# ROLE OF COMPONENTS OF FRAILTY ON QUALITY OF LIFE IN DIALYSIS PATIENTS: A CROSS-SECTIONAL STUDY

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## SUMMARY

**Background:** Many people on dialysis suffer a variety of conditions that can affect frailty (the condition or quality of being frail), such as comorbidities, disabilities, dependence, malnutrition, cognitive impairment and poor social conditions. Frailty is suspected to affect quality of life (QoL).
**Objectives:** The study aimed to evaluate the effect of the different components of frailty on the QoL of people on dialysis.
**Methods:** We enrolled 203 out of 233 prevalent patients on dialysis in the Trieste area of Italy. We applied the Short-Form 36 (SF-36) questionnaire, Activities of Daily Living, Instrumental Activities of Daily Living, Subjective Global Assessment scales and Karnofsky Index. In addition we analysed their social conditions.
**Results:** Dependence, malnutrition and disability had a negative role on QoL. Living with family and good social-economic conditions were significantly related to a better QoL.
**Conclusions:** Dependence, malnutrition, disability, poor social and economic conditions have a significant effect on life quality. The role of comorbidities appears to be less important. Screening of patients, nutritional and functional rehabilitation and prevention of social isolation appear to be indispensable in guaranteeing a satisfactory life quality.

**KEY WORDS** Comorbidities ● Dependence ● Dialysis ● Frailty ● Quality of life

## INTRODUCTION

The definition of frailty remains problematic. Some years ago the World Health Organisation defined as frail an elderly person who needs a substantial level of assistance and support (Andrews *et al*. 2004). Frailty is characterised by different modalities of expression and clinical instability, with a tendency to deterioration (Panzetta *et al*. 2009).

Frailty is generally due to the accumulation of co-morbid conditions and a variety of physical and/or mental abnormalities, most often in the context of an inadequate affective environment and of social deprivation, resulting in increased risk for disability, dependence, hospitalisation and death (Hogan *et al*. 2003). In recent years the characteristics of patients on dialysis have dramatically changed. Nowadays patients are frequently older (Brown & Johansson 2010), they present with many comorbidities, (Mucsi *et al*. 2008), malnutrition (De Mutsert *et al*. 2009), physical disabilities, (Cook & Jassal 2008) and compromised cognitive status, (Murray *et al*. 2006) sometimes associated with a depressive mood.

All these conditions are components of the frailty dimension. In the dialysis population, the condition of frailty is significantly represented not only among older people, but also in people younger than 50 years (Johansen *et al*. 2007). This has direct consequences on clinical practice and on organisation of social services. In addition, we have to consider that the outcome for the patients must not be limited only to survival but must be extended to promotion of health-related quality of life (QoL) (KDOQI Guidelines 2006; Kimmel *et al*. 2008).

## BIODATA

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### CORRESPONDENCE

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Many authors suggest the need to measure the variables that affect the QoL of patients on dialysis, and must undertake specific actions to improve it (Cleary & Drennan 2005). Many studies have explored the role of various contributors to QoL in patients with chronic renal disease. In particular, psychological determinants (Sayin et al. 2007), clinical conditions (Abdel-Kader et al. 2009), technological (Sentveld et al. 2008) and organisational factors (Manns et al. 2009) have been analysed.

However, studies exploring the contribution of components of frailty on this important outcome are not conclusive (Johansen et al. 2007; Saito & Jassal 2007) or have taken into account only small populations (Antoine et al. 2004).

Recent literature has suggested a lack of knowledge about the relationship between frailty and QoL (Bilotta et al. 2010). In addition, in our daily practice it appeared that frail people had a worse QoL so we wanted to highlight the main factors on which to intervene.

That is why our study considers the effect of every component of frailty in a multivariate analysis. The aim of the study is to analyse how components of frailty (disability, dependence, nutritional status, comorbidities, poor social conditions) affect the QoL of patients on dialysis.

## METHODS

In August 2010 the number of adult patients on dialysis in the Trieste area was 233 (985 per million population). We enrolled 203 patients in this cross-sectional study. The inclusion criteria were:

- Time on dialysis of at least 3 months.
- Stable clinical condition.
- Adequate dialysis treatment (Kt/V > 1.2) (Gotch and Sargent 1985; Heimburger 2009).
- Normal cognitive function estimated by Mini Mental State Examination (MMSE) (Folstein et al. 1975).
- Verbal agreement to questionnaire.
- Able to communicate in the Italian language.

We administered the Short-Form 36 questionnaire (Ware & Sherbourne 1992) to patients, translated by Apolone et al. (1997) (official Italian version), to evaluate QoL.

The SF-36 is a multi-purpose, short-form health survey that has been validated in the dialysis population (McHorney et al. 1993, Mingardi et al. 1999). This tool measures particular QoL aspects linked to the health and measures the following domains

1. physical functioning (how people manage common daily living activities);
2. physical role (difficulties in activities linked to one's role due to physical health);
3. bodily pain (pain and its effects on daily activities during last 4 weeks before questionnaire administration);
4. general health (personal perception of health);
5. vitality (sensation of energy/mental fatigue);
6. social functioning (time dedicated to it and physical or emotional problems interfering);
7. emotional role (how emotional factors interfere with work or other activities);
8. mental health (psychological well-being or suffering: mainly anxiety and depression).

The eight scales are re-assumed in two clusters according to the mental or physical component they explore. Question scoring is based on a Likert scale then translated into a 0–100 scale: the higher the value the better the health of the person.

We also undertook the Activities of Daily Living (ADL) (Katz 1963) and Instrumental Activities of Daily Living (IADL) Lawton and Brody (1969) scales to measure disability. ADL is a six item tool that measures the ability to carry out self-care activities such as walking, moving, eating, personal hygiene, dressing and use of the toilet. IADL measures the ability to use the telephone, technology, money and public transport, taking medications and doing housework via a nine question tool.

The Karnofsky Index (KI) (Karnofsky & Burchenal 1949) were used to analyse dependence and the Subjective Global Assessment (SGA) scale (Detsky et al. 1987) was used to evaluate nutritional status. KI measures the performance status of a patient on a 0–100 scale that varies from a person able to undertake normal activity and work (100%) through the need of different amounts of care and support until death (0%).

SGA is an observational tool with five questions about an individual's medical history and three brief physical examinations.

In addition we collected data on the patients' social conditions through questionnaire (interview) and we analysed all clinical records to identify comorbidities, according to the Italian Register of Dialysis and Transplantation (RIDT 2009).

## STATISTICAL ANALYSIS

We conducted statistical analysis using software SPSS version 18.0. We undertook a multiple linear regression model (stepwise method) to analyse how clinical determinants of frailty affect every domain and cluster of SF-36 because they are correlated covariates. This method considers the interaction of many variables as a whole (multivariate analysis) and excludes the not relevant ones ($p < 0.05$) whilst identifying the most relevant ones.

A t-test was performed for every comorbidity, to assess if each had a single effect on QoL. Every single disease that was significant on the basis of the univariate analysis (p-value $< 0.05$ on t-test) was included in the linear regression algorithm. Data were adjusted for gender, age, time on dialysis. We evaluated the social aspects by an ANOVA test, submitting significant results to *post hoc* tests.

## RESULTS

The study enrolled 203/233 prevalent patients on dialysis. Thirty patients were excluded because they were not eligible according to inclusion criteria. One hundred and ninety patients were treated with haemodialysis and 13 patients with peritoneal dialysis.

Patients (126 males) had a mean age of $72.03 \pm 11.9$ years, and time on dialysis of $42.6 \pm 55.6$ months. Socio-demographic variables are summarised in Table 1.

The SF-36 cluster depicting the physical component of QoL resulted in a mean score of $33.9 \pm 10.4$, while the score of the mental component was $48.5 \pm 8.6$ (range 0–100).

The mean values of the eight domains of SF-36 are summarised in Table 2.

Our data show that 32.5% of patients revealed one or more disabilities (ADL scale) and that 38.4% were totally or partially dependent (IADL scale). KI demonstrated that 42.9% of subjects needs help to take care of themselves. Malnutrition was present in 34% of the subjects investigated (SGA; Table 3).

| Variable | Frequency | % |
|---|---|---|
| Schooling | | |
| Primary school | 60 | 29.6 |
| Junior high | 84 | 41.4 |
| Senior high | 45 | 22.2 |
| University | 14 | 6.9 |
| Marital status | | |
| Unmarried | 22 | 10.8 |
| Married | 118 | 58.1 |
| Divorced | 18 | 8.9 |
| Widowed | 45 | 22.2 |
| Economic condition | | |
| Appropriate | 173 | 85.2 |
| Acceptable | 29 | 14.3 |
| Not appropriate | 1 | 0.5 |
| Lives with … | | |
| Husband/wife | 118 | 58.1 |
| Parents | 21 | 10.3 |
| Caregiver | 8 | 3.9 |
| Alone | 47 | 23.2 |
| Institution | 9 | 4.4 |
| Family relationship | | |
| Good | 164 | 80.8 |
| Occasional | 37 | 18.2 |
| None | 2 | 1 |
| Social relationship | | |
| Good | 113 | 55.5 |
| Only in family | 79 | 38.9 |
| None | 11 | 5.6 |

Table 1: Patients' social conditions.

The average number of comorbidities observed in the patients studied was 3.04 (range: 0–8). About one-third of patients (31.5%) live without family support. Even if family relationships are considered positively by 80% of patients, 44.5% of them complain a lack of wide social relationships. In this population 82.5% of patients consider their economic situation as suitable yet nobody described it as totally inadequate.

Linear regression analysis showed that among individual components of frailty, dependence ($p < 0.001$), impaired nutritional status ($p = 0.001$) and disability ($p = 0.005$) have a primary negative role on QoL in many domains of SF-36, even more than comorbidities that are significant on a univariate analysis (data adjusted for gender, age and time on dialysis; Table 4).

Living with family instead of in a nursing home or with another caregiver ($p = 0.002$), good economic conditions ($p = 0.01$), and, above all, widespread social relationships ($p < 0.001$) were found to be significantly related to a better QoL (Table 5).

| Domain/cluster SF-36 | Mean | Median | SD | Percentiles | |
| --- | --- | --- | --- | --- | --- |
| | | | | 25 | 75 |
| Physical functioning | 46.74 | 45 | 28.64 | 20 | 70 |
| Role—physical | 41.01 | 50 | 33.5 | 0 | 75 |
| Bodily pain | 60.33 | 52 | 28.94 | 41 | 84 |
| General health | 37.68 | 30 | 21.58 | 20 | 52 |
| Vitality | 44.04 | 40 | 17.15 | 30 | 55 |
| Social functioning | 65.68 | 62.5 | 24.81 | 50 | 87.5 |
| Role—emotional | 76.34 | 100 | 30.21 | 66.67 | 100 |
| Mental health | 64.01 | 64 | 18.61 | 48 | 76 |
| Physical component | 33.93 | 33.18 | 10.42 | 25.79 | 41.39 |
| Mental component | 48.48 | 50.26 | 8.6 | 42.03 | 54.26 |

Table 2: The Short Form-36 questionnaire results.

## DISCUSSION

Our population includes patients on haemodialysis (190 out of 203) and on peritoneal dialysis (13 out of 203). The results observed are discussed independently of dialysis modality, because we consider that QoL in people on dialysis is linked to the condition itself, rather than to its treatment.

| | Absolute frequency | Relative frequency |
| --- | --- | --- |
| ADL scale | | |
| 1 = 5 physical dependences | 2 | 1.0 |
| 2 = 4 physical dependences | 15 | 7.4 |
| 3 = 3 physical dependences | 10 | 4.9 |
| 4 = 2 physical dependences | 14 | 6.9 |
| 5 = 1 physical dependence | 25 | 12.3 |
| 6 = complete autonomy | 137 | 67.5 |
| Total | 203 | 100.0 |
| IADL scale | | |
| 0 < 4 = dependent | 13 | 6.4 |
| 5 < 9 = partially dependent | 65 | 32 |
| 10 < 14 = complete autonomy | 125 | 61.6 |
| Total | 203 | 100 |
| SGA scale | | |
| C = severe malnutrition | 1 | .5 |
| $B_2$ = moderate malnutrition | 25 | 12.3 |
| $B_1$ = mild malnutrition | 43 | 21.2 |
| A = normal nutritional status | 134 | 66.0 |
| Total | 203 | 100.0 |
| Karnofsky Index | | |
| 30 = severely disabled | 4 | 2.0 |
| 40 = disabled, requires special care | 23 | 11.3 |
| 50 = requires considerable care | 36 | 17.7 |
| 60 = requires occasional assistance | 24 | 11.8 |
| 70 = cares for self, unable to work | 23 | 11.3 |
| 80 = normal activity with effort | 51 | 25.1 |
| 90 = normal, minor signs of disease | 42 | 20.7 |

Table 3: Determinants of frailty distribution.

It has been shown that QoL in patients on dialysis treatment is worse than that of a general population comparable for age and gender (Mingardi et al. 1999; Meinero et al. 2011). We have not included a control population, yet our results reflect those reported previously in the dialysis population. The last international DOPPS report for Italy (DOPPS 2009) confirms the same mean for the SF-36 cluster depicting physical component of QoL (33.42 ± 10.96) that emerged in our study, while the mean value of mental component cluster (39.53 ± 14.01) is lower than that observed in our population.

The best way to improve QoL of patients on dialysis is a renal transplant (Kimmel et al. 2008). However the inadequate availability of donors, the increasing number of potential receivers and the increasing number of elderly patients not eligible for transplantation because of many comorbidities induce the search of alternative tools able to improve QoL in this population.

Our study has taken into consideration for the first time the role of every component of frailty dimension and has highlighted their significance on QoL. We demonstrated that the individual components of frailty taken into account have a significant negative role on physical component of QoL that is more compromised than the mental one.

In particular the important role played by dependence has emerged, that has been associated in the past with increased risk of short- and long-term mortality (Panzetta et al. 2004).

It may be easy to suppose that depending on another person to assist with daily activities can worse one's evaluation of their QoL, and our study demonstrates that dependence,

| | Individual determinants | p-Value | $R^2$ |
|---|---|---|---|
| **Domain SF-36** | | | |
| Physical functioning | Dependence (KI) | <0.001 | 0.72 |
| | Gender | <0.001 | |
| | Instrumental disability | 0.04 | |
| | Peripheral vasculopathy | 0.05 | |
| Role physical | Dependence (KI) | <0.001 | 0.3 |
| | Nutritional status | 0.001 | |
| | Instrumental disability | 0.01 | |
| | Gender | 0.03 | |
| | Age | 0.05 | |
| Bodily pain | Dependence (KI) | <0.001 | 0.19 |
| | Dialytic age | 0.002 | |
| General health | Dependence | <0.001 | 0.33 |
| | Nutritional status | 0.01 | |
| | Dialytic age | 0.04 | |
| Vitality | Dependence | <0.001 | 0.47 |
| | Nutritional status | 0.01 | |
| | Disability | 0.02 | |
| Social functioning | Disability | <0.001 | 0.28 |
| | Nutritional status | 0.02 | |
| | Peripheral vasculopathy gender | 0.01 | |
| | | 0.05 | |
| Role emotional | Nutritional status | <0.001 | 0.23 |
| | Disability | 0.01 | |
| Mental health | Dependence | <0.001 | 0.33 |
| | Nutritional status | 0.002 | |
| **Cluster SF-36** | | | |
| Physical component | Dependence | <0.001 | 0.53 |
| | Gender | <0.001 | |
| | Number of comorbidities | 0.02 | |
| | Dialytic age | 0.02 | |
| Mental component | Nutritional status | 0.001 | 0.24 |
| | Disability | 0.005 | |

Table 4: Role of individual determinants of frailty on quality of life.

often cited as the main component of frailty definition (Panzetta *et al*. 2009), represents the principal predictor of a reduced QoL.

Dependence is more relevant than other variables as having a significant effect on many domains of QoL as observed in many other studies (Stojanovic & Stefanovic 2007; Mucsi *et al*. 2008; Mujais *et al*. 2009). Among comorbidities the only determinant identified by multiple linear regression was peripheral vasculopathy, that intervened on the domain 'social functioning'. The analysis showed the significance of vascular disease on every domain and cluster of SF-36. It is a disabling disease (Combe *et al*. 2009), that was present in 27.1% of the studied population, which was replicated in the 2007 DOPPS Report for Italy, at 28.6%.

An extremely significant role is played by nutritional status. In our study, nutritional status was evaluated by an observational tool (the SGA) and highlights the importance of careful nutritional assessment of the patient.

Finally the study shows that the absence of social components of frailty (poor social relationships and economic condition) is associated with a significantly better QoL: social relationships and good economic conditions are extremely significant on almost every domain of QoL. Family support is judged in general adequate and it is not significant on SF-36 domains except for role physical, probably because family may have a double role in generating sometimes independence and sometimes a dependence condition in patients (Boaretti *et al*. 2006; Fan *et al*. 2008).

| Domain/cluster SF-36 | Social determinants | p-Value |
|---|---|---|
| Physical functioning | Lives[*] (alone, with family, caregiver, institution) | <0.001 |
| | Social relationships | <0.001 |
| | Economic status | 0.008 |
| Role—physical | Lives[*] | 0.01 |
| | Family relationships | 0.009 |
| | Social relationships | 0.02 |
| | Economic status | 0.02 |
| Bodily pain | Social relationships | 0.04 |
| General health | Lives[*] | 0.005 |
| | Social relationships | 0.002 |
| | Economic status | 0.04 |
| Vitality | Lives[*] | 0.04 |
| | Social relationships | <0.001 |
| | Economic situation | 0.02 |
| Social functioning | Social relationships | 0.002 |
| | Economic situation | 0.02 |
| Role—emotional | | n.s. |
| Mental health | Social relationships | 0.002 |
| | Economic situation | 0.01 |
| Physical component | Lives[*] | 0.002 |
| | Social relationships | <0.001 |
| | Economic situation | 0.01 |
| Mental component | | n.s. |

Table 5: Role of social determinants of frailty on quality of life.
[*]Means alone or with family or caregiver or in institution.

## LIMITATIONS

We did not include a control group but we made comparisons with international literature. The patients' economic situation was evaluated via a three-item Likert scale but has only been measured by patient perception of their financial situation.

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## IMPLICATIONS FOR PRACTICE

The activities required to facilitate a satisfactory QoL in patient son dialysis are suggested to be:

- constant screening of patients by clinical nurses (even with simple observational tools) to identify the first signs of dependence and malnutrition;
- promotion of nutritional and functional rehabilitation;
- prevention of social isolation achieved through a coordinated net of social and health services.

## CONCLUSION

Our results demonstrate that dependence and social variables are the main factors that affect QoL in patients on dialysis in Trieste, Italy.

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## CONFLICT OF INTEREST

No conflict of interest has been declared by the authors.

## AUTHOR CONTRIBUTIONS

PS: Principal Project Leader, conceived study, participated in design and coordination, read and approved the final manuscript. GG; MC; GOP: Participated in design and coordination, undertook interviews, helped to draft manuscript, read and approved the final manuscript. GB: Analysed the data, helped to draft manuscript and approved the final manuscript.

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