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Biopsychosocial and spiritual factors associated with quality of life in elderly hospitalized patients undergoing post-acute rehabilitation: a cross-sectional study

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1

1 **ABSTRACT**

2 **Objectives**: We investigated whether biopsychosocial and spiritual factors and satisfaction
3 with care were associated with patients' perceived quality of life.

4 **Design**: This was a cross-sectional descriptive study.

5 **Setting**: Data were collected from inpatients at a post-acute geriatric rehabilitation center in a
6 university hospital in Switzerland.

7 **Participants**: Participants aged 65 years and over were consecutively recruited from October
8 2014 to January 2016. Exclusion criteria included significant cognitive disorder and terminal
9 illness. Of 227 eligible participants, complete data were collected from 167.

10 **Main outcome measures**: Perceived quality of life was measured using the World Health
11 Organization Quality of Life questionnaire - version for older people. Predictive factors were
12 age, sex, functional status at admission, comorbidities, cognitive status, depressive symptoms,
13 living conditions, and satisfaction with care. A secondary focus was the association between
14 spiritual needs and quality of life.

15 **Results**: Patients undergoing geriatric rehabilitation experienced a good quality of life.
16 Greater quality of life was significantly associated with higher functional status (r_s = .204, p =
17 .011), better cognitive status (r_s = .175, p = .029), and greater satisfaction with care (r_s = .264,
18 p = .003). Poorer quality of life was significantly associated with comorbidities (r_s = −.226, p
19 = .033), greater depressive symptoms (r_s = −.379, p < .001), and unmet spiritual needs (r_s =
20 −.211, p = .049). Multivariate linear regression indicated that depressive symptoms (β:
21 −1.011; 95% confidence intervals [CI]: −1.428, −0.594; p < .001) and satisfaction with care
22 (β: 0.254; 95% CI: 0.016, 0.493; p = .037) significantly predicted quality of life.

23 **Conclusions**: Patient perceptions of quality of life were strongly associated with depression,
24 functional status, and satisfaction with care. More research is needed to assess whether
25 considering quality of life could improve care plan creation.

26

27 **Keywords:** geriatric rehabilitation, quality of life, biopsychosocial and spiritual model,
28 satisfaction with care.

29 **ARTICLE SUMMARY**

30 **Strengths and limitations of this study**

31 ▪ This study uses biopsychosocial and spiritual descriptors to explore determinants of
32 quality of life in geriatric rehabilitation.

33 ▪ Design is based on a "real world" setting, with usual clinical practice descriptors of
34 biopsychosocial and spiritual dimensions, which is likely to result in good ecological
35 validity.

36 ▪ Owing to precedent point, the rate of missing values is higher.

37 ▪ Cross-sectional study cannot conclude in any causal relationships between descriptors and
38 quality of life.

INTRODUCTION

40 Quality of life is an increasingly interesting outcome in the context of the aging population. It

41 is relevant to consider quality of life rather than mortality in elderly people, given the high

42 prevalence of chronic conditions and their impact on functional independence. Elderly people

43 usually prefer quality of life over long life.[1] It seems therefore valuable to study quality of

44 life in elderly persons and to identify likely influential factors.

45 Overall, elderly community-dwelling populations retain a good quality of life. For instance, in

46 a random sample of 999 English respondents over 65 years of age, 82% described their

47 quality of life as good.[2] Quality of life in elderly persons is affected by a variety of factors;

48 thus, depressive disorders, functional impairment and other health problems could reduce a

49 patient's quality of life, whereas social support can positively affect quality of life.[3]

50 Psychosocial resources can have a substantial influence on quality of life, affecting situations

51 such as facing a diminution of functionality, for example.[2] Although quality of life can

52 decrease with physical impairment, elderly persons suffering significant limitations in their

53 daily lives may nevertheless (and somewhat paradoxically) describe their quality of life as

54 excellent.[4-5] In a study of 185 community-dwelling older Americans with advanced illness,

55 Solomon et al. found that 65% of patients reported their quality of life as the best possible or

56 good.[6]

57 Quality of life in elderly persons has been assessed in a number of health-care settings (acute

58 care, assisted living and nursing home). Existing studies have similar results, and tend to

59 show that the perceived quality of life remains good in these settings.[7-8] There are only a

60 few studies that investigate quality of life in rehabilitation and most of them were focused on

61 patients with very specific illnesses, such as osteoporosis and hip fracture.[4, 9] However,

62 measuring quality of life in this setting should be of interest because improving quality of life

63 is typically understood as the ultimate goal of rehabilitation.[10-11] Moreover, it could be a

64 broader outcome to measure in rehabilitation, in addition to traditional variables linked to

65 functional independence improvement.

66 Geriatric rehabilitation is traditionally interdisciplinary, with attention paid to biopsychosocial

67 issues.[12-13] This setting even integrates the spiritual dimension at different levels, in a

68 global biopsychosocial and spiritual model of care.[14-15]

69 The biopsychosocial and spiritual model is a representation of the human being in which the

70 biological, psychological, social and spiritual dimensions are considered to be simultaneously

71 in play.[12, 14] Sulmasy hypothesizes that the biological, psychological, social and spiritual

72 dimensions of this model contribute to quality of life: "the composite state – how the patient

73 feels physically, how the patient is faring psychologically and interpersonally, as well as how

74 the patient is progressing spiritually – constitutes the substrate of the construct called quality

75 of life".[14]

76 Thus, we aimed to examine the biopsychosocial and spiritual factors associated with quality

77 of life in elderly hospitalized patients undergoing post-acute rehabilitation.

78 Because this population is reliant on the hospital institution and is involved in constant

79 interaction with health care providers, the patient's perception of the treatment received has to

80 be taken into account. Satisfaction with care is one proxy to describe the system from the

81 perspective of the patient, and the literature has shown the influence of satisfaction with care

82 on quality of life in other settings.[16-17] Therefore, the inclusion of an evaluation of

83 satisfaction with the care patients received is relevant.

84 The following hypotheses are made:

85 The four dimensions of the biopsychosocial and spiritual model and the patient's satisfaction

86 with the care received are likely associated with the quality of life of a person undergoing

87 geriatric rehabilitation.

88 To confirm this hypothesis, the objectives of this study are to explore:

89 1) The quality of life perceived by the patient in a setting of post-acute geriatric

90 rehabilitation.

91 2) The relationship between the biopsychosocial dimensions of the patient and patients'

92 perceived quality of life. As a secondary focus, the relationship between the spiritual

93 dimension and patients' perceived quality of life.

94 3) The relationship between satisfaction with care received and patients' perceived

95 quality of life.

96

97 **METHOD**

98 **Context and Population**

99 This cross-sectional descriptive study was conducted at a post-acute rehabilitation center for

100 geriatric patients at the Lausanne University Hospital in Switzerland. Participants were

101 consecutively included during a cumulative period of 13 months running from October 2014

102 to January 2016. The patients spent an average of 20.5 days in this 95-bed center, after an

103 acute-care hospital stay, and 74% of them then returned home.

104 Eligible participants were at least 65 years old. Exclusion criteria included significant

105 cognitive disorders (defined by a score of less than 21 on the Mini Mental State, MMS [18]),

106 too ill to be able to participate (medically unstable or with uncontrolled symptoms such as

107 severe pain or significant dyspnea), not French-speaking, or a doctor-estimated life

108 expectancy of less than 6 months. Patients who had previously been included and excluded

109   were not re-included as a case of new admission during this period. In the end, 167 patients

110   participated in the study (Figure 1). An analysis comparing the participants (N = 167) with

111   patients who refused to participate (N = 60) and with those who did not participate owing to

112   logistical reasons (N = 177) did not show any characteristic significant differences.

113   [INSERT FIGURE 1]

114   The study was approved by the Cantonal Committee of Vaud on the Ethics of Research on

115   Human Subjects, and all the participants gave their written informed consent. The manuscript

116   was drafted in accordance with the STROBE reporting guidelines (www.strobe-

117   statement.org/).

118   **Data Collected**

119   At the time of admission, data were collected on age, sex, reason for admission, living

120   conditions (living alone, use of home care services, living in a nursing home), functional

121   status at home prior to admission (from history, using basic activities of daily living [ADL]

122   and instrumental activities of daily living [IADL]; ADL scores ranged from 0 to 6,[19] while

123   IADL scores ranged from 0 to 8,[20] a high score indicating better functional status),

124   functional status at the time of admission to the geriatric rehabilitation center (measured using

125   the functional independence measure [FIM], with scores ranging from 18 to 126, a high score

126   indicating better functional status),[21] falls during the previous twelve months, cognitive

127   status (measured using the MMS, with scores ranging from 0 to 30, a high score indicating

128   better cognitive status)[18] and level of comorbidities (measured using the cumulative illness

129   rating scale [CIRS-G], with scores ranging from 0 to 56, a high score indicating more

130   comorbidities).[22] During the second week of hospitalization, a chaplain evaluated the

131   spiritual needs of the patient (cf. below). All of these assessments were systematically

132   conducted in the usual clinical setting.

133 Specifically for this research, a research assistant met with patients during their second week

134 of hospitalization at the post-acute rehabilitation center to evaluate their quality of life (cf.

135 below), the presence of depressive symptoms (patient health questionnaire-9, PHQ9, with

136 scores ranging from 0 to 27, a high score indicating more depressive symptoms)[23-24] and

137 their satisfaction with the care received (cf. below). The PHQ-9 was specifically chosen for its

138 psychometric properties, as a usual clinical setting normally has a tool with lower properties.

139 *World Health Organization Quality of Life questionnaire - version for older people*

140 *(WHOQOL-OLD).* Quality of life was evaluated by the WHOQOL-OLD, a questionnaire

141 developed using the World Health Organization framework and translated into and validated

142 in French.[25-26] The WHOQOL-OLD is specifically intended for persons over 60 years of

143 age and emphasizes the following six dimensions, which are particularly relevant to the

144 quality of life for this segment of the population: "sensory abilities"; "autonomy"; "past,

145 present and future activities"; "social participation"; "death and dying"; and "intimacy". The

146 "sensory abilities" dimension describes sensory functionality (hearing, sight, touch, taste and

147 smell) and its impact on loss of quality of life. The "autonomy" dimension involves the ability

148 to maintain control over one's actions and decisions. The "past, present and future activities"

149 dimension reflects the feeling of accomplishment during life and perspectives on life as it

150 continues. The "social participation" dimension assesses patient satisfaction related to his/her

151 daily activities, particularly social activities. The "death and dying" dimension refers to

152 preoccupations with death. Finally, the "intimacy" dimension relates to intimate and personal

153 relations with persons who are close to the respondent. The questionnaire includes 24 answers

154 evaluated on a Likert scale from 1 to 5. The total score and the score for each dimension

155 (which are calculated by an algorithm) range from 0 to 100. A high score indicates a higher

156 quality of life.

157 *Quality from the Patient's Perspective Short Form (QPP-SF).* The QPP-SF is a questionnaire

158 that evaluates care using patient descriptions.[27-28] It covers the following four areas:

159 medical-technical competences (three factors); physical-technical conditions (three factors);

160 identity-oriented approach (10 factors); and socio-cultural atmosphere (four factors). The final

161 score ranges from 20 to 80; a high score indicates high satisfaction with the care received. For

162 purposes of this study, the questionnaire was translated by two persons whose native language

163 was French, and a native English speaker performed a reverse translation.

164 *Spiritual Distress Assessment Tool (SDAT).* The SDAT evaluates the spiritual needs of

165 hospitalized elderly patients.[29-30] The SDAT consists of 5 items (the need for life balance,

166 the need for connection, the need for values acknowledgement, the need to maintain control,

167 and the need to maintain identity), scored on a Likert scale of 0 (need completely met) to 3

168 (need completely unmet). The total score ranges from 0 to 15; a high score indicates

169 important unmet spiritual needs. The SDAT was administered to patients by a specially

170 trained chaplain using a standardized procedure.

171 **Statistical Analyses**

172 Descriptive analyses of the variables were undertaken. Correlations of the different

173 descriptive elements and quality of life were determined using Spearman rank correlations.

174 Quality of life was considered both in overall terms and within each of its dimensions.

175 Univariate analyses were carried out only with available data (complete case analysis), and

176 the number of missing data was mentioned (see the Strengths and Weaknesses section for

177 explanations about missing data). The data were analyzed using Stata 12.0 (Stata Corp LP,

178 College Station, TX). Finally, a multivariate linear regression was undertaken, with the

179 WHOQOL-OLD total as the dependent variable, and age, sex, FIM, MMS, PHQ-9, living

180 conditions and QPP-SF as explanatory variables. The low availability of the chaplain resulted

181 in many missing SDAT responses; therefore, we considered spirituality as a secondary rather

182 than a primary focus and did not include it in the multivariate analysis. Multicollinearity

183 among the explanatory variables was assessed with the variance inflation factor. Parameters

184 were estimated using multiple imputation (20 imputations), with R version 3.3.1 (www.r-

185 project.org) and the package mice version 2.25.[31] The number of missing values is also

186 indicated. The statistical significance was set at $p < .05$.

187

188 RESULTS

189 Population Description

190 The average age of the participants was 82.3 ± 7.2 years, and 65.9% were women. Their

191 characteristics are described in Table 1. The patients were mostly admitted from orthopedics

192 and traumatology (42 %), internal medicine (41 %), neurology (6 %) and cardio-vascular

193 surgery (4 %). Participants from orthopedics and traumatology were admitted after fracture

194 surgery (40 %), elective surgery (39 %), conservative treatment of fractures (17 %) and other

195 reasons (4 %). From internal medicine, they were in post-acute rehabilitation for gait and

196 balance disorders of multifactorial etiology (29 %), an infectious disease (27 %), a cardiac

197 event (20 %) and other reasons (25 %).

198

199 *Table 1*. Clinical characteristics of the sample (N = 167).

Characteristics	Mean ± SD [min; max] or %	Median [interquartile range]	Number of missing values
Age (years)	82.3 ± 7.2 [65; 101]	83.0 [77-88]	0
Women (%)	65.9	(women)	0
ADL index at admission[a]	5.1 ± 1.1 [1; 6]	5 [5-6]	1

IADL index at admission[b]	4.7 ± 2.4 [1; 8]	5 [3-7]	2
Fall during the previous year (%)	68.9	(yes)	0
Living alone (%)	72.5	(yes)	0
Home care before hospitalization (%)	64.1	(yes)	0
Living in nursing home before hospitalization (%)	0.6	(no)	0
FIM[c]	86.4 ± 14.3 [27; 109]	91 [79-96]	1
MMS[d]	26.7 ± 2.7 [21; 30]	28 [25-29]	0
CIRS[e]	14.3 ± 4.9 [4; 33]	14 [11-18]	72
PHQ-9[f]	7.0 ± 4.8 [0; 27]	6 [4-10]	4
SDAT[g]	6.0 ± 3.1 [0; 12]	6 [3-9]	69
QPP-SF[h]	72.3 ± 8.5 [26; 80]	75 [69-78.5]	30

Note. [a]Activities of daily living (score range from min. 0 to max. 6), [b]Instrumental activities of daily living (0 to 8), [c]Functional independence measure (18 to 126), [d]Mini mental state (0 to 30), [e]Cumulative illness rating scale (0 to 56), [f]Patient health questionnaire-9 (0 to 27), [g]Spiritual distress assessment tool (0 to 15), [h]Quality from the patient's perspective short form (20 to 80).

200

Quality of Life in Geriatric Rehabilitation

202   Overall, on a transformed scale of 0 to 100, the quality of life perceived by the patients is 68.3

203   ± 12.2 (median 69.3, min. 37.5, max. 94.8) (Figure 2). The dimensions of the WHOQOL-

204   OLD range from 60.0 ± 22.7 ("sensory abilities") to 77.4 ± 18.8 ("death and dying").

205   [INSERT FIGURE 2]

Univariate Analysis of Factors Associated with Quality of Life

207   Detailed data are provided in Table 2. Overall better quality of life is significantly associated

208   with a higher functional status at the time of entrance (FIM), a better cognitive state (MMS)

209   and a better satisfaction regarding care received (QPP-SF). The presence of comorbidities

210   (CIRS), lower mood (PHQ-9), and unmet spiritual needs (SDAT) are associated with a lower

211   quality of life. We do not see a significant relation for the social evaluation factors.

212

213   *Table 2.* Analysis of associations with the WHOQOL-OLD, both overall and for each

214   underlying dimension. Spearman's rank correlation, r_s [p-value]. Variables with a

215   weak to average correlation ($|r_s| \geq .200$) are indicated in gray; those with a significant

216   correlation (p-value $\leq .050$) are in boldface. The number of missing values is indicated

217   in parentheses.

Characteristics	WHOQOL-OLD total	Sensory abilities	Autonomy	Death and dying	Past, present and future activities	Social participation	Intimacy
Age (years)	-.031 [.705] (11)	.095 [.224] (1)	-.088 [.262] (1)	.088 [.265] (4)	-.020 [.797] (0)	-.084 [.284] (2)	.007 [.933] (3)
Women (%)	.004 [.965] (11)	.039 [.614] (1)	-.013 [.873] (1)	-.047 [.550] (4)	-.038 [.628] (0)	.024 [.758] (2)	.015 [.847] (3)
FIM	**.204 [.011] (12)**	**.170 [.029] (2)**	**.312 [.000] (2)**	-.127 [.107] (5)	**.177 [.023] (1)**	**.210 [.007] (3)**	.061 [.443] (4)
MMS	**.175 [.029] (11)**	.038 [.631] (1)	**.212 [.006] (1)**	-.062 [.429] (4)	**.202 [.009] (0)**	**.202 [.035] (2)**	**.157 [.045] (3)**
CIRS	**-.226 [.033] (77)**	.005 [.961] (72)	**-.231 [.025] (73)**	-.087 [.407] (74)	**-.230 [.025] (72)**	**-.337 [.001] (72)**	.083 [.430] (74)
PHQ-9	**-.379 [.000] (15)**	**-.331 [.000] (5)**	**-.319 [.000] (5)**	**-.265 [.001] (8)**	**-.156 [.047] (4)**	**-.317 [.000] (6)**	-.101 [.202] (7)
Living alone (%)	-.063 [.434] (11)	-.089 [.255] (1)	.080 [.308] (1)	-.052 [.510] (4)	-.098 [.209] (0)	-.048 [.540] (2)	**-.170 [.030] (3)**
Home care before hospitalization (%)	-.238 [.003] (11)	-.106 [.174] (1)	**-.245 [.002] (1)**	-.119 [.132] (4)	-.048 [.056] (0)	-.152 [.051] (2)	-.072 [.358] (3)
SDAT	**-.211 [.049] (79)**	-.152 [.137] (70)	-.182 [.073] (69)	-.052 [.619] (73)	-.173 [.089] (69)	**-.248 [.015] (71)**	**-.218 [.034] (72)**
QPP-SF	**.264 [.003] (38)**	.045 [.604] (31)	**.247 [.004] (31)**	.074 [.392] (32)	**.179 [.037] (30)**	**.307 [.000] (31)**	**.245 [.004] (33)**
QPP-SF: medical-technical competences	**.207 [.011] (16)**	.055 [.488] (7)	**.179 [.024] (7)**	.076 [.345] (9)	**.206 [.009] (6)**	**.272 [.001] (8)**	**.218 [.006] (9)**
QPP-SF : physical-technical conditions	**.252 [.002] (16)**	.085 [.286] (7)	**.201 [.011] (7)**	.130 [.104] (9)	.114 [.150] (6)	**.251 [.001] (8)**	**.311 [.000] (9)**
QPP-SF : identity-oriented approach	**.231 [.006] (26)**	.025 [.758] (17)	**.251 [.002] (17)**	.006 [.947] (19)	**.199 [.014] (16)**	**.265 [.001] (18)**	**.257 [.002] (19)**
QPP-SF : socio-cultural atmosphere	**.242 [.004] (24)**	.027 [.739] (16)	**.213 [.009] (16)**	.052 [.529] (18)	**.208 [.010] (15)**	**.247 [.002] (16)**	**.325 [.000] (18)**

218

219   Table 2 also describes the association between each of the dimensions of WHOQOL-OLD

220   and the biopsychosocial and spiritual dimensions. Associations remain similar as those in the

221   overall score except for "sensory abilities" and "death and dying", which are only connected

222   with a limited number of markers.

223

224   **Linear Multivariate Analysis of Factors Associated with Quality of Life**

225   In multivariate analysis, mood (PHQ-9; β = -1.011, p <.001) and satisfaction with the care

226   received (QPP-SF; β = 0.254, p = .037) have a significant association with the quality of life

227   (Table 3). The variation explained by all the variables was 26.2% (F = 6.254, p < .001). No

228   multicollinearity was identified between the explanatory variables, because the maximal

229   variance inflation factor was 1.28.

230   *Table 3*. Multivariate linear analysis with multiple imputation to predict the

231   WHOQOL-OLD total.

Predictive factor	total WHOQOL-OLD (11 missing values)		Number of missing values
	β (95% CI)	*p*-value	
Age (years)	-0.044 (-0.305 to 0.217)	.740	0
Women	0.323 (-3.480 to 4.126)	.867	0
FIM	0.109 (-0.022 to 0.240)	.101	1
MMS	0.088 (-0.601 to 0.777)	.801	0
PHQ-9	-1.011 (-1.428 to -0.594)	<.001	4
Living alone	-1.679 (-5.760 to 2.401)	.417	0
QPP-SF	0.254 (0.016 to 0.493)	.037	30

Note. β, regression coefficient.

232

233   **DISCUSSION**

234 Elderly patients undergoing rehabilitation after acute care perceived a relatively high level of

235 quality of life. To our knowledge, these are new data for this specific setting. This is not

236 surprising, given this environment aims to offer stimulating conditions to promote and regain

237 a good quality of life. Quality of life has a strong relationship with mood and functional status

238 in this study. This important link corresponds with research results found in other settings,

239 such as those found in Conrad et al.[32] Although only a limited number of patients

240 performed the spiritual needs evaluation, the data show that patients with unmet spiritual

241 needs experienced a poorer quality of life.

242 Patients had a high degree of satisfaction with the care they received. This result is consistent

243 with previous studies with standard adult patients, showing that level of satisfaction is higher

244 in rehabilitation setting.[33] Satisfaction with care received is strongly associated with quality

245 of life. Such results are consistent with the literature in other settings, especially with those

246 reported by Hartgering et al, which reported satisfaction with care received positively related

247 to older patients' quality of life in an acute care setting with global and integrated care.[16]

248 Further research is needed to better understand their inter-relationships.[34]

249 The multivariate model emphasizes the importance of satisfaction with care to quality of life

250 in this setting. This model, besides confirming the importance of the psychological

251 dimension, does not allow us to draw conclusions about biopsychosocial factors related to the

252 quality of life. Functional status and cognitive status were not statistically significant in this

253 multivariable linear regression, suggesting that, at least in this setting, they were not the most

254 important drivers of perceived quality of life. This reflects that quality of life is complex and

255 this study could only partially approach this complexity. Measuring quality of life, not fully

256 explained from pooling descriptors of usual clinical practice, may surpass these traditional

257 descriptors.

Strengths and Weaknesses

259 This study was undertaken in a "real world" clinical practice. The scales are employed in

260 usual clinical practice and shared regularly in interdisciplinary meetings. The use of these

261 tools, widely employed and validated in different clinical contexts, is likely to result in good

262 ecological validity.

263 This study has certain limitations. First, the results apply only to a sample of elderly

264 hospitalized patients without severe cognitive disorders, and thus cannot be generalized to

265 patients with cognitive disorders. Furthermore, the cross-sectional study cannot conclude any

266 causal relationships between descriptors and quality of life. In addition, the rate of patients

267 who did not participate might create a risk of selection-based bias, though slight, as the

268 characteristics of the patients who participated and those who did not showed no significant

269 differences. In the context of data drawn from usual clinical practice, the social dimension can

270 be misjudged and fail to demonstrate any link to quality of life; to avoid this result, a purpose-

271 designed tool such as a scale of social support might be required.[35] Such a scale would

272 certainly show the importance of social support to quality of life.[36-37] Similarly, some

273 evaluations were not always undertaken: the chaplain worked part-time and was not able to

274 conduct all the SDAT, despite excellent patient acceptance. The CIRS were not systematically

275 completed by the physicians. Conversely, missing data for the WHOQOL-OLD or the QPP-

276 SF are from patients who did not respond to at least one of the questions asked, preventing

277 calculation of the total score. Nevertheless, multiple imputation allowed us to limit the

278 nonresponse bias in the multivariate analysis.

Implications for Clinical Practice

280 Evaluating quality of life is relevant in geriatric rehabilitation because we observe that

281 variables traditionally used in clinical practice may not be sufficient to explain the quality of

282 life and therefore insufficient to achieve that goal. Knowing the necessary elements for a good

283 quality of life for each patient is fundamental to better understanding him/her, and might

284 improve guidance in setting goals of care. This information could contribute to offer truly

285 patient-centered care in hospital environments, and is therefore useful to the different

286 professionals in charge of these patients.

287 However, further development of a biopsychosocial and spiritual model can only be

288 encouraged. Similarly, this work suggests the importance of integrating an evaluation of the

289 satisfaction with care received because it is also associated with quality of life.

290 Considering the following quotation: "Therapeutic success depends in part upon the

291 therapist's ability to set a story in motion which is meaningful to the patient as well as to

292 herself",[38] this work, which accounts for a patient's quality of life, also has an ethical

293 impact. In fact, this measure might help balance aspects of beneficence and respect for

294 autonomy in a system that should not be paternalistic, but that also cannot meet all of a

295 patient's expectations.

Conclusion

297 Patients undergoing post-acute geriatric rehabilitation perceive a good quality of life.

298 Satisfaction with care they received is strongly associated with quality of life. In this setting,

299 biopsychosocial and spiritual descriptors used in clinical practice are only moderately

300 associated with quality of life. A follow-up to this study might evaluate how to better

301 integrate quality of life in the construction of the care project, in addition to the usual

302 descriptors of the clinical practice.

303 **FOOTNOTES**

306 **Competing interests:** None declared.

307 **Ethics approval:** Cantonal Committee of Vaud on the Ethics of Research on Human

308 Subjects, Lausanne, Switzerland.

309 **Data sharing statement:** The full anonymized data set can be provided on request.

310 **Contributors:** MAB, ERT, ER and SM designed the research. MAB and JP conducted

311 statistical analysis. All authors interpreted the data. MAB wrote the first draft of the

312 manuscript. All authors participated in the writing of subsequent versions and approved the

313 final article.

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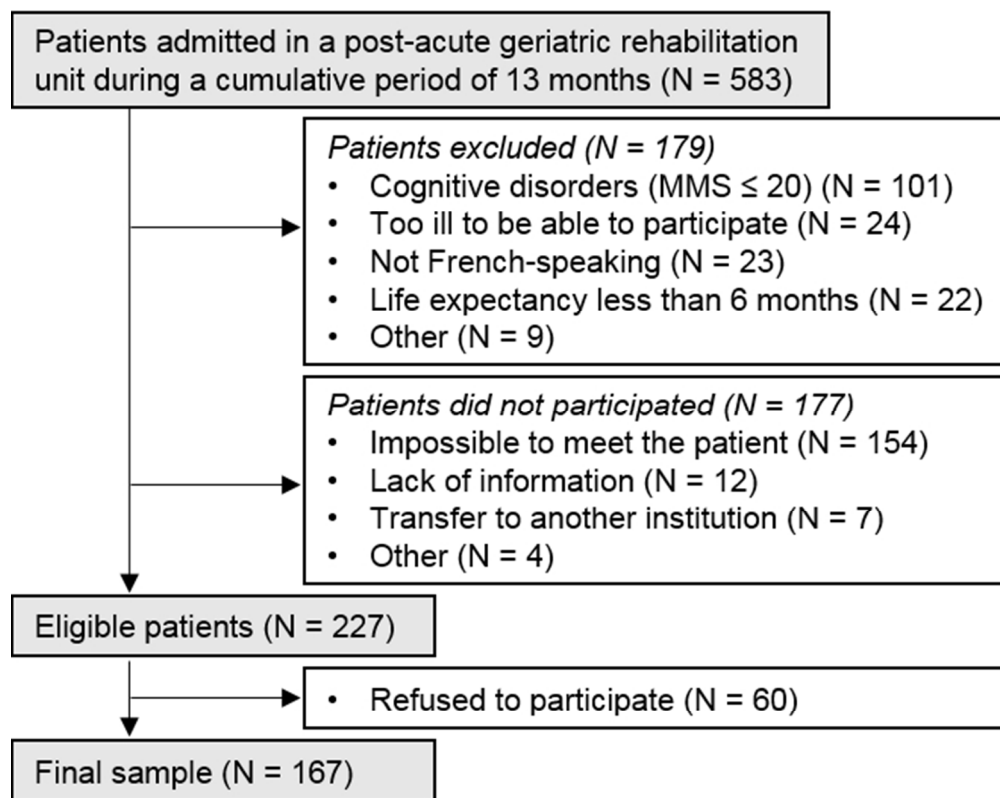399 38. Mattingly C. The concept of therapeutic 'emplotment'. *Soc Sci Med* 1994;38:811-22.

400 **FIGURE LEGENDS**

401 Figure 1. *Study flow chart.*

402 Figure 2. *WHOQOL-OLD scores describing the overall quality of life and each underlying*

403 *dimension. The number of missing values is indicated in parentheses.*

Patients admitted in a post-acute geriatric rehabilitation unit during a cumulative period of 13 months (N = 583)

Patients excluded (N = 179)
- Cognitive disorders (MMS ≤ 20) (N = 101)
- Too ill to be able to participate (N = 24)
- Not French-speaking (N = 23)
- Life expectancy less than 6 months (N = 22)
- Other (N = 9)

Patients did not participated (N = 177)
- Impossible to meet the patient (N = 154)
- Lack of information (N = 12)
- Transfer to another institution (N = 7)
- Other (N = 4)

Eligible patients (N = 227)

- Refused to participate (N = 60)

Final sample (N = 167)

Study flow chart.

55x44mm (300 x 300 DPI)

WHOQOL-OLD scores describing the overall quality of life and each underlying dimension. The number of missing values is indicated in parentheses.

122x82mm (300 x 300 DPI)

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	**1 - 2**
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	**2**
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	**4 - 5**
Objectives	3	State specific objectives, including any prespecified hypotheses	**5 - 6**
Methods			
Study design	4	Present key elements of study design early in the paper	**6**
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	**6**
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	**6**
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	**7 - 9**
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	**7 - 9**
Bias	9	Describe any efforts to address potential sources of bias	**6, 9**
Study size	10	Explain how the study size was arrived at	**6**
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	**9**
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	**9**
		(*b*) Describe any methods used to examine subgroups and interactions	**9**
		(*c*) Explain how missing data were addressed	**9, 15**
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	**n/a**
		(*e*) Describe any sensitivity analyses	**n/a**

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	**6 , Figure 1**
		(b) Give reasons for non-participation at each stage	**Figure 1**
		(c) Consider use of a flow diagram	**Figure 1**
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	**10, Table 1**
		(b) Indicate number of participants with missing data for each variable of interest	**Tables 1 - 3, Figure 2**
Outcome data	15*	Report numbers of outcome events or summary measures	**Figure 2, Tables 2 - 3**
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	**13, Table 3**
		(*b*) Report category boundaries when continuous variables were categorized	**n/a**
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	**n/a**
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	**n/a**
Discussion			
Key results	18	Summarise key results with reference to study objectives	**13 - 14**
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	**14 - 15**
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	**13 - 16**
Generalisability	21	Discuss the generalisability (external validity) of the study results	**14 - 15**
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	**17**

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Factors associated with quality of life in elderly hospitalized patients undergoing post-acute rehabilitation: a cross-sectional analytic study in Switzerland

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Factors associated with quality of life in elderly hospitalized patients undergoing post-acute rehabilitation: a cross-sectional analytic study in Switzerland

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1 **ABSTRACT**

2 **Objectives**: We investigated whether biopsychosocial and spiritual factors and satisfaction
3 with care were associated with patients' perceived quality of life.

4 **Design**: This was a cross-sectional analytic study.

5 **Setting**: Data were collected from inpatients at a post-acute geriatric rehabilitation center in a
6 university hospital in Switzerland.

7 **Participants**: Participants aged 65 years and over were consecutively recruited from October
8 2014 to January 2016. Exclusion criteria included significant cognitive disorder and terminal
9 illness. Of 227 eligible participants, complete data were collected from 167.

10 **Main outcome measures**: Perceived quality of life was measured using the World Health
11 Organization Quality of Life questionnaire - version for older people. Predictive factors were
12 age, sex, functional status at admission, comorbidities, cognitive status, depressive symptoms,
13 living conditions, and satisfaction with care. A secondary focus was the association between
14 spiritual needs and quality of life.

15 **Results**: Patients undergoing geriatric rehabilitation experienced a good quality of life.
16 Greater quality of life was significantly associated with higher functional status (r_s = .204, p =
17 .011), better cognitive status (r_s = .175, p = .029), and greater satisfaction with care (r_s = .264,
18 p = .003). Poorer quality of life was significantly associated with comorbidities (r_s = −.226, p
19 = .033), greater depressive symptoms (r_s = −.379, p < .001), and unmet spiritual needs (r_s =
20 −.211, p = .049). Multivariate linear regression indicated that depressive symptoms (β =
21 −0.961; 95% confidence intervals [CI]: −1.449, −0.472; p < .001) significantly predicted
22 quality of life.

23 **Conclusions**: Patient perceptions of quality of life were significantly associated with
24 depression. More research is needed to assess whether considering quality of life could
25 improve care plan creation.

26

27 **Keywords**: geriatric rehabilitation, quality of life, biopsychosocial and spiritual model,
28 satisfaction with care.

29 **ARTICLE SUMMARY**

30 **Strengths and limitations of this study**

31 ▪ This study uses biopsychosocial and spiritual descriptors to explore determinants of
32 quality of life in geriatric rehabilitation.

33 ▪ Design is based on a "real world" setting, with usual clinical practice descriptors of
34 biopsychosocial and spiritual dimensions, which is likely to result in good ecological
35 validity.

36 ▪ Owing to the precedent point, the rate of missing values is higher, which may induce a
37 bias. To address this, the multivariate analysis included multiple imputation.

38 ▪ All evaluations were not made at the same time, and we cannot exclude the possibility that
39 symptomatic change may have occurred in some patients.

40 **INTRODUCTION**

41 Quality of life is an increasingly interesting outcome in the context of the aging population. It

42 is relevant to consider quality of life rather than mortality in elderly people, given the high

43 prevalence of chronic conditions and their impact on functional independence. Elderly people

44 usually prefer quality of life over long life.[1] It seems therefore valuable to study quality of

45 life in elderly persons and to identify likely influential factors.

46 Overall, elderly community-dwelling populations retain a good quality of life. For instance, in

47 a random sample of 999 English respondents over 65 years of age, 82% described their

48 quality of life as good.[2] Quality of life in elderly persons is affected by a variety of factors;

49 thus, depressive disorders, functional impairment and other health problems could reduce a

50 patient's quality of life, whereas social support can positively affect quality of life.[3]

51 Psychosocial resources can have a substantial influence on quality of life, affecting situations

52 such as facing a diminution of functionality, for example.[2] Although quality of life can

53 decrease with physical impairment, elderly persons suffering significant limitations in their

54 daily lives may nevertheless (and somewhat paradoxically) describe their quality of life as

55 excellent.[4-5] In a study of 185 community-dwelling older Americans with advanced illness,

56 Solomon et al. found that 65% of patients reported their quality of life as the best possible or

57 good.[6]

58 Quality of life in elderly persons has been assessed in a number of health-care settings (acute

59 care, assisted living and nursing home). Existing studies have similar results, and tend to

60 show that the perceived quality of life remains good in these settings.[7-8] There are only a

61 few studies that investigate quality of life in rehabilitation and most of them were focused on

62 patients with very specific illnesses, such as osteoporosis and hip fracture.[4, 9] However,

63 measuring quality of life in this setting should be of interest because improving quality of life

64 is typically understood as the ultimate goal of rehabilitation.[10-11] Moreover, it could be a

65 broader outcome to measure in rehabilitation, in addition to traditional variables linked to

66 functional independence improvement.

67 Geriatric rehabilitation is traditionally interdisciplinary, with attention paid to biopsychosocial

68 issues.[12-13] This setting even integrates the spiritual dimension at different levels, in a

69 global biopsychosocial and spiritual model of care.[14-15]

70 The biopsychosocial and spiritual model is a representation of the human being in which the

71 biological, psychological, social and spiritual dimensions are considered to be simultaneously

72 in play.[12, 14] Sulmasy hypothesizes that the biological, psychological, social and spiritual

73 dimensions of this model contribute to quality of life: "the composite state – how the patient

74 feels physically, how the patient is faring psychologically and interpersonally, as well as how

75 the patient is progressing spiritually – constitutes the substrate of the construct called quality

76 of life".[14]

77 Thus, we aimed to examine the biopsychosocial and spiritual factors associated with quality

78 of life in elderly hospitalized patients undergoing post-acute rehabilitation.

79 Because this population is reliant on the hospital institution and is involved in constant

80 interaction with health care providers, the patient's perception of the treatment received has to

81 be taken into account. Satisfaction with care is one proxy to describe the system from the

82 perspective of the patient, and the literature has shown the influence of satisfaction with care

83 on quality of life in other settings.[16-17] Therefore, the inclusion of an evaluation of

84 satisfaction with the care patients received is relevant.

85 The following hypotheses are made:

86   The four dimensions of the biopsychosocial and spiritual model and the patient's satisfaction

87   with the care received are likely associated with the quality of life of a person undergoing

88   geriatric rehabilitation.

89   To confirm this hypothesis, the objectives of this study are to explore:

90   1) The quality of life perceived by the patient in a setting of post-acute geriatric

91   rehabilitation.

92   2) The relationship between the biopsychosocial dimensions of the patient and patients'

93   perceived quality of life. As a secondary focus, the relationship between the spiritual

94   dimension and patients' perceived quality of life.

95   3) The relationship between satisfaction with care received and patients' perceived

96   quality of life.

97

98   **METHOD**

99   **Context and Population**

100   This cross-sectional analytic study was conducted at a post-acute rehabilitation center for

101   geriatric patients at Lausanne University Hospital in Switzerland. Participants were

102   consecutively included during a cumulative period of 13 months running from October 2014

103   to January 2016. The patients spent an average of 20.5 days in this 95-bed center, after an

104   acute-care hospital stay, and 74% of them then returned home.

105   Eligible participants were at least 65 years old. Exclusion criteria included significant

106   cognitive disorders (defined by a score of less than 21 on the Mini Mental State, MMS [18]),

107   too ill to be able to participate (medically unstable or with uncontrolled symptoms such as

108   severe pain or significant dyspnea), not French-speaking, or a doctor-estimated life

109   expectancy of less than 6 months. Patients who had previously been included and excluded

110   were not re-included as a case of new admission during this period. In the end, 167 patients

111   participated in the study (Figure 1). An analysis comparing the participants (N = 167) with

112   patients who refused to participate (N = 60) and with those who did not participate owing to

113   logistical reasons (N = 177) did not show any characteristic significant differences.

114   [INSERT FIGURE 1]

115   The study was approved by the Cantonal Committee of Vaud on the Ethics of Research on

116   Human Subjects, and all the participants gave their written informed consent. The manuscript

117   was drafted in accordance with the STROBE reporting guidelines (www.strobe-

118   statement.org/).

119   **Data Collected**

120   At the time of admission, data were collected on age, sex, reason for admission, living

121   conditions (living alone, use of home care services, living in a nursing home), functional

122   status at home prior to admission (from history, using basic activities of daily living [ADL]

123   and instrumental activities of daily living [IADL]; ADL scores ranged from 0 to 6,[19] while

124   IADL scores ranged from 0 to 8,[20] a high score indicating better functional status),

125   functional status at the time of admission to the geriatric rehabilitation center (measured using

126   the functional independence measure [FIM], with scores ranging from 18 to 126, a high score

127   indicating better functional status),[21] falls during the previous twelve months, cognitive

128   status (measured using the MMS, with scores ranging from 0 to 30, a high score indicating

129   better cognitive status)[18] and level of comorbidities (measured using the cumulative illness

130   rating scale [CIRS], with scores ranging from 0 to 56, a high score indicating more

131   comorbidities).[22] During the second week of hospitalization, a chaplain evaluated the

132   spiritual needs of the patient (cf. below). All of these assessments were systematically

133   conducted in the usual clinical setting.

134 Specifically for this research, a research assistant met with patients during their second week

135 of hospitalization at the post-acute rehabilitation center to evaluate their quality of life (cf.

136 below), the presence of depressive symptoms (patient health questionnaire-9, PHQ9, with

137 scores ranging from 0 to 27, a high score indicating more depressive symptoms)[23-24] and

138 their satisfaction with the care received (cf. below). The PHQ-9 was specifically chosen for its

139 psychometric properties, as a usual clinical setting normally has a tool with lower properties.

140 *World Health Organization Quality of Life questionnaire - version for older people*

141 *(WHOQOL-OLD).* Quality of life was evaluated by the WHOQOL-OLD, a questionnaire

142 developed using the World Health Organization framework and translated into and validated

143 in French.[25-26] The WHOQOL-OLD is specifically intended for persons over 60 years of

144 age and emphasizes the following six dimensions, which are particularly relevant to the

145 quality of life for this segment of the population: "sensory abilities"; "autonomy"; "past,

146 present and future activities"; "social participation"; "death and dying"; and "intimacy". The

147 "sensory abilities" dimension describes sensory functionality (hearing, sight, touch, taste and

148 smell) and its impact on loss of quality of life. The "autonomy" dimension involves the ability

149 to maintain control over one's actions and decisions. The "past, present and future activities"

150 dimension reflects the feeling of accomplishment during life and perspectives on life as it

151 continues. The "social participation" dimension assesses patient satisfaction related to his/her

152 daily activities, particularly social activities. The "death and dying" dimension refers to

153 preoccupations with death. Finally, the "intimacy" dimension relates to intimate and personal

154 relations with persons who are close to the respondent. The questionnaire includes 24 answers

155 evaluated on a Likert scale from 1 to 5. The total score and the score for each dimension

156 (which are calculated by an algorithm) range from 0 to 100. A high score indicates a higher

157 quality of life.

158 *Quality from the Patient's Perspective Short Form (QPP-SF).* The QPP-SF is a questionnaire

159 that evaluates care using patient descriptions.[27-28] It covers the following four areas:

160 medical-technical competences (three factors); physical-technical conditions (three factors);

161 identity-oriented approach (10 factors); and socio-cultural atmosphere (four factors). The final

162 score ranges from 20 to 80; a high score indicates high satisfaction with the care received. For

163 purposes of this study, the questionnaire was translated by two persons whose native language

164 was French, and a native English speaker performed a reverse translation.

165 *Spiritual Distress Assessment Tool (SDAT).* The SDAT evaluates the spiritual needs of

166 hospitalized elderly patients.[29-30] The SDAT consists of five items (the need for life

167 balance, the need for connection, the need for values acknowledgement, the need to maintain

168 control, and the need to maintain identity), scored on a Likert scale of 0 (need completely

169 met) to 3 (need completely unmet). The total score ranges from 0 to 15; a high score indicates

170 important unmet spiritual needs. The SDAT was administered to patients by a specially

171 trained chaplain using a standardized procedure.

172 **Statistical Analyses**

173 Descriptive analyses of the variables were undertaken. Correlations of the different

174 descriptive elements and quality of life were determined using Spearman rank correlations.

175 Quality of life was considered both in overall terms and within each of its dimensions.

176 Univariate analyses were carried out only with available data (complete case analysis), and

177 the number of missing data was mentioned (see the Strengths and Weaknesses section for

178 explanations about missing data). The data were analyzed using Stata 12.0 (Stata Corp LP,

179 College Station, TX). Finally, a multivariate linear regression was undertaken, with the

180 WHOQOL-OLD total as the dependent variable, and age, sex, FIM, MMS, CIRS, PHQ-9,

181 living conditions, SDAT and QPP-SF as explanatory variables. The number of participants

182 required for the study was initially based on a rule of thumb of 10 times the number of

183 coefficients, but this was then majored owing to missing values. Multicollinearity among the

184 explanatory variables was assessed with the variance inflation factor. The residual variance

185 was homogenous, excluding any heteroscedasticity. No clear outliers emerged from the

186 diagnostic plots. Parameters were estimated using multiple imputation (20 imputations), with

187 R version 3.3.1 (www.r-project.org) and the package mice version 2.25.[31] The number of

188 missing values is also indicated. The statistical significance was set at $p \leq .050$.

189 **RESULTS**

190 **Population Description**

191 The average age of the participants was 82.3 ± 7.2 years, and 65.9% were women. Their

192 characteristics are described in Table 1. The patients were mostly admitted from orthopedics

193 and traumatology (42 %), internal medicine (41 %), neurology (6 %) and cardio-vascular

194 surgery (4 %). Participants from orthopedics and traumatology were admitted after fracture

195 surgery (40 %), elective surgery (39 %), conservative treatment of fractures (17 %) and other

196 reasons (4 %). From internal medicine, they were in post-acute rehabilitation for gait and

197 balance disorders of multifactorial etiology (29 %), an infectious disease (27 %), a cardiac

198 event (20 %) and other reasons (25 %).

199   *Table 1.* Clinical characteristics of the patient sample.

Characteristics	Number of missing values	Total sample (N = 167)	Women (N = 110)	Men (N = 57)	Orthopedics and traumatology (N = 70)	Internal medicine (N = 68)
Age (years) (mean ± SD)	0	82.3 ± 7.2	82.5 ± 7.5	81.8 ± 6.7	80.7 ± 7.5†	84.3 ± 6.6
Women (%)	0	65.9	100.0*	0.0	74.3	60.3
ADL index before admission[a]	1	5.1 ± 1.1	5.1 ± 0.9	5.0 ± 1.3	5.4 ± 0.8†	4.8 ± 1.2
IADL index before admission[b]	2	4.7 ± 2.4	5.1 ± 2.3*	4.1 ± 2.3	5.9 ± 2.2†	3.5 ± 1.9
Fall during the	0	68.9	72.7	61.4	70.0	72.1

previous year (%)						
Living alone (%)	0	72.5	81.8*	54.4	70.0	82.4
Home care before hospitalization (%)	0	64.1	63.6	64.9	42.9†	79.4
Living in nursing home before hospitalization (%)	0	0.6	0.9	0.0	0.0	1.5
FIM[c]	1	86.4 ± 14.3	87.9 ± 14.1*	83.4 ± 14.4	86.9 ± 13.2	84.9 ± 14.9
MMS[d]	0	26.7 ± 2.7	26.7 ± 2.8	26.8 ± 2.7	27.2 ± 2.7†	26.1 ± 2.8
CIRS[e]	72	14.3 ± 4.9	13.4 ± 4.3*	16.2 ± 5.5	12.5 ± 4.0†	15.6 ± 5.2
PHQ-9[f]	4	7.0 ± 4.8	7.0 ± 4.9	7.0 ± 4.6	6.7 ± 4.8	7.2 ± 4.9
SDAT[g]	69	6.0 ± 3.1	5.9 ± 2.9	6.2 ± 3.5	5.8 ± 3.1	6.4 ± 3.2
QPP-SF[h]	30	72.3 ± 8.5	72.6 ± 8.1	71.7 ± 9.3	71.5 ± 10.0	72.9 ± 7.4

Note. *Women vs Men, $p \leq 0.050$, †Orthopedics and traumatology vs Internal medicine, $p \leq 0.050$
[a]Activities of daily living (score range from min. 0 to max. 6), [b]Instrumental activities of daily living (0 to 8), [c]Functional independence measure (18 to 126), [d]Mini mental state (0 to 30), [e]Cumulative illness rating scale (0 to 56), [f]Patient health questionnaire-9 (0 to 27), [g]Spiritual distress assessment tool (0 to 15), [h]Quality from the patient's perspective short form (20 to 80).

200

Quality of Life in Geriatric Rehabilitation

202   Overall, on a transformed scale of 0 to 100, the quality of life perceived by the patients is 68.3

203   ± 12.2 (median 69.3, min. 37.5, max. 94.8) (Figure 2). The dimensions of the WHOQOL-

204   OLD range from 60.0 ± 22.7 ("sensory abilities") to 77.4 ± 18.8 ("death and dying").

205   [INSERT FIGURE 2]

Univariate Analysis of Factors Associated with Quality of Life

207   Detailed data are provided in Table 2. Overall better quality of life is significantly associated

208   with a higher functional status at the time of entrance (FIM), a better cognitive state (MMS)

209   and a better satisfaction regarding care received (QPP-SF). The presence of comorbidities

210   (CIRS), lower mood (PHQ-9), and unmet spiritual needs (SDAT) are associated with a lower

211   quality of life. We do not see a significant relation for the social evaluation factors.

212   *Table 2.* Analysis of associations with the WHOQOL-OLD, both overall and for each

213   underlying dimension. Spearman's rank correlation, r_s [p-value]. Variables with a

214   weak to average correlation ($|r_s| \geq .200$) are indicated in gray; those with a significant

215   correlation (p-value ≤ .050) are in boldface. The number of missing values is indicated

216   in parentheses.

Characteristics	WHOQOL-OLD total	Sensory abilities	Autonomy	Death and dying	Past, present and future activities	Social participation	Intimacy
Age (years)	-.031 [.705] (11)	.095 [.224] (1)	-.088 [.262] (1)	.088 [.265] (4)	-.020 [.797] (0)	-.084 [.284] (2)	.007 [.933] (3)
Women (%)	.004 [.965] (11)	.039 [.614] (1)	-.013 [.873] (1)	-.047 [.550] (4)	-.038 [.628] (0)	.024 [.758] (2)	.015 [.847] (3)
FIM	**.204 [.011] (12)**	**.170 [.029] (2)**	**.312 [.000] (2)**	-.127 [.107] (5)	**.177 [.023] (1)**	**.210 [.007] (3)**	.061 [.443] (4)
MMS	**.175 [.029] (11)**	.038 [.631] (1)	**.212 [.006] (1)**	-.062 [.429] (4)	**.202 [.009] (0)**	**.202 [.035] (2)**	**.157 [.045] (3)**
CIRS	**-.226 [.033] (77)**	.005 [.961] (72)	**-.231 [.025] (73)**	-.087 [.407] (74)	**-.230 [.025] (72)**	**-.337 [.001] (72)**	.083 [.430] (74)
PHQ-9	**-.379 [.000] (15)**	**-.331 [.000] (5)**	**-.319 [.000] (5)**	**-.265 [.001] (8)**	**-.156 [.047] (4)**	**-.317 [.000] (6)**	-.101 [.202] (7)
Living alone (%)	-.063 [.434] (11)	-.089 [.255] (1)	.080 [.308] (1)	-.052 [.510] (4)	-.098 [.209] (0)	-.048 [.540] (2)	**-.170 [.030] (3)**
Home care before hospitalization (%)	-.238 [.003] (11)	-.106 [.174] (1)	**-.245 [.002] (1)**	-.119 [.132] (4)	-.048 [.056] (0)	-.152 [.051] (2)	-.072 [.358] (3)
SDAT	**-.211 [.049] (79)**	-.152 [.137] (70)	-.182 [.073] (69)	-.052 [.619] (73)	-.173 [.089] (69)	**-.248 [.015] (71)**	**-.218 [.034] (72)**
QPP-SF	**.264 [.003] (38)**	.045 [.604] (31)	**.247 [.004] (31)**	.074 [.392] (32)	**.179 [.037] (30)**	**.307 [.000] (31)**	**.245 [.004] (33)**
QPP-SF: medical-technical competences	**.207 [.011] (16)**	.055 [.488] (7)	**.179 [.024] (7)**	.076 [.345] (9)	**.206 [.009] (6)**	**.272 [.001] (8)**	**.218 [.006] (9)**
QPP-SF : physical-technical conditions	**.252 [.002] (16)**	.085 [.286] (7)	**.201 [.011] (7)**	.130 [.104] (9)	.114 [.150] (6)	**.251 [.001] (8)**	**.311 [.000] (9)**
QPP-SF : identity-oriented approach	**.231 [.006] (26)**	.025 [.758] (17)	**.251 [.002] (17)**	.006 [.947] (19)	**.199 [.014] (16)**	**.265 [.001] (18)**	**.257 [.002] (19)**
QPP-SF : socio-cultural atmosphere	**.242 [.004] (24)**	.027 [.739] (16)	**.213 [.009] (16)**	.052 [.529] (18)	**.208 [.010] (15)**	**.247 [.002] (16)**	**.325 [.000] (18)**

217

218   Table 2 also describes the association between each of the dimensions of WHOQOL-OLD

219   and the biopsychosocial and spiritual dimensions. Associations remain similar as those in the

220   overall score except for "sensory abilities" and "death and dying", which are only connected

221   with a limited number of markers.

222 **Linear Multivariate Analysis of Factors Associated with Quality of Life**

223 In multivariate analysis, mood (PHQ-9; β = -0.961, p < .001) has a significant association

224 with quality of life (Table 3). Satisfaction with the care received is at the limit of having a

225 significant relationship (QPP-SF; β = 0.237, p = .054) with quality of life. The variation

226 explained by all the variables was 26.7% (F = 4.170, p < .001). No multicollinearity was

227 identified between the explanatory variables, the maximal variance inflation factor was 1.58.

228 *Table 3*. Multivariate linear analysis with multiple imputation to predict the total

229 WHOQOL-OLD score.

Predictive factor	total WHOQOL-OLD (11 missing values)		Number of missing values
	β (95% CI)	p-value	
Age (years)	-0.025 (-0.301 to 0.251)	.861	0
Women	0.255 (-3.940 to 4.450)	.904	0
FIM	0.109 (-0.039 to 0.256)	.147	1
MMS	0.055 (-0.653 to 0.763)	.878	0
CIRS	-0.007 (-0.617 to 0.603)	.983	72
PHQ-9	-0.961 (-1.449 to -0.472)	<.001	4
Living alone	-1.504 (-5.920 to 2.913)	.502	0
Home care before hospitalization	-2.302 (-6.898 to 2.294)	.321	0
SDAT	-0.006 (-0.995 to 0.983)	.990	69
QPP-SF	0.237 (-0.004 to 0.479)	.054	30

Note. β, regression coefficient.

230

231 **DISCUSSION**

232 Elderly patients undergoing rehabilitation after acute care perceived a relatively high level of

233 quality of life. For example, we found higher WHOQOL-OLD scores than those reported by

234 Fang et al. using data of a developmental study of the WHOQOL-OLD, which included 5566

235 respondents from 20 international centers (opportunistic sample of ill and well patients).[32]

236 To our knowledge, these are new data for this specific setting. This is not surprising, given

237 this environment aims to offer stimulating conditions to promote and regain a good quality of

238 life. In this study, quality of life had a significant relationship with mood (both in univariate

239 and multivariate analysis) and functional status (only in univariate analysis). This link

240 corresponds with research results found in other settings, such as those found in Conrad et

241 al.[33] Although only a limited number of patients performed the spiritual needs evaluation,

242 the data show that patients with unmet spiritual needs experienced a poorer quality of life.

243 Patients had a high degree of satisfaction with the care they received. This result is consistent

244 with previous studies with standard adult patients, showing that level of satisfaction is higher

245 in rehabilitation setting.[34] Satisfaction with care received is associated with quality of life.

246 Such results are consistent with the literature in other settings, especially with those reported

247 by Hartgering et al, which reported satisfaction with care received positively related to older

248 patients' quality of life in an acute care setting with global and integrated care.[16] Further

249 research is needed to better understand their inter-relationships.[35]

250 In addition to confirming the importance of the psychological dimension, the multivariate

251 model does not allow us to draw conclusions about biopsychosocial factors related to quality

252 of life. Functional status and cognitive status were not statistically significant in this

253 multivariable linear regression, suggesting that, at least in this setting, they were not the most

254 important drivers of perceived quality of life. This reflects that quality of life is complex and

255 this study could only partially approach this complexity. Measuring quality of life, not fully

256 explained from pooling descriptors of usual clinical practice, may surpass these traditional

257 descriptors.

258 **Strengths and Weaknesses**

259 This study was undertaken in a "real world" clinical practice. The scales are employed in

260 usual clinical practice and shared regularly in interdisciplinary meetings. The use of these

261 tools, widely employed and validated in different clinical contexts, is likely to result in good

262 ecological validity.

263 This study has certain limitations. First, the results apply only to a sample of elderly

264 hospitalized patients without severe cognitive disorders, and thus cannot be generalized to

265 patients with cognitive disorders. Furthermore, the rate of patients who did not participate

266 might create a risk of selection-based bias, though slight, as the characteristics of the patients

267 who participated and those who did not showed no significant differences. In addition, all

268 evaluations were not made at the same time (first and second week of hospitalization), and we

269 cannot exclude the possibility that symptomatic change may have occurred in some patients.

270 In the context of data drawn from usual clinical practice, the social dimension can be

271 misjudged and fail to demonstrate any link to quality of life; to avoid this result, a purpose-

272 designed tool such as a scale of social support might be required.[36] Such a scale would

273 certainly show the importance of social support to quality of life.[37-38] Similarly, some

274 evaluations were not always undertaken: the chaplain worked part-time and was not able to

275 conduct all the SDAT, despite excellent patient acceptance. The CIRS assessments were not

276 systematically completed by the physicians. Conversely, missing data for the WHOQOL-

277 OLD or the QPP-SF are from patients who did not respond to at least one of the questions

278 asked, preventing calculation of the total score. Nevertheless, multiple imputation allowed us

279 to limit the nonresponse bias in the multivariate analysis.

280 **Implications for Clinical Practice**

281 Evaluating quality of life is relevant in geriatric rehabilitation because we observe that

282 variables traditionally used in clinical practice may not be sufficient to explain the quality of

283 life and therefore insufficient to achieve that goal. Knowing the necessary elements for a good

284 quality of life for each patient is fundamental to better understanding him/her, and might

285 improve guidance in setting goals of care. This information could contribute to offer truly

286 patient-centered care in hospital environments, and is therefore useful to the different

287 professionals in charge of these patients.

288 However, further development of a biopsychosocial and spiritual model can only be

289 encouraged. Similarly, this work suggests the importance of integrating an evaluation of the

290 satisfaction with care received because it is also associated with quality of life.

291 Considering the following quotation: "Therapeutic success depends in part upon the

292 therapist's ability to set a story in motion which is meaningful to the patient as well as to

293 herself",[39] this work, which accounts for a patient's quality of life, also has an ethical

294 impact. In fact, this measure might help balance aspects of beneficence and respect for

295 autonomy in a system that should not be paternalistic, but that also cannot meet all of a

296 patient's expectations.

Conclusion

298 Patients undergoing post-acute geriatric rehabilitation perceive a good quality of life.

299 Depressive symptoms were significantly associated with quality of life. In this setting,

300 biopsychosocial and spiritual descriptors used in clinical practice are only moderately

301 associated with quality of life. A follow-up to this study might evaluate how to better

302 integrate quality of life in the construction of the care project, in addition to the usual

303 descriptors of the clinical practice.

304 **FOOTNOTES**

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307 **Competing interests:** None declared.

308 **Ethics approval:** Cantonal Committee of Vaud on the Ethics of Research on Human

309 Subjects, Lausanne, Switzerland.

310 **Data sharing statement:** The full anonymized data set can be provided on request.

311 **Contributors:** MAB, ERT, ER and SM designed the research. MAB and JP conducted

312 statistical analysis. All authors interpreted the data. MAB wrote the first draft of the

313 manuscript. All authors participated in the writing of subsequent versions and approved the

314 final article.

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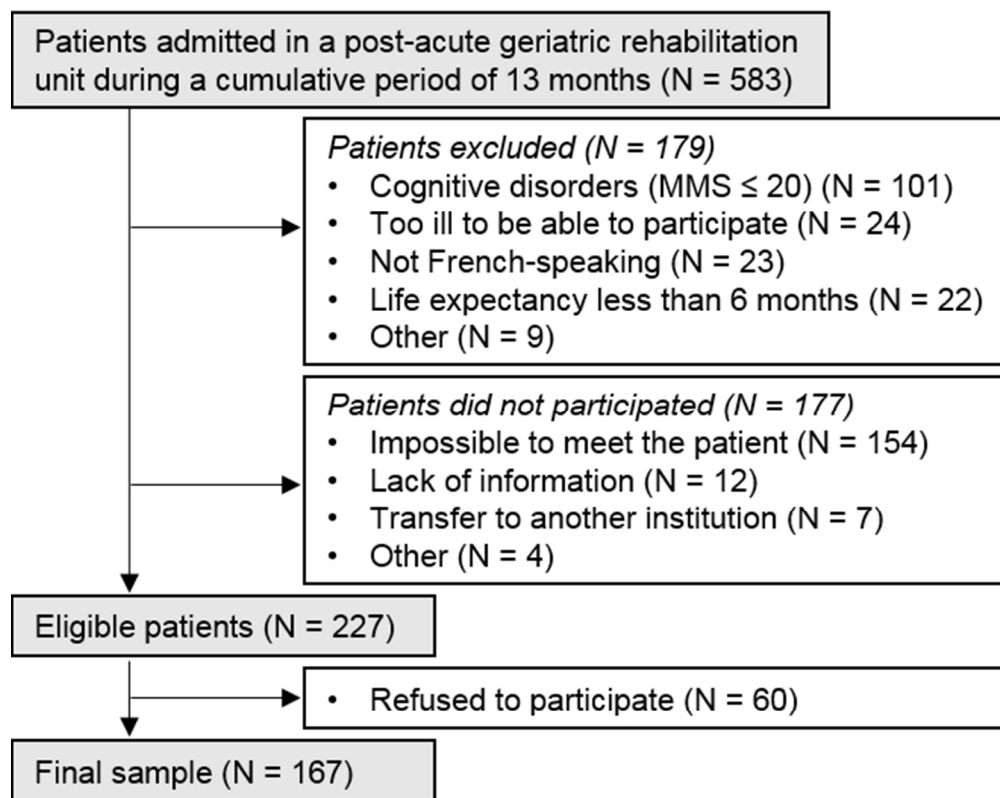402 39. Mattingly C. The concept of therapeutic 'emplotment'. *Soc Sci Med* 1994;38:811-22.

403   **FIGURE LEGENDS**

404   Figure 1. *Study flow chart.*

405   Figure 2. *WHOQOL-OLD scores describing the overall quality of life and each underlying*

406   *dimension. The number of missing values is indicated in parentheses.*

```
Patients admitted in a post-acute geriatric rehabilitation
unit during a cumulative period of 13 months (N = 583)
```

Patients excluded (N = 179)
- Cognitive disorders (MMS ≤ 20) (N = 101)
- Too ill to be able to participate (N = 24)
- Not French-speaking (N = 23)
- Life expectancy less than 6 months (N = 22)
- Other (N = 9)

Patients did not participated (N = 177)
- Impossible to meet the patient (N = 154)
- Lack of information (N = 12)
- Transfer to another institution (N = 7)
- Other (N = 4)

Eligible patients (N = 227)

- Refused to participate (N = 60)

Final sample (N = 167)

Study flow chart.

55x44mm (300 x 300 DPI)

WHOQOL-OLD scores describing the overall quality of life and each underlying dimension. The number of missing values is indicated in parentheses.

122x82mm (300 x 300 DPI)

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	**1 - 2**
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	**2**
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	**4 - 5**
Objectives	3	State specific objectives, including any prespecified hypotheses	**5 - 6**
Methods			
Study design	4	Present key elements of study design early in the paper	**6**
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	**6**
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	**6**
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	**7 - 9**
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	**7 - 9**
Bias	9	Describe any efforts to address potential sources of bias	**6, 9**
Study size	10	Explain how the study size was arrived at	**6**
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	**9**
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	**9**
		(*b*) Describe any methods used to examine subgroups and interactions	**9**
		(*c*) Explain how missing data were addressed	**9, 15**
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	**n/a**
		(*e*) Describe any sensitivity analyses	**n/a**

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	**6 , Figure 1**
		(b) Give reasons for non-participation at each stage	**Figure 1**
		(c) Consider use of a flow diagram	**Figure 1**
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	**10, Table 1**
		(b) Indicate number of participants with missing data for each variable of interest	**Tables 1 - 3, Figure 2**
Outcome data	15*	Report numbers of outcome events or summary measures	**Figure 2, Tables 2 - 3**
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	**13, Table 3**
		(*b*) Report category boundaries when continuous variables were categorized	**n/a**
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	**n/a**
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	**n/a**
Discussion			
Key results	18	Summarise key results with reference to study objectives	**13 - 14**
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	**14 - 15**
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	**13 - 16**
Generalisability	21	Discuss the generalisability (external validity) of the study results	**14 - 15**
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	**17**

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.