Predictors of Perceived Health Status in Patients after Kidney Transplantation

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Background. Patients after kidney transplantation have decreased mortality, morbidity and better quality of life compared to people on dialysis. Major efforts are being directed towards research into graft and patient survival. Research into quality of life is less intensive. The aim of this study was to explore the predictors of perceived health status (PHS) in kidney transplant recipients.

Methods. Out of 218 patients after kidney transplantation 138 participated in the study. Linear regression analysis was performed to predict PHS, measured with the SF-36 questionnaire, in three age categories (<40, 40–59, ≥60 years). Independent variables included social support (measured with the Social Support List Discrepancies questionnaire), sociodemographic and medical variables, side effects and compliance.

Results. Predictors of better PHS in patients <40 years were better social support (P<0.001), lower creatinine (P<0.001) and lower stress from adverse effects (P<0.001). In the group of patients aged 40–59 years higher education (P<0.05), increased housekeeping activities (P<0.01) and lower stress from adverse effects (P<0.001) predicted better PHS. In the last age group predictors of better PHS were lower rate of dialysis (P<0.05) and posttransplant hospitalizations (P<0.01), absence of diabetes mellitus (P<0.01) and lower stress from adverse effects (P<0.05).

Conclusions. Major differences exist in PHS among kidney transplant recipients depending on their age. Side effects of therapy are the most important predictor of PHS for all age groups. PHS of young patients mostly depends on their renal function and their social support. Education and working activities are most important for middle-aged people whereas in older patients PHS is mostly affected by comorbidity.

Keywords: Quality of life, Perceived health status, Kidney transplantation, SF-36.

(Transplantation 2006;81: 1306–1310)
The importance of medical and non-medical predictors of per-
treatment. In addition, the authors discuss the clinical im-
effects of immunosuppression and compliance with the
social support, dialysis and transplantation factors, side-
factors, including demographic, socio-economic variables,
aim of merging the importance of medical and non-medical
transplantation. A wide range of variables is analyzed with the
received health status depending on age in patients after kidney
of results in physical functioning general health perceptions
found to have impact on perceived health status (8).
Fujisawa et al. found serum creatinine to be the only predictor
results in physical functioning general health perceptions
validity scales of the SF-36 questionnaire (16). Many re-
searchers have found co-morbid conditions including ane-
ia, diabetes mellitus, hypertension, joint and eye diseases, to
be associated with poor health status (7–11, 13, 14). In addi-
tion, length of hospital stay, number of hospitalizations and
time on dialysis, which reflect morbidity, have also been
found to have impact on perceived health status (8, 9, 13).
The aim of this study is to explore predictors of per-
ceived health status depending on age in patients after kidney
transplantation. A wide range of variables is analyzed with the
aim of merging the importance of medical and non-medical
factors, including demographic, socio-economic variables, social support, dialysis and transplantation factors, side-
effects of immunosuppression and compliance with the
treatment. In addition, the authors discuss the clinical im-
portance of medical and non-medical predictors of per-
ceived health status and the consequences for possible in-
terventions.

MATERIALS AND METHODS

Patients

Out of 218 patients with a functioning graft after kidney
transplantation from two transplant centers in Slovakia, 208
agreed to participate in the study and 138 sufficiently com-
pleted the given questionnaires (effective response rate
63.3%). Nonresponders did not differ significantly from the
analyzed group whether in age, gender, education or employ-
ment status. All patients after the third month and before 7
years posttransplantation were asked to participate, with the
exception of those with severe dementia or mental retarda-
tion. The lower limit of three months was chosen as it is a
common period for short-term evaluations (8–10, 14). Two,
five, or 10 years are usually used for long-term evaluations. As
the aim of this study was to study approximately 200 patients,
the upper limit was set at 7 years after transplantation after
considering the number of patients in our transplant centres.
All patients signed an informed consent before the interview.
The local ethical committee approved the study.

Procedures and Measures

Patients were interviewed by an independent observer in a
structured interview, which focused on basic demo-
graphic information, education, employment status, house-
keeping activities, family life, social activities, dialysis history,
compliance with immunosuppressive treatment and adverse
effects of immunosuppression.

Age, gender, education (elementary, secondary and
university), employment status (employed full-time or part-
time, not employed—disabled, retired or unemployed) and
house-keeping activities (measured in hours per week spent
shopping, cooking, cleaning, or caring for family members)
were socio-demographic variables.

Patients completed the Short Form Health Survey (SF-
36) and Social Support List Discrepancies questionnaire
(SSL-D). The SF-36 is a 36-item questionnaire for assessment
of perceived health status (17). It consists of eight subscales
which can be combined as the physical summary component
and the mental summary component. All subscales as well as
the summary components are presented as scores between 0
and 100 with higher scores indicating better health status. The
validity and reliability of SF-36 have been tested in patients
with renal disease including those after kidney transplanta-
tion (6, 7, 16, 18). Skalska et al. validated the questionnaire in
the Czech population (19). The Cronbach α in the present
sample was 0.95, while the Cronbach α for each subscale var-
ied between 0.77 (for social functioning) and 0.91 (for phys-
ical functioning). For the purposes of this study only sum-
mary component scores were used.

SSL-D is an instrument designed for assessment of so-
cial support (20). The items in this questionnaire are grouped
into 6 scales and they can be computed into a summary score
(higher score indicates better social support). The validity
and reliability of this questionnaire have been previously
tested in various patient populations (21–23). The Cronbach
α of the questionnaire in the research we performed was 0.89.
For the purposes of this study only the SSL-D sumscore was
used.

Information about medical variables was mostly taken
from patients’ medical records. Dialysis variables were as fol-
s: duration of dialysis period (in years), number of hospi-
talizations during dialysis period and number of operations
during dialysis period. Transplantation variables were as fol-
s: serum creatinine (Scr), time since transplantation (in
months), number of hospitalizations after transplantation,
number of operations after transplantation and type of im-
munosuppression protocol. Presence of diabetes mellitus was
used as a measure of co-morbidity.

Patients were asked to select from the list of 16 various
adverse effects of immunosuppression during the interview
(malaise, pain, muscle weakness, weight gain, facial changes,
depression, anxiety, sleep disorders, gingival hyperplasia, leg
edemas, skin lesions, hair loss, facial edemas, sexual dysfunc-
tion, diarrhea, fragile skin). Stress from each of these adverse
effects of immunosuppression was measured on a 5-point
scale (0: no stress, 1: low stress, 2: moderate stress, 3: high
stress, 4: very high stress). For each patient a total score of all
adverse effects was calculated as the sum of scores in all items.

Compliance with the immunosuppression therapy was
measured on a 5-point scale: 1: excellent, hardly ever modify
the treatment (no more than once per last month); 2: good, rarely modify the treatment (2–3× per last month); 3: average, sometimes modify the treatment (once a week); 4: fair, often modify the treatment (more than once a week); 5: bad, always modify the treatment. Modification of treatment was explained as missing a dose, prolonging the intervals between doses by more than two hours or changing the dose of immunosuppressants. The nephrologist was interviewed about each patient’s compliance with the immunosuppression therapy using the same scale as well. No specific single method was imposed on the nephrologist to identify noncompliance. Nephrologists mostly based their opinion on cyclosporin level variations or knowledge about prescribed and used immunosuppressants. Patients were considered to be compliant only if they declared their compliance by themselves as excellent, in accord with their physician’s opinion.

Statistics

Stepwise multiple linear regression analysis was performed in order to find predictors of perceived health status. Physical and mental component summary scores of the SF-36 were entered as the dependent variables. The model of independent variables consisted of socio-demographic variables, social support (SSL-D sumscore), dialysis variables, transplantation variables, co-morbidity, sum score of stress from side-effects of immunosuppression and compliance with the immunosuppressive medication. The analysis was performed with the sample divided into three age categories—patients aged less than 40 years, patients between 40 and 59 years and patients over 60 years. The cutoff values were selected based on data distribution and information from the literature. SPSS 10.0 was used for statistical analyses.

RESULTS

Mean age was 48.4±11.9 years and male/female ratio was 1.55. The majority of patients had a good graft function with median of serum creatinine 133 μmol/L (1.5 mg/dl). The predominant immunosuppressive protocol consisted of cyclosporin, mycophenolate mofetil and prednisone. More immunosuppressants. Patients were considered to be compliant only if they declared their compliance by themselves as excellent, in accord with their physician’s opinion.

The results of multiple linear regression analyses of predictors of perceived health status are presented in Tables 3–5. Only the models with the best explanation of variance in the mental and physical components of perceived health status are presented.

Better social support and fewer side-effects of immunosuppression predicted a better mental component of perceived health status in patients younger than 40 years. Better social support and lower SCr predicted a better physical component of perceived health status in this age group (Table 3).

Completely different results were found in the group of middle-aged patients (between 40 and 59 years). Higher education, increased housekeeping activities and lower stress from adverse effects of immunosuppression predicted better perceived health status (Table 4).

In the last age group (patients aged 60 years and older) the mental component of perceived health status was positively associated with lower posttransplant morbidity represented by lower posttransplant hospitalization rate, absence of diabetes mellitus and fewer side effects of immunosuppression. Similarly, the physical component was positively associated with lower dialysis hospitalization rate and fewer side effects of immunosuppression (Table 5).

DISCUSSION

The aim of this study was to detect the most relevant bio-psycho-social predictors of perceived health status in kidney transplant recipients. Based on literature search and our previous experience (24), the presented models were created.

Age is the most important variable when considering perceived health status in kidney transplant recipients (8–10, 24–26). We decided therefore to analyze patients separately in three different age groups (less than 40, 40–59 and more than 60 years). In all groups both medical and non-medical variables play an important role.

Perceived health status in young patients is mostly influenced by their social support, renal function and side-effects of immunosuppression. The models give an excellent explanation of variance in perceived health status (60.7% for the mental and 78.3% for the physical component). The study by Hathaway et al. with 91 patients with mean age 39.2 years found social support to be the most important predictor of all measures in the Sickness Impact Profile questionnaire (9).
minants of their health status. With good kidney function success of transplantation is one of the most important deter-

Fujisawa et al. published their study based on 117 kidney transplant recipients with ages similar to our "young patients group". They found SCr to be a significant predictor of better results in SF-36 subscales (16). Both of these papers support our results in this age category. It seems that for young people success of transplantation is one of the most important determinants of their health status. With good kidney function their reintegration into society is successful and they report excellent perceived health status.

The explanation of variance in perceived health status is less clear in middle-aged patients compared to the younger ones (47.4% in the mental and 48.1% in the physical component). Both groups also present major differences in predictors of perceived health status, as predicted by education, housekeeping activities and side effects of immunosuppres-

<table>
<thead>
<tr>
<th>Variable</th>
<th>% or mean, SD (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organ donor</td>
<td>cadaveric 96.3% living 3.7%</td>
</tr>
<tr>
<td>Dialysis before transplantation</td>
<td>hemodialysis 74.3% peritoneal dialysis 14.0% both 11.7%</td>
</tr>
<tr>
<td>Time since transplantation</td>
<td>34.11 ± 24.6 months</td>
</tr>
<tr>
<td>Primary kidney disease</td>
<td>glomerulonephritis 43.5% tubulointerstitial nephritis 23.2% polycystic kidneys 5.1% diabetes mellitus 3.6% congenital diseases 2.9% systemic diseases, vasculitis 2.2% other or unknown causes 19.6%</td>
</tr>
<tr>
<td>Immunosuppression protocol</td>
<td>Pred+CsA+Aza 12.8% Pred+CsA 13.5% Pred+CsA+MMF 40.6% Pred+Tac+MMF 9.0% CsA+Aza 3.8% CsA+MMF 10.5% Tac+MMF 0.8% CsA 8.3% Tac 0.8%</td>
</tr>
</tbody>
</table>

Pred, prednisone; CsA, cyclosporin A; Aza, azathioprine; MMF, myco-

<p>| TABLE 3. Multiple linear regression analysis of predictors of perceived health status in age group &lt;40 years |</p>
<table>
<thead>
<tr>
<th>Preditors</th>
<th>Mental component</th>
<th>Physical component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment status</td>
<td>0.570***</td>
<td>0.412***</td>
</tr>
<tr>
<td>Social support</td>
<td>0.369</td>
<td>0.170</td>
</tr>
<tr>
<td>SCr</td>
<td>-0.282</td>
<td>-0.453*</td>
</tr>
<tr>
<td>Side effects of IS</td>
<td>-0.906**</td>
<td>-0.395*</td>
</tr>
<tr>
<td>Compliance</td>
<td>0.485**</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE 2. Medical characteristics of the patient sample (N=138)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
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<tr>
<td></td>
</tr>
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</tr>
<tr>
<td>Immunosuppression protocol</td>
</tr>
</tbody>
</table>

Pred, prednisone; CsA, cyclosporin A; Aza, azathioprine; MMF, myco-

<p>| TABLE 4. Multiple linear regression analysis of predictors of perceived health status in age group 40–59 years |</p>
<table>
<thead>
<tr>
<th>Preditors</th>
<th>Mental component</th>
<th>Physical component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment status</td>
<td>0.550***</td>
<td>0.679*</td>
</tr>
<tr>
<td>Social support</td>
<td>0.373***</td>
<td>0.412**</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>0.797**</td>
<td></td>
</tr>
<tr>
<td>Side effects of IS</td>
<td>-0.584***</td>
<td>-0.605***</td>
</tr>
<tr>
<td>Compliance</td>
<td>0.485**</td>
<td></td>
</tr>
</tbody>
</table>

IS,– immunosuppression. * P<0.05, ** P<0.01, *** P<0.001.

<p>| TABLE 5. Multiple linear regression analysis of predictors of perceived health status in age group ≥60 years |</p>
<table>
<thead>
<tr>
<th>Preditors</th>
<th>Mental component</th>
<th>Physical component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment status</td>
<td>0.300***</td>
<td>0.233</td>
</tr>
<tr>
<td>Social support</td>
<td>0.24</td>
<td>0.465</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>-0.797**</td>
<td></td>
</tr>
<tr>
<td>Side effects of IS</td>
<td>-0.679*</td>
<td>-0.395*</td>
</tr>
<tr>
<td>Compliance</td>
<td>0.485**</td>
<td></td>
</tr>
</tbody>
</table>

SCr, serum creatinine; IS, immunosuppression; D hospitalizations, number of hospitalizations during dialysis period; D operations, number of operations during dialysis period; Tx hospitalization, number of hospitalizations after transplantation. * P<0.05, ** P<0.01.
Their major worries are connected with the fate of their graft (8). On the other hand, older patients accept even lower kidney function as long as they feel the same benefit in terms of their health status. So they rate unpleasant effects of treatment (14) and barriers in their everyday life (15) as more important.

The models of predictors of perceived health status among the oldest patients explained 48.2% of variance in the mental component and 34.6% in the physical component. Major variations in health status appear to exist in this age group and no variable is predominant. Despite the lower percentage of explained variance, perceived health status has a quite clear determinant: co-morbidity (number of pretransplant and posttransplant hospitalizations, presence of diabetes, side-effects of immunosuppression). These data are similar to the results of the study by Siegal et al. (14).

Participants in this study were recruited from two major transplant centers in Slovakia. The sample is representative and therefore the results may be extrapolated to the whole Slovak transplant population. However, perceived health status might be influenced by many cultural, ethnic and national variables, so additional larger multicenter studies are required to verify the results and allow their extrapolation to other populations. Another limitation of the study is that it had a cross-sectional design, so the results must also be verified longitudinally.

The most important medical variable for all age groups is the presence of unpleasant side-effects of immunosuppressive treatment. The consequence of this for clinical practice is that the adverse symptoms should be constantly evaluated by the transplant team, and major efforts should aim at decreasing their severity. Another important medical variable is kidney function, but only in the group of younger patients. Worry about viability of the graft and duration of its function is the major stressor for these patients (8, 27). The major concern in this age category lies therefore in optimizing the kidney function, but with careful balance in the treatment to minimize side-effects. On the other hand, kidney function is not the predictor of perceived health status in older patients at all, as they benefit even with “less successful transplantation” with lower graft function. Instead, co-morbidity is more important for this age group, so the major implications for practice are connected with optimizing treatment and following up co-morbid diseases (mostly diabetes and cardiovascular morbidity). Of the non-medical variables, social support has a predominant effect on health status in younger patients, while ability to participate in everyday activities is the most important variable for older patients. These non-medical factors must be taken into account by the transplant team. Cooperation of medical staff with a psychologist, a social worker and the patient’s family is necessary therefore in order to assure better quality of life as well as the patient’s active rehabilitation and reintegration into society.

REFERENCES