14] Older age, more co-morbidities [12], higher baseline HRQoL [15, 16], lower body mass index, lower bone mineral density [17] treatment with osteosynthesis [18] and complications after internal fixation of femoral neck fractures [11] were identified as specific risk factors for lower HRQoL after a hip fracture. It has been described earlier that the lowest HRQoL is reached in the first three months after a hip fracture, with some improvement in the years thereafter, however the pre fracture HRQoL is never regained. [19].

The aim of the current study was to evaluate the course of HRQoL with specific emphasis on the risk factors for decline in HRQoL during the first 3 months after a hip fracture and the factors associated with recovery of HRQoL after these 3 months in a large prospective cohort of patients.

Methods

Patient cohort

A prospective observational cohort including 461 hip fracture patients (OTA classification 31-A, B and 32-(1-3).1) [20] aged 50 years and older was conducted. All patients were consecutively admitted to a 450-bed teaching hospital (Delft, the Netherlands) between March 2008 and December 2009. Patients with a fracture due to a high-energy trauma or with a pathologic fracture were excluded. Patients with a contra lateral hip fracture within the time window of the study (n=20), those who were treated conservatively (n=14) and patients who were cognitively impaired (n=92) were excluded from the study. The latter was done because cognitive impairment influences HRQoL questionnaire accuracy. [21] Cognitive impairment was defined as dementia, based upon history taking from patients, family and other caretakers or a delirium at the time of admission (based on the

DSM-IV criteria) [22]. Thus, 335 patients were eligible for the analysis. Length of follow-up for all patients was 12 months or up to death.

Uniform collection and recording of data of all patients of this cohort was achieved by evaluation at admission (baseline) and after three and 12 months, according to the local standardized care pathway for hip fracture patients. [23] Collected demographic data were age (divided in two categories based on the median, younger than 80 years and older than 80 years), gender, American Society of Anesthesiologists (ASA) Physical Status classification [24], presence of a partner at admission, living institutionalized or living at home prior to admission and prefracture level of mobility (mobile with or without an aid). A cane, crutch(es) or walker were all considered an aid. Characteristics obtained during admission were; presence of anemia at admission, defined as a hemoglobin (Hb) below 7.5 mmol/L (12 g/dL) in women and below 8.1 mmol/L (13 g/dL) in men [25], type of hip fracture (intracapsular or extracapsular), type of treatment (osteosynthesis or arthroplasty), diagnosis of delirium based on DSM IV-criteria and length of stay (LOS, divided in two categories based on the median, ≤ or > nine days). Mortality was scored meticulously by repeated consultation of the population registers of the counties in the region of the hospital as well as the hospital's patient registration systems for the full length of follow-up.

Health Related Quality of life (SF-12)

To measure HRQoL, the Dutch version of the SF-12 was used. [26–28] The SF-12 is a twelve-item generic health instrument that evaluates eight domains including restrictions or limitations on physical and social activities, normal activities and responsibilities of daily living, pain, mental health and wellbeing and perceptions of health. The SF-12 is divided in a Physical Component summary Score (PCS) and a Mental Component summary Score (MCS), with a maximum score of 100 each. The SF-12 has been shown to be valid, reliable, and responsive in a wide variety of populations and contexts, including patients with orthopaedic conditions [29]. Baseline HRQoL was registered at admission on the Emergency Department. Patients were asked to score their prefracture level of HRQoL retrospective, referring to a period prior to the fracture. Measurement of the HRQoL was repeated prospective during routine follow-up at three and 12 months after the hip fracture in the outpatient clinic or by a questionnaire sent to the patient.

Statistical analysis

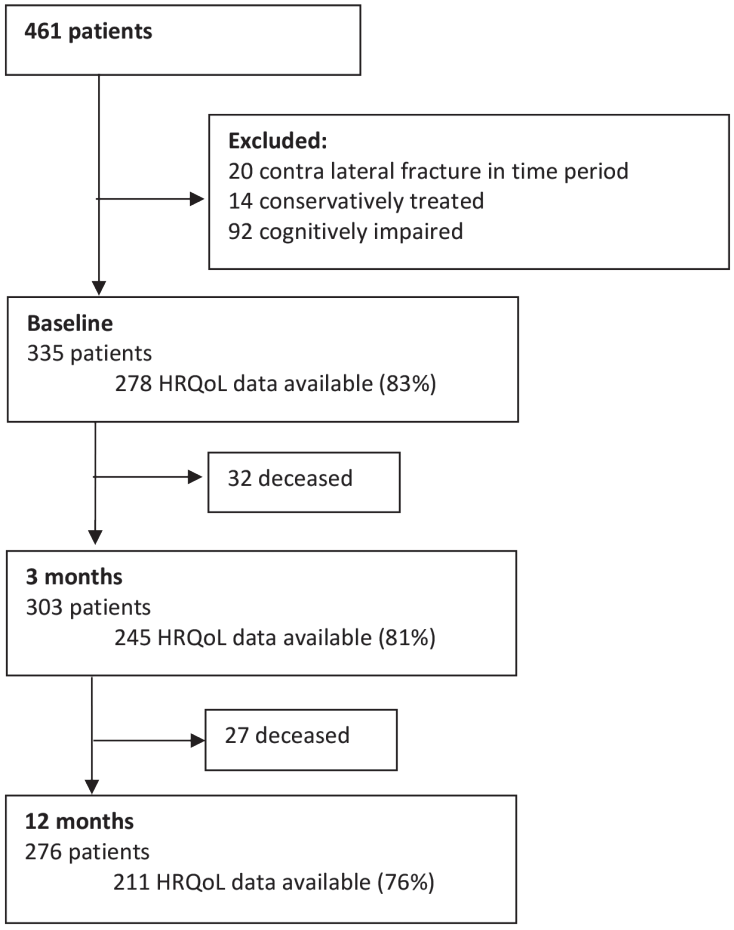
Statistical analysis was performed using SPSS 19.0. (IBM Corporation, Somers, NY, USA) Baseline differences in HRQoL for different patient characteristics (i.e. age, gender) were tested using the unpaired T-test when the data were normally distributed. Decline in HRQoL between baseline and three months was calculated for all patients and for different patient characteristics, an unpaired T-test was used to test for differences.

For all patients with HRQoL data at baseline and at three months a multivariable logistic regression analysis was performed using age, gender, ASA classification, presence of partner at admission, living institutionalized prior to admission, prefracture level of mobility, presence of anemia, type of fracture, type of treatment, occurrence of a delirium and LOS as potential variables associated with decline and recovery of HRQoL. The same analysis was performed for patients with HRQoL data at three months and 12 months. Multicollinearity was tested by Collinearity Statistics. Non-significant variables were removed one by one, removing the largest P-value first, until all remaining variables in the model had a P-value <0.10. The coefficient of determination (R^2) indicating how much of the variability in the PCS and MCS is explained by the explanatory variables, was calculated.

Results

Baseline HRQoL data was complete in 278 patients out of the 335 patients included the cohort (83%), after three months HRQoL data was complete in 245 out of 303 patients (81%). Thirty-two patients (10%) died in the first three months. After 12 months HRQoL was completed in 211 out of 276 patients (76%) (Figure 1). Fifty-nine patients (17.6%) died within the first year after hip fracture at a median of 71.0 days (SD 96 days, interquartile range 22-201). A total of 173 patients (52%) completed HRQoL data at baseline, three months and 12 months. There were 103 patients alive at 12 months who had missing HRQoL data on one or more time points. The patients with complete follow up were more often ASA I/II (n= 140 (81%) versus n= 68 (64%) p=0.005) had more often a partner at admission (n= 83 (52.0%) versus n= 34 (28.9%) p= 0.04) and lived less often in an institution (n= 15 (8.7%) vs. n= 25 (24.5%) p< 0.001). The other characteristics were not different between these groups.

Figure 1; flowcharts of availaible and analyzed patients



Baseline HRQoL PCS and MCS

Table 1 displays baseline characteristics of the cohort. Table 2 displays baseline HRQoL stratified by risk factors. PCS was higher at baseline in the patients younger than 80 years of age, males, patients with ASA classification I/II, with a partner at admission, not living in an institution prior to admission, who were mobile without an aid, who had no anemia at admission and who stayed in hospital shorter than nine days. The baseline MCS was higher for patients younger than 80 years of age, males, patients with ASA classification I/II, with partner at admission, not living institutionalized prior to their fracture, mobile without an aid and who did not suffer from a delirium during admission.

Table 1: baseline patient characteristics

		Number (percentage)
Age (median, range)		median 80.5 (50 - 101)
Gender	Female	227 (68%)
ASA classification	I/II	233 (70%)
Partner at admission [a]	Yes	127 (39%)
Living in an institution prior to admission [b]	Yes	64 (19%)
Prefracture level of mobility [c]	With aid	139 (47%)
Anemia at admission [d]	Yes	124 (37%)
Type of fracture	Intracapsular #	202 (60%)
Type of treatment [c]	Arthroplasty ##	121 (37%)
Delirium [e]	Yes	49 (15%)
Length of stay (median, range)		median 9 (3 – 71)

Values missing [a] = 11, [b] = 1, [c] = 40, [d] = 9, [e]= 4
opposed to Extracapsular
opposed to Osteosynthesis

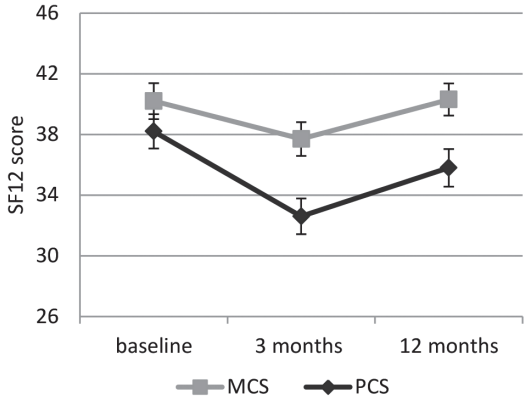
Table 2: baseline physical (PCS) and mental component score (MCS) stratified by risk factors

		PCS	95% CI	P	MCS	95% CI	
All patients (n= 335)		38.2	37.1-39.4		40.2	39.1-41.2	
Age	<80	41.6	40.0-43.1		41.7	40.2-43.2	
	≥80	35.3	33.8-36.7	<0.01	38.8	37.3-40.2	<0.01
Gender	Female	36.9	35.5-38.2		39.8	38.5-41.0	
	Male	41.2	39.2-43.2	0.04	41.0	39.1-42.9	0.04
ASA classification	I/II	40.8	39.6-42.1		41.5	40.2-42.7	
	III/IV	31.5	29.5-33.5	<0.01	36.8	34.9-38.8	<0.01
Partner at admission	Yes	40.7	38.9-42.4		43.0	41.3-44.7	
	No	37.0	35.5-38.5	0.01	38.7	37.3-40.1	0.03
Living in an institution prior to admission	Yes	31.0	28.4-33.7		34.6	32.0-37.1	
	No	39.7	38.5-40.9	<0.01	41.3	40.2-42.4	<0.01
Prefracture level of mobility	With aid	32.4	30.9-33.9		38.1	36.5-39.7	
	Without aid	45.0	43.6-46.4	<0.01	42.8	41.4-44.3	<0.01
Anemia at admission	Yes	35.4	33.5-37.2		39.8	38.0-41.6	
	No	39.9	38.6-41.3	0.05	40.4	39.1-41.8	0.71
Type of fracture	Intracapsular	39.2	37.8-40.7		40.8	39.4-42.2	
	Extracapsular	36.2	34.3-38.1	0.18	39.0	37.1-40.8	0.3
Type of treatment	Arthroplasty	36.8	34.9-38.6		39.2	37.4-40.9	
	Osteosynthesis	39.4	37.9-40.8	0.42	40.8	39.4-42.1	0.25
Delirium	Yes	34.0	31.0-36.9		35.6	32.9-38.4	
	no	39.1	37.9-40.3	0.18	41.0	39.9-42.1	<0.01
Length of stay	< /=9 days	41.6	40.1-43.2		41.6	40.1-43.1	
	> 9 days	35.2	33.7-36.7	<0.01	38.9	37.5-40.3	<0.01

Course of HRQoL

Both PCS and MCS declined in the first three months. (figure 2) PCS did not recover to the baseline value at 12 months follow-up, whereas MCS did.

Figure 2; Course of Mental Component Score (MCS) and Physical Component Score (PCS) in time mean (SD)



HRQoL = Health Related Quality of Live

Factors associated with decline and recovery of PCS

Analysis of difference in HRQoL between baseline and three months shows that male gender, lower ASA classification and higher prefracture mobility level was associated with a higher decline of PCS (univariate analysis, table 3). Higher prefracture mobility level was associated with a higher recovery of PCS between three and 12 months. In multilevel analysis younger age, lower ASA classification, higher prefracture mobility level, intracapsular fracture and treatment with osteosynthesis were independently associated with larger loss in PCS HRQoL in the first three months (table 4). Higher prefracture mobility level, intracapsular fracture, treatment with osteosynthesis and length of stay more than nine days were associated with higher recovery of PCS HRQoL between three and 12 months (table 5). Figure 3 shows PCS course in time stratified by age, ASA, mobility, type of fracture, type of treatment and length of stay.

Table 3; Decline and recovery of the physical component score (PCS) stratified by risk factors

		Decline between baseline and three months			Recovery between 3 and 12 months		
		Δ	CI	P	Δ	CI	P
All patients (n= 218)		-5.6	-6.8; -4.4		3.1	1.8; 4.4	
Age	<80	-6.6	-8.8; -4.3		4.2	1.9; 6.5	
	≥ 80	-4.7	-6.9; -2.5	0.30	2.0	-0.4; 4.3	0.07
Gender	Female	-4.7	-6.7; -2.8		2.4	0.4; 4.5	
	Male	-7.4	-10.2 -4.5	<0.01	4.5	1.5; 7.4	0.12
ASA classification	I/II	-6.9	-8.7; -5.1		3.7	1.8; 5.6	
	III/IV	-1.6	-4.6; 1.4	<0.001	0.9	-2.4; 4.3	0.08
Partner at admission	Yes	-6.0	-8.5; -3.5		4.2	1.6; 6.7	
	No	-5.4	-7.6; -3.3	0.61	2.1	-0.2; 4.4	0.10
Living in an institution prior to admission	Yes	-3.2	-7.2; 0.9		0.9	-3.9; 5.7	
	No	-6.0	-7.7; -4.3	0.15	3.3	1.5; 5.1	0.29
Prefracture level of mobility	With aid	-2.5	-4.6; -0.3		0.6	-1.8; 3.0	
	Without aid	-8.8	-10.7; -6.8	<0.001	5.2	3.1; 7.3	<0.001
Anemia at admission	Yes	-4.0	-6.7; -1.2		2.2	-0.8; 5.2	
	No	-6.5	-8.5; -4.5	0.08	3.5	1.5; 5.6	0.28
Type of fracture	Intracapsular	-6.1	-8.2; -4.1		3.9	1.7; 6.0	
	Extracapsular	-4.8	-7.7; -2.0	0.36	2.2	-0.7; 5.2	0.20
Type of treatment	Arthroplasty	-4,6	-7.3; -2.0		1.4	-1.5; 4.3	
	Osteosynthesis	-6.2	-8.3;-4.2	0.26	3.9	1.8; 6.1	0.06
Delirium	Yes	-3.5	-8.0; 1.1		0.3	-4.7; 5.4	
	No	-6.0	-7.8; -4.3	0.23	3.6	1.7; 5.4	0.14
Length of stay	< =9 days	-6.3	-8.0; -4.5		2.9	1.2; 4.5	
	> 9 days	-5.6	-7.7; -3.5	0.94	3.3	1.5; 5.2	0.78

Table 4 Multivariable analysis of decline in Physical Component Score (PCS) between baseline and 3 months

		B	95% CI	P
Age	<80 years	-4.36	-8.11; -0.60	0.023
ASA classification	I/II	-4.48	-8.28; -0.68	0.007
Prefracture level of mobility	Without aid	-6.15	-9.81; -2.48	0.001
Type of fracture	Intracapsular	-7.48	-12.98; -1.98	0.008
Type of treatment	Osteosynthesis	-7.40	-12.89; -1.92	0.009

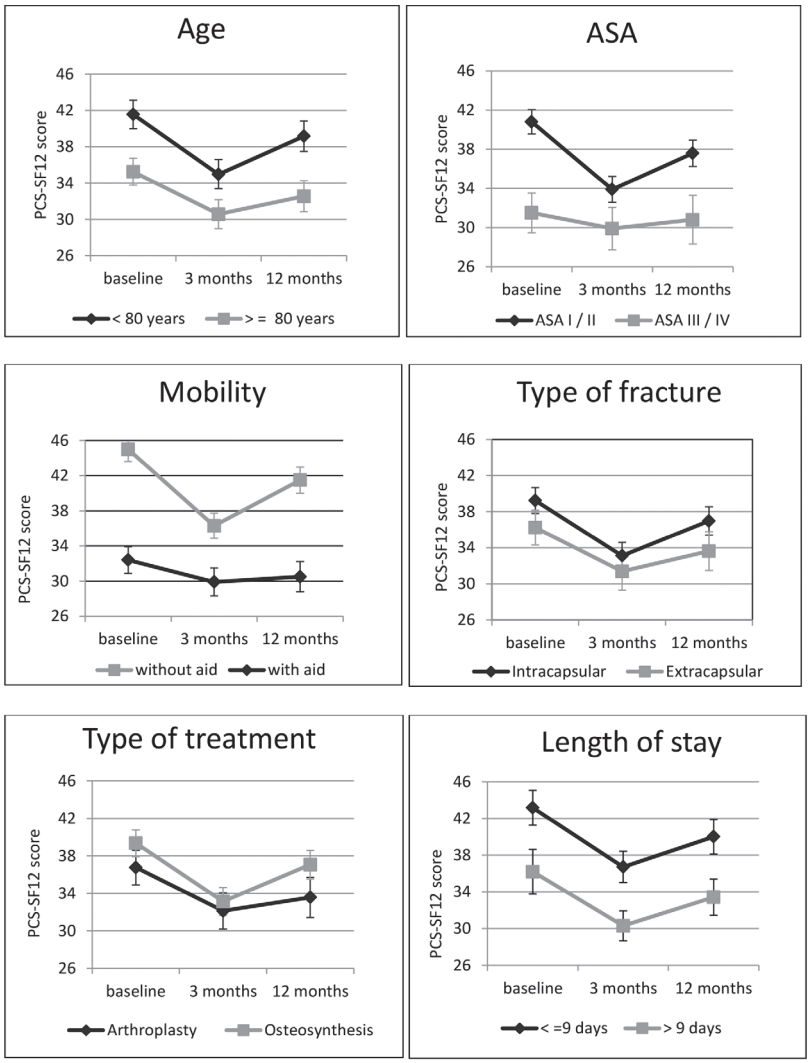
R square = 0.193

Table 5 Multivariable analysis of recovery in Physical Component Score (PCS) between 3 and 12 months

		B	95% CI	P
Prefracture level of mobility	Without aid	3.95	1.33; 6.56	0.003
Type of fracture	Intracapsular	4.36	1.28; 7.43	0.006
Type of treatment	Osteosynthesis	5.49	2.28; 8.70	0.001
Length of stay	> 9 days	3.28	0.64; 5.92	0.015

R square = 0.151

Figure 3; Physical Component Score (PCS) course in time stratified by age, ASA, mobility, type of fracture, type of treatment and length of stay. Mean (SD)



Factors associated with decline and recovery of MCS
Univariate analysis shows none of the studied factors associated with a higher initial decline and a later increase of MCS. No model could be made for MCS decline between baseline and three months and recovery between three and 12 months, as none of the risk factors were significant predictors in the multilevel analysis.

Discussion

In this observational cohort study on HRQoL in hip fracture patients during the first postoperative year, HRQoL declined, which was more pronounced in the PCS than in the MCS. The PCS did not recover to baseline values at 12 months postoperative, whereas MCS did. Age, ASA classification, prefracture level of mobility, type of fracture and type of treatment were associated with the decline in the PCS.

Our findings that patients did not recover to their baseline PCS level, but did recover to their preoperative MCS level is in accordance with other cohort studies. [6, 9, 10, 12–14, 17, 19, 30, 31] A meta-analysis by Peasgood et al (2009) [19] also showed the lowest HRQoL in the first three months after a hip fracture, with some improvement in the years thereafter, but never full recovery to the prefracture level.

Lower ASA classification, higher prefracture level of mobility and younger age were associated with a relatively larger decline in PCS HRQoL after a hip fracture: i.e. the more healthy patients suffered the most from the sequelae of a hip fracture. An international cohort study on 1,273 hip fracture patients showed that patients with higher HRQoL at baseline had greater loss of HRQoL after their hip fracture.[15] A study on the same cohort of hip fracture patients as the current study focussing on of the level of mobility showed that the most mobile patients were least likely to return to their pre fracture mobility level after three months. [2] Since these healthier and more active patients have a larger decline of their PCS HRQoL, more attention in the postoperative rehabilitation should be given to them, whilst a general feeling might exist, that these healthier patients might need less attention. Special rehabilitation programs with focus on mobilization and early discharge policy for this group could contribute to this. Younger age in our cohort was associated with a larger decline in the first three months, while most studies showed that older age is associated with larger loss in HRQoL. [12, 15] These other studies however measured HRQoL after one or two years, and younger patients recover quicker after these first three months. Patients with intra capsular fractures are in general younger (mean two years), more mobile and

less dependent regarding activities of daily living compared to patients with extra capsular fractures. [32–34] Since these patients with an intra capsular fracture seems to be healthier, they are more likely to have a larger initial decline in HRQoL.

In the Norwegian hip fracture register, patients treated with an osteosynthesis for a displaced femoral neck fracture had higher reoperation rates, higher long-term mortality and a lower HRQoL after four months, compared to those treated with a hemi arthroplasty. [18] Buecking et al. demonstrated that treatment with osteosynthesis was associated independently with a larger decrease in HRQoL at discharge.[35] Both studies confirm our finding that patients treated with osteosynthesis have a larger loss in HRQoL compared to those treated with arthroplasty. This suggests that arthroplasty should be considered with a low threshold. However in our study osteosynthesis was associated with a larger recovery in HRQoL between three months and one year. This resulted in an equal loss in HRQoL between osteosynthesis and prosthesis in the first year.

None of the factors were significant predictors for decline or recovery of MCS HRQoL after a hip fracture. This is in contrast to others who found that comorbidities were associated with a larger decline in MCS HRQoL, but that study included only 61 patients. [12]

The strengths of our study are its prospective character, the size of the cohort (n=335) and the length of follow up (one year). Only a few prospective studies reporting on factors associated with the course of PCS HRQoL after a hip fracture are known [12, 15, 35] Two studies had a relatively short follow-up: one (n=402) up until discharge, [35] the other (n=1273) four months. [15] The study with the longest follow-up (two years) was small study (n=61). [12]

A limitation of our study is the incomplete follow-up: the follow-up rate ranged from 76 to 83%, corrected for mortality. This follow-up rate can be classified as substantial. The mortality rate of 17.6% is lower than the recently reported average 1-year mortality after hip fracture of 22 to 29%. [36] Since we used multilevel analysis, a part of the problem of the incomplete follow-up is addressed for in our data analysis. Inclusion of the pre-operative and three months results of patients who died in the first year after the fracture might have influenced our results, while those patients probably had lower HRQoL scores when they would have been alive at 12 months. Recall bias may be present for baseline HRQoL, which was recorded at admission in the hospital in the emergency department,

but recent literature showed that recall data is accurate. [37–39] Also since we excluded cognitive impaired patients, our results can be generalizable only to hip fracture patients who are mentally fit. [21] Medical comorbidities were not scored as individual parameter, but ASA score was used as a reflexion of comorbidities. Finally, the SF-12 was used to measure HRQoL although in 2007 the European Consumer Safety Association advised to use a combination of EuroQol-5D and Health Utilities Mark III in all studies on injury-related disability [40]. However, the SF-12 has been shown to be valid, reliable, and responsive in a patients with orthopaedic conditions [29].

In summary, the initial decline in PCS HRQoL, three months after a hip fracture, was larger in healthier patients (younger than 80 years, higher pre fracture level of mobility, ASA I and II et cetera), most probably due to their higher prefracture values. This implies that these patients need extra care or health professionals should be aware that also "healthy" patients could deteriorate after a significant life event like a hip fracture. Thus prevention from overall decline in HRQol should also be focused at this patient group and not only on the frail patient group. Special rehabilitation programs and discharge policy for this group and not only for the more frail patients is justified. Since the decline in PCS HRQoL in the first three months was larger in patients treated with osteosynthesis compared to those treated with arthroplasty of the hip, the latter option should be considered with a low threshold.

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