Journal of Occupational Rehabilitation
https://doi.org/10.1007/s10926-018-9804-8

Predictors of Return to Work 12 Months After Solid Organ Transplantation: Results from the Swiss Transplant Cohort Study

Laure Vieux[1] · Amira A. Simcox[1] · Zakia Mediouni[1] · Pascal Wild[1] · Michael Koller[2] · and the Swiss Transplant Cohort Study · Regina K. Studer[1] · Brigitta Danuser[1]

Abstract

Background Return to work with or after a chronic disease is not a very well understood process, influenced by a variety of personal, professional, societal and medical factors. The aim of this study is to identify predictors for return to work 12 months after a solid organ transplant applying a bio-psycho-social model. *Methods* This study is based on patients included in the Swiss Transplant Cohort Study, a national prospective multicentre cohort, who underwent a first solid organ transplant (kidney, liver, heart, lung). Bio-psycho-social factors were tested and predictors of return to work identified using logistic regression models. *Results* Among the 636 patients included in the study, 49.8% (317) were employed 12 months post-transplant. The major predictor for returning to work 12 months posttransplant was pre-transplant employment status (OR 10.8). Accordingly, the population was stratified in employed and not employed pre-transplant groups. Age, self-perceived health (6 months post-transplant) and the transplanted organ were significantly associated with post-transplant employment status in both groups. Return to work was influenced by education, depression (6 month post-transplant) and waiting time in the employed pre-transplant group and by invalidity pension in the not employed pre-transplant group. *Conclusion* Employment status pre-transplant being highly associated with employment status post-transplant, the process promoting return to work should be started well before surgery. Biomedical, psychological and social factors must be taken into account to promote return to work in transplanted patients.

Keywords Employment status · Organ transplantation · Pre-transplant · Post-transplant · Return to work

Introduction

Transplantation of solid organs has become the treatment of choice for end-stage organ failure. The goal is to improve both the length and quality of life (QOL) while minimizing the burden of disease and cost of care [1]. From this qualitative point of view, employment and work ability play a central role. Return to work is an indicator of the social integration of the transplanted patient. It improves the individual's economical and psychosocial well being, decreases the cost for the society, and is correlated with better outcomes including improved survival, QOL, and mental health [2, 3].

Recent studies confirmed QOL improvement after transplantation throughout the four major organs [4]. Despite this apparent success, the improvement of QOL after solid organ transplantation does not necessarily translate into improvement of return to work or into reduction of social welfare benefit received prior to transplantation [5]. Furthermore, although good post-transplant objective functional health found in the vast majority of liver [6], heart and lung patients [7], not employed patients perceived their health status to be significantly lower than employed patients [6, 8, 9].

Among the available literature, return to work rate after an organ transplant shows a high variability across organs but also across studies on the same organ. For instance, Botsford [10] stated in a 1995 literature review that return to work rates after heart transplantation vary widely from as low as 21% to as high as 87%. Similar conflicting data can be found after kidney transplantation, ranging from 26% in a

✉ Zakia Mediouni
zakia.mediouni@chuv.ch

[1] Institut universitaire romand de Santé au Travail, Rte de la Corniche 2, 1066 Epalinges, Switzerland

[2] Basel Institute for Clinical Epidemiology and Biostatistics, University Hospital Basel, Hebelstrasse 10, 4031 Basel, Switzerland

Published online: 25 August 2018

Brazilian study [11] to 71% in a Swiss study by Eppenberger et al. [12] and after liver transplantation, ranging from 22 to 55% according to a recent review by Åberg [13].

Return to work with or after a chronic disease is not a very well understood process. It is influenced by a variety of personal, professional, societal and medical factors. In order to support transplanted patients in returning back to work, a deeper understanding of the determinants influencing this process is crucial and a broader model than a pure bio-medical or a pure psycho-social one should be applied including psychological, societal and bio-medical factors as originally proposed by Engel [14].

Supporting the need for a multidimensional model, studies investigating return to work after transplantation have identified a variety of influencing factors such as depression and self-perceived health (SPH) (in the psychological domain), age, gender and education (in the socio-demographic domain) and transplanted organ, the aetiology of the disease and comorbidities such as diabetes (in the bio-medical field) [1, 6–9, 11, 15–19]. Some medical variables were also specific to the transplanted organ such as forced expiratory volume in one second after lung transplant [2] and glomerular filtration rate and the type of donor (living vs. deceased) after kidney transplant [11, 12, 18].

The most consistent factor across studies showing a strong positive association with the post-transplant working status seems to be the pre-transplant working status [1, 7, 10, 12, 13, 19]. The other factors were less consistently identified. The heterogeneity of the return to work rate and influencing factors identified can be attributed to different studies' methodology with respect to the definition of work, inclusion criteria, length of follow up and specificities of the population studied such as sociodemographic variables, the healthcare framework, the labor market, and the social system [20].

To our knowledge, none of the studies investigating the employment status after transplantation analyzed factors in a bio-psycho-social model using a longitudinal design in a cohort including recipients of the four major solid organs. A pilot study conducted by Praz-Christinaz et al. [21] concerning factors influencing the return to work after kidney or liver transplantation in 61 Swiss patients found that working before transplantation, being a kidney transplanted patient, having higher education and being a male are factors positively associated with employment after transplantation.

The present study, linking data of a psychosocial follow up with questionnaires and data of the medical follow up, investigates the determinants of return to work 12 months after solid organ transplantation. It studied socio-demographic factors (sex, age, marital status, education, professional status, and invalidity pension), psychological factors (SPH, depression) and bio-medical factors (transplanted organ, graft loss, waiting time) to predict the employment status 12 months after transplantation in a nationwide cohort sample including all transplanted patients of the four major organs in Switzerland.

Methods

The study population was taken from the Swiss Transplant Cohort Study (STCS), a prospective national multicenter cohort study including all organ recipients transplanted in Switzerland. Interested readers are referred to Koller et al. [22] for more details.

For the present study, we included all patients recruited in the STCS database from May 2008 to December 2012 with a solid organ transplantation of kidney, liver, heart or lung aged 18–65 at registration (which corresponds to the age interval between career entry and retirement in Switzerland). We excluded retirees, double or previous transplants and patients for whom the employment status was missing before the transplantation or 1 year after.

The STCS scientific committee approved this study.

Variables

The employment status, based on self-reports, was assessed at baseline (t_0) and 12 months after transplantation (t_2). Employment status 12 months after transplantation is the variable of interest. The answer options were employed, defined as being actively working in the labor market in a paid position, versus not employed, defined as not being active in the paid labor market. Since the focus of this study was on paid work, housepersons and students were considered as not employed and self-employed as employed.

The other assessed variables were divided in three groups: socio-demographic, psychological and bio-medical factors.

- Socio-demographic factors: *sex* (male or female), *age* in four classes ([18–35]; [35–45]; [45–55]; [55–65] years); *marital status* (married or not married); *education* (no professional education [no finished school or 9 years of mandatory school]), professional education [apprenticeship, diploma qualifying for admission to university, mastery level diploma and federal diploma], higher professional education [higher technical or commercial school and University degree]; *professional status* (employee, self-employed, director/higher management) and *invalidity pension* (receiving invalidity pension or not receiving invalidity pension). This latter variable was based on the answer of the open question "Why do you not work?". This information was only available among patients who were not employed pre-transplant.
- Psychological factors: *Depression* was assessed using the Hospital Anxiety and Depression Scale (HADS) [23].

For the purpose of this study, we exclusively used the depression subscale consisting of seven items with a scale ranging from 0 to 3. The scores of the seven items were added up to provide a total score for depressive symptoms, with a possible range from 0 to 21 (HADS score 0–7: no depression, HADS score 8–21: suspected and evident depression). *SPH* was assessed with a Visual Analog Scale (VAS) on the day when filling out the questionnaire (ranging from 0 being the worst state imaginable to 100 being the best state with an arbitrary cut-off point at 75).

– Biomedical factors: *organ* (kidney or non kidney), dichotomized in two classes due to the small number of patients in the liver, heart and lung transplantation groups; *graft loss* (graft loss or no graft loss); *waiting time* (0–0.5, 0.6–2.5 years), based on the time from inclusion in the cohort study to transplantation. There was no patient in our study group being on the waiting list for more than 2.5 years.

These variables were assessed at different time points as shown in Fig. 1: socio-demographic factors were assessed at baseline (t_0), depression and SPH were assessed at baseline (t_0) as well as at 6 months (t_1) and 12 months (t_2) post-transplant in order to follow their evolution over time, graft loss was assessed 6 months post-transplant.

Statistical Methods

After the descriptive analysis of the study sample, logistic regression analyses were carried out to identify the determinants of being employed 12 months after transplantation. The variables considered were: sex, age, marital status, education, professional status, invalidity pension, waiting time and organ at t_0, and graft loss, depression and SPH scores at t_1. Given the predominant effect of the pre-transplant employment status (see Table 1), the modeling of the independent variables was done separately for the group of patients not employed pre-transplant and the group of patients employed pre-transplant.

Within each of the two groups based on the pre-transplant employment status, the modeling strategy first assessed the presumed effect of each independent factor (univariate model) on the post-transplant employment status. In a second step, we included these effects jointly and arrived at a more parsimonious model (selected model) by a backward selection procedure, keeping only factors that proved statistically significant.

A box plot described the evolution of depression and SPH scores at baseline (t_0), 6 months (t_1) and 12 months (t_2) in the employed and not employed pre-transplant patients.

A p-value < 0.05 was considered statistically significant. Statistical analyses were performed using Stata IC 12 (StataCorp. 2009. Stata Statistical Software: Releases 11. College Station, TX: StataCorp LP).

Table 1 Cross-tabulation of the working status pre-transplant and post-transplant

Pre-transplant	12 months post-transplant		Total
	Not employed	Employed	
Not employed	226 (79.6%)	58 (20.4%)	284 (44.6%)
Employed	93 (26.4%)	259 (73.6%)	352 (55.4%)
Total	319 (50.2%)	317 (49.8%)	636 (100%)
Odds ratio			**10.8** [7.0–16.9]

Significant OR value is given in bold

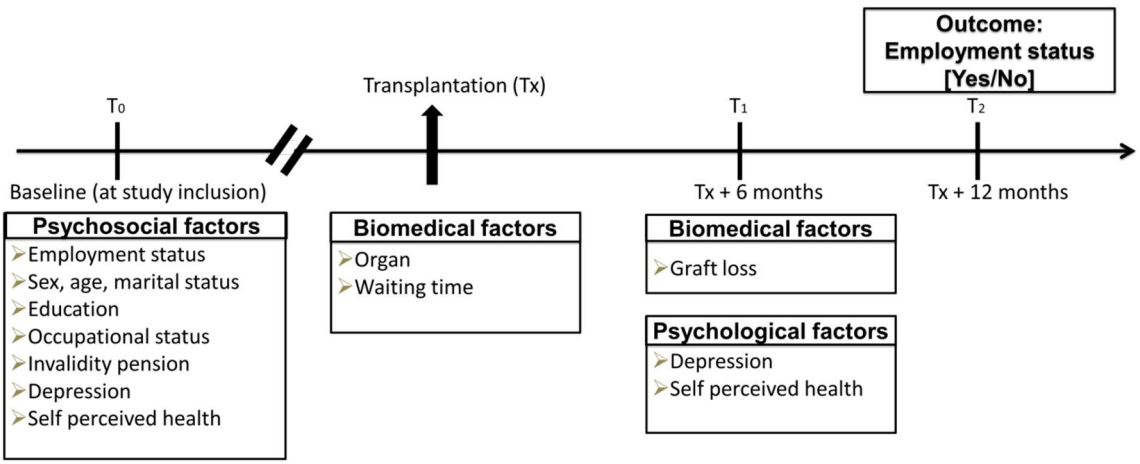

Fig. 1 Measurement time points of variables

Results

Population

In total, 636 patients were included in the analysis. Among them, 55% (95% CI 51–59%) worked before transplantation (n = 352). This percentage further decreased to 50% (95% CI 46–53%) 1 year post-transplant (n = 317). They were mainly male (65.4%, n = 416), mostly married (64.4%, n = 408) with a mean age of 50 years (SD: 11.5 years).

The majority of our cohort were kidney transplanted patients (60.7%, n = 386). A minority had no professional education (25.8%, n = 163) compared to professional education (42.9%, n = 271) or higher professional education (31.2%, n = 197). Most of the patients worked as employees (77.4%, n = 394), compared to self-employed (18.1%, n = 92) and directors (4.5%, n = 23). Missing data were excluded for this descriptive analysis.

Graft loss rarely occurred (3.3%, n = 21). Mean waiting time across organ was around 7 months between inclusion and transplantation.

Employment Status Pre-transplant

Table 1 shows the cross-tabulation of the employment status before and after transplantation and odd ratio calculation. The main determinants of employment status post-transplant is the employment status pre-transplant: OR 10.8, 95% CI 7.0–16.9. Unemployed pre-transplant patients have a considerable greater risk to be unemployed one year after transplantation compared to those employed pre-transplant. Given the strength of this association, we chose to stratify our population based on the employment status before transplantation to make it possible to highlight the effect of other potential explanatory variables on the outcome in the further analyses.

Determinants for Post-transplant Employment Among Not Employed Patients Pre-transplant

The regression results (univariate and selected models) for the determinants of the post-transplant employment status among the patients who were not employed before transplantation are shown in Table 2.

In the univariate regression analyses, statistically significant variables were: age class, transplanted organ, SPH (t_1), and invalidity pension.

Young patients (age 18–35 years) were more often employed 12 months post-transplant than older patients (age 55–65 years) (OR 4.7, 95% CI 2.0–11.0). The results were not statistically significant for the other age groups. Kidney transplanted patients returned to work more often than the patients transplanted with other organs (OR 2.7, 95% CI 1.4–5.0). SPH score more than 75 increased the probability to go back to work (OR 2.7, 95% CI 1.3–5.5) and receiving an invalidity pension statistically decreased the probability to go back to work (OR 0.3, 95% CI 0.1–0.8). In the selected multiple regression model, all these variables remained significant with similar OR values.

Determinants for Post-transplant Employment Among Employed Patients Pre-transplant

The regression results (univariate and selected models) for the determinants of the post-transplant employment status among the patients who were employed before transplantation are shown in Table 3.

In the univariate regression analysis, statistically significant variables were: age class, organ, education, SPH (t_1), depression (t_1) and waiting time.

All younger age groups considered have a favorable OR compared to the 55–65 years group (45–55 years old: OR 2.9, 95% CI 1.6–5.3; 35–45 years old: OR 4.5, 95% CI 2.1–9.9; 18–35 years old: OR 2.6, 95% CI 1.2–5.7). Kidney transplanted patients returned to work more often than the patients transplanted with other organs (OR 2.4, 95% CI 1.5–4.0). Compared with employees without professional education, employees with higher professional education were more frequently employed (OR 2.7, 95% CI 1.4–5.2) whereas there was no statistical significance between the patients having a professional education and those without. SPH score more than 75 increased the probability to go back to work (OR 2.4, 95% CI 1.4–4.2) and a short waiting time increased the probability to return to work (OR 2, 95% CI 1.0–4.0). Again, all these variables (with the exception of depression) remained significant in the selected multiple regression model, within similar OR values.

Excluding the patients with graft loss (n = 21) from both employed and not employed patients pre-transplant did not change the results.

Longitudinal Evolution of SPH and Depression

Figure 2 shows the evolution of self perceived health and depression scores (t_0, t_1, t_2).

Regardless of the employment status, mean SPH score increased from 54 (t_o) to 72 (t_1) and even to 74 (t_2), getting close to a Swiss general population of workers aged 45–65 years (mean SPH score 79) [24]. Depression score decreased after transplantation regardless of the employment status from a mean HADS score of 4.8 (t_0) to 3.5 (t_1 and t_2).

Table 2 Determinants of employment 12 months after transplantation among not employed patients before transplantation (descriptive results and logistic regression analysis)

Determinants	Not employed pre-transplant N = 284 (44.7%)			
	Not employed post-transplant (12 months) N = 226 (79.6%)	Employed post-transplant (12 months) N = 58 (20.4%)	Univariate model OR [95% CI]; p value	Selected model OR [95% CI]; p value
Sex				
Male (N = 172)	139 (80.8%)	33 (19.2%)	Reference	
Female (N = 112)	87 (77.7%)	25 (22.3%)	1.2 [0.7–2.2]; 0.522	
Age (years)				
55–65 (N = 126)	110 (87.3%)	16 (12.7%)	Reference	Reference
45–55 (N = 83)	63 (76.0%)	20 (24.0%)	2.2 [1.1–4.5]; 0.035	3.2 [1.3–7.4]; 0.229
35–45 (N = 38)	31 (81.6%)	7 (18.4%)	1.6 [0.6–4.1]; 0.376	2.0 [0.6–7.4]; 0.008
18–35 (N = 37)	22 (59.5%)	15 (40.5%)	**4.7** [2.0–10.9]; <0.001	**4.3** [1.6–11.6]; 0.003
Organ				
Non kidney				
Liver (N = 57)	50 (87.7%)	7 (12.3%)	Reference	Reference
Heart (N = 26)	23 (88.5%)	3 (11.5%)		
Lung (N = 47)	41 (87.2%)	6 (12.8%)		
Kidney (N = 154)	112 (72.7%)	42 (27.3%)	**2.7** [1.4–5.0]; 0.002	**3.7** [1.7–8.1]; 0.001
Marital status (m = 1)				
Not married (N = 96)	77 (80.2%)	19 (19.8%)	Reference	
Married (N = 187)	149 (79.7%)	38 (20.3%)	1.0 [0.6–1.9]; 0.916	
Education (m = 3)				
No professional education (N = 100)	77 (77.0%)	23 (23.0%)	Reference	
Professional education (N = 118)	100 (84.8%)	18 (15.2%)	0.6 [0.3–1.2]; 0.147	
Higher professional education (N = 63)	46 (73.0%)	17 (27.0%)	1.2 [0.6–2.6]; 0.565	
Professional status (m = 115)				
Employee (N = 132)	106 (80.3%)	26 (19.7%)	Reference	
Self-employed (N = 31)	21 (67.7%)	10 (32.3%)	1.9 [0.8–4.6]; 0.134	
Director, manager (N = 6)	5 (83.3%)	1 (16.7%)	0.8 [0.1–7.3]; 0.85	
SPH (m = 38)				
VAS score 0–75 (N = 152)	130 (85.5%)	22 (14.5%)	Reference	Reference
VAS score 75–100 (N = 94)	66 (70.2%)	28 (30.0%)	**2.5** [1.3–4.7]; 0.004	**2.7** [1.3–5.5]; 0.005
Depression (m = 31)				
HADS score 0–7 (N = 213)	166 (78.0%)	47 (22.1%)	Reference	
HADS score 8–21 (N = 40)	36 (90.0%)	4 (10.0%)	0.4 [0.1–1.2]; 0.090	
Invalidity pension				
No (N = 220)	168 (79.4%)	52 (23.6%)	Reference	Reference
Yes (N = 64)	58 (90.6%)	6 (9.4%)	**0.3** [0.1–0.8]; 0.017	**0.3** [0.1–0.8]; 0.016
Graft loss				
Yes (N = 8)	7 (87.5%)	1 (12.5%)	Reference	
No (N = 276)	219 (79.4%)	57 (20.6%)	1.8 [0.2–15.16]; 0.578	
Waiting time (m = 1)				
> 0.5 years (N = 31)	27 (87.0%)	4 (13.0%)	Reference	
0–0.5 years (N = 252)	199 (79.0%)	53 (21.0%)	1.8 [0.6–5.4]; 0.293	

Significant OR values are given in bold

m missing, *VAS* Visual Analog Score, *SPH* self-perceived health

Table 3 Determinants of employment 12 months after transplantation among employed patients before transplantation (descriptive results and logistic regression analysis)

Determinants	Employed pre-transplant N = 352 (55.3%)			
	Not employed post-transplant (12 months) N = 93 (26.4%)	Employed post-transplant (12 months) N = 259 (73.6%)	Univariate model OR [95% CI]; p value	Selected model OR [95% CI]; p value
Sex				
Male (N = 244)	62 (25.4%)	182 (74.6%)	Reference	
Female (N = 108)	31 (28.7%)	77 (71.3%)	0.8 [0.5–1.4]; 0.518	
Age (years)				
55–65 (N = 132)	54 (40.9%)	78 (59.1%)	Reference	Reference
45–55 (N = 104)	20 (19.2%)	84 (80.8%)	**2.9** [1.6–5.3]; <0.001	**2.9** [1.4–5.7]; 0.002
35–45 (N = 68)	9 (13.2%)	59 (86.8%)	**4.5** [2.1–9.9]; <0.001	**4.3** [1.7–10.6]; 0.002
18–35 (N = 48)	10 (20.8%)	38 (79.2%)	**2.6** [1.2–5.7]; 0.015	**2.9** [1.2–7.0]; 0.016
Organ				
Non kidney				
Liver (N = 65)	21 (32.3%)	44 (67.7%)	Reference	Reference
Heart (N = 24)	10 (41.7%)	14 (58.3%)		
Lung (N = 31)	15 (48.4%)	16 (51.6%)		
Kidney (N = 232)	47 (20.3%)	185(79.7%)	**2.4** [1.5–4.0]; <0.001	**2.9** [1.7–5.2]; <0.001
Marital status (m = 2)				
Not married (N = 129)	31 (24.0%)	98 (76.0%)	Reference	
Married (N = 221)	62 (28.1%)	159 (71.9%)	0.8 [0.5–1.3]; 0.411	
Education (m = 2)				
No professional education (N = 63)	24 (38.1%)	39 (61.9%)	Reference	Reference
Professional education (N = 153)	44 (28.8%)	109 (71.2%)	1.5 [0.8–2.8]; 0.181	1.8 [0.9–3.8]; 0.101
Higher professional education (N = 134)	25 (18.7%)	109 (81.3%)	**2.7** [1.4–5.2]; 0.004	**3.0** [1.4–6.4]; 0.005
Professional status (m = 12)				
Employee (N = 262)	70 (26.7%)	192 (73.3%)	Reference	
Self-employed (N = 61)	12 (19.7%)	49 (80.3%)	1.5 [0.7–3.0]; 0.257	
Director, manager (N = 17)	5 (29.4%)	12 (70.6%)	0.9 [0.3–2.6]; 0.808	
SPH (m = 24)				
VAS score 0–75 (N = 144)	52 (36.1%)	92 (63.9%)	Reference	Reference
VAS score 75–100 (N = 184)	31 (16.9%)	153 (83.2%)	**2.8** [1.7–4.7]; < 0.001	**2.4** [1.4–4.2]; 0.002
Depression (m = 20)				
HADS score 0–7 (N = 297)	70 (23.6%)	227 (76.4%)	Reference	
HADS score 8–21 (N = 35)	16 (45.7%)	19 (54.3%)	**0.4** [0.2–0.8]; 0.006	
Graft loss				
Yes (N = 13)	6 (46.2%)	7 (53.8%)	Reference	
No (N = 339)	87 (25.7%)	252 (74.3%)	2.5 [0.8–7.6]; 0.111	
Waiting time				
> 0.5 years (N = 40)	16 (40.0%)	24 (60.0%)	Reference	Reference
0–0.5 years (N = 312)	77 (24.7%)	235 (75.3%)	**2.0** [1.0–4.0]; 0.041	**2.5** [1.1–5.5]; 0.025

Significant OR values are given in bold

m missing, *VAS* Visual Analog Score, *SPH* self-perceived health

Discussion

In our study, 55% of transplantation patients were employed pre-transplant and 50% were employed 12 months after transplantation, this difference is not statistically significant. The major predictors for returning to work 12 months post-transplant was pre-transplant employment status. Employed pre-transplant patients

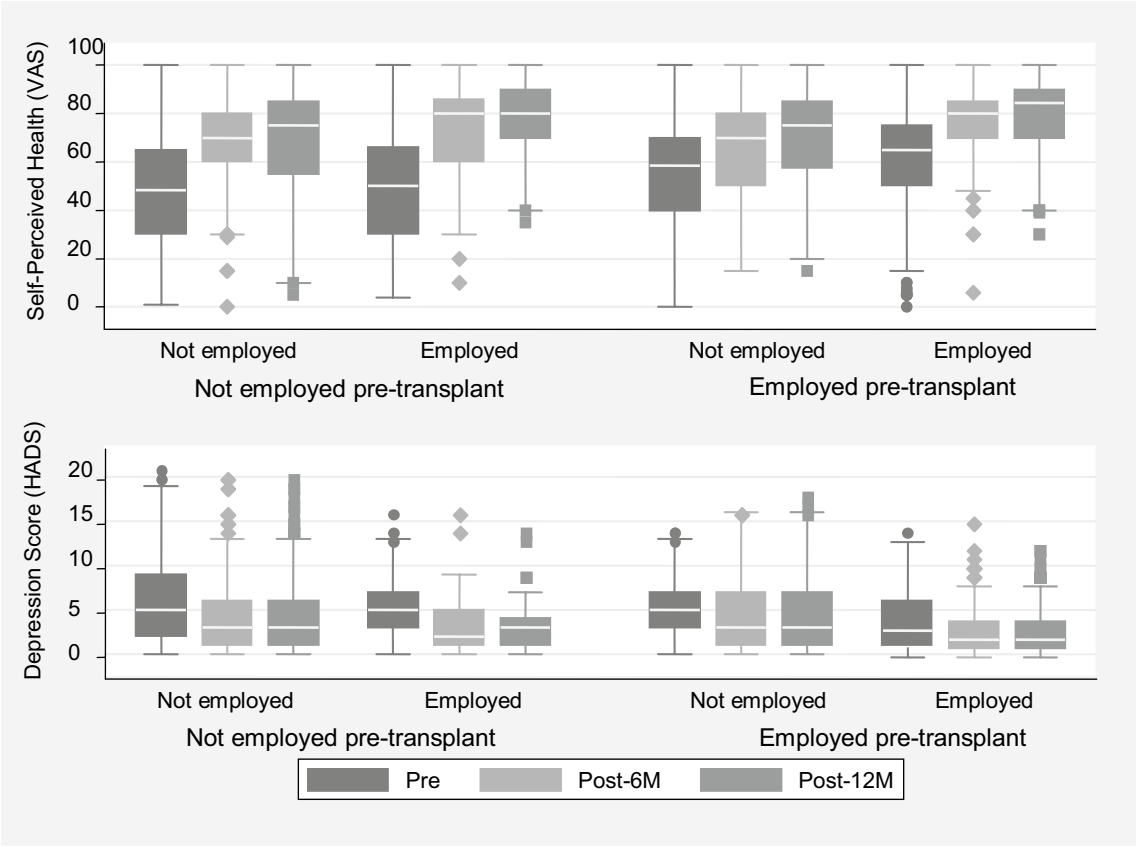

Fig. 2 Self-perceived health (SPH) and depression scores before transplantation and 6 and 12 months after transplantation separated by pre- and post-transplant working status

are significantly more likely to be employed after transplantation than patients without employment before it. Age, SPH (6 months post-transplant) and the transplanted organ were significantly associated with post-transplant employment status in both groups, not employed pre-transplant group and employed pre-transplant. Additionally, return to work was influenced by education, depression (6 month post-transplant) and waiting time in the employed pre-transplant group and by invalidity pension in the not employed pre-transplant group.

The employment rates are comparable with other studies in the same field [7, 15, 17, 25, 26]. One Swiss study about kidney transplanted patients [12] showed a higher employment rate after transplantation. This difference might be explained by the fact that this previous study considered housepersons and students as being employed, whereas they were considered not employed in our study.

In the following, we are going to discuss the pre-transplant employment status, the sociodemographic factors, the biomedical factors and the psychological factors.

Pre-transplant Employment Status

We found that the main factor influencing return to work post-transplant was the employment status pre-transplant. This factor is consistently identified across organs and studies [3, 12, 17, 25, 26]. In our study, the strength of the association with an OR above 10 strongly suggests that unemployment before transplantation is detrimental for being employed post-transplant. Transplantation is a medical intervention that improves quality of life and workability but does not lead automatically to return to work. Little is known about the determinants of the pre-transplant employment status. A recent study by Danuser et al. [27] looked for the determinants of being employed pre-transplant on a kidney-transplanted cohort of patients. They found that being a male, being between 35 and 45 years old, having an income higher than 4500 CHF, having a higher education, having a higher SPH score and a lower depression score pre-transplant, and having the

first dialysis less than a year ago were factors associated with a higher chance to be employed pre-transplant.

Sociodemographic Factors

As expected based on previous studies [1, 9, 11–13, 16, 18, 25], age was found to be a predictor to return to work for both groups of patients employed or not employed before transplantation. A study by Sangalli et al. [18] suggests that elderly people need longer than 1 year to return to work, which could partially explain the impact of age on return to work in our study. The possibility to benefit from a pre-retirement agreement independently of their work ability might also be an explanation for our finding. A long history of disease and associated comorbidities increase the likelihood for elderly transplant patients to benefit from an invalidity pension. Invalidity pension and its effect on employment status is a controversial subject. Whereas invalidity pension is important for patients who continue to suffer from poor health after transplantation, it may discourage those whose health improved to return to work out of fear of losing their benefits or security [17, 20]. In our study, the absence of invalidity pension was a significant predictor of returning to work, which is in line with results reported in previous studies [13, 17, 18, 27, 28]. However, the information on invalidity pension comes from a non-specific question ("Why do you not work?"). It is possible that some study participants receive invalidity pension but do not indicate this as reason for not working.

Positive relationship between education level and employment status has been found in kidney and other solid organ transplanted populations in the past [1, 3, 8, 9, 13]. Possible explanations are that higher education means access to jobs with less physical exertion and higher responsibilities making it easier to get back to work with chronic medical conditions and are usually more prone to adaptation if necessary. Contrary to these previous studies, De Baere et al. [25] found that there was a trend but no significant association between education level and return to work.

Our study showed different results for education level and waiting time in the two groups. They were significant predictors for employment post-transplant in the employed pre-transplant group but not in the not employed group. A possible explanation could be that the not employed pre-transplant patients had a lower education (35% without professional education) than the employed patient (18% without professional education). Additionally, a longer waiting time can imply a progressive impairment of the health state and the increase of psychological burden due to the period of waiting, making working more difficult and pushing the patients out of employment before transplantation.

Biomedical Factors

Kidney patients, in line with previous articles comparing organs, were more likely to be employed after transplantation than non kidney patients (liver, heart and lung) [7, 26, 29]. A possible cause for this finding is that kidney transplantation has been performed for a longer time compared to the other organ transplantations. According to De Baere et al. [25], non kidney patients are confronted with more complications after surgery hindering them from working. Detailed analyses on the kidney patient subgroup are published in a previous article from our group [27].

Psychological Factors

SPH 6 months after transplantation was positively associated with employment status 12 months after transplantation. Depression 6 months post-transplant was found to have no significant association with being employed 12 months after transplantation in our study. The link between depression and employment status post-transplant has already been studied and yielded conflicting results: Saab et al. [17] found no relation between mental health measured by the SF36 and employment status in liver patients but Gorevski et al. [30] and Newton et al. [31] found that post-transplant depression is associated with not being employed after transplantation. The conflicting results with respect to the association between depression and transplantation might be due to several reasons: cross sectional study design, different methods to assess depression and differences in time points between transplantation and mental health assessment.

Globally, positive SPH's evolution is in line with a previous study by Fusar-Poli et al. [28]. Depression scores also improved from pre-transplant to post-transplant.

Strengths and Limitations

This study has several strengths. It is a nation-wide multicenter study involving the six major hospitals in Switzerland. We therefore can assume that there was only a minimal selection bias due to missing occupational data and that the cohort is representative of the first-time solid organ transplanted Swiss population.

To our knowledge, it is the first cohort study adopting a bio-psycho-social perspective, linking a psycho-social questionnaire with medical data, including recipients of all major organ transplantation.

Current research on post-transplant employment status is mostly based on cross sectional surveys. Comprehensive long-term follow-up data are often not available. The present study includes all transplant recipients resident in Switzerland (with the exception of around 5% who did not give their consent).

The size of this cohort allowed us to analyze the predictive factors of the post-transplant employment status separately for those patients who were employed pre-transplant and for those patients who were not employed pre-transplant.

This study has also some limitations. First, the questionnaire used for the STCS did not include any item allowing to specifically code professional data (blue/white collar, physical work, hierarchical level, etc) although those are factors that could influence return to work prognosis in patients with chronic conditions. Second, the number of non kidney patients was insufficient for carrying out organ-specific analyses therefore nor specific comorbidities nor organ failure's indicator were taken into account in the present study despite the fact that diabetes, glomerular filtration rate or etiology of the organ failure have been studied before with conflicting results [9, 11, 13, 16]. Third, the information on invalidity pension comes from a non-specific question. It was therefore impossible to make a distinction in those who were not working, if they receive a disability pension, or an unemployment benefit, or being pre-retired or if they have left the labor market (e.g., becoming a housewife). Meanwhile this question has been reformulated making these distinctions possible for future studies. In our study, we have used graft loss as proxy for overall post-transplant complication. When interpreting our results with respect to this aspect, it must be kept in mind that our sample had a very small number of graft loss and that graft loss represents only one of many possible complications. Future studies might benefit from taking into account the most important complications.

Conclusion

Once passed the acute surgical period, one goal of post-transplantation professional carers should be to support patients' social reintegration. Helping them in getting back to their chosen career is part of this process and should be promoted. Despite the absence of medical complications (represented by graft loss) and the increase in SPH score, employment rate decreased 1 year after transplantation compared to before transplantation, although the difference was not significant.

The most important factor influencing return to work post-transplant was the employment status pre-transplant (OR 10.8, 95% CI 7.0–16.9). Despite this factor being consistently identified across organs and studies little is known about the determinants of the pre-transplant employment status. Further studies are needed to highlight the determinants of employment status of patients with chronic severe functional impairment who require an organ transplantation. This study suggests that patients, who are not employed before transplantation, receive organs other than kidney, are older or with a low education are at higher risk not to be employed post-transplant.

Some factors like age, organ and—to a lesser degree—education cannot be changed. However, pre-transplant employment status, SPH and waiting time are three factors that can be actively acted upon using a global biopsychosocial approach. Knowledge of hindering and facilitating factors for employment post-transplant is important in order to develop successful intervention strategies fostering return to work.

This study strongly suggests that the return to work prognosis is set before transplantation. If a society wishes to increase transplanted patients' work participation, intervention and support have to start well before the act of transplantation and should aim at maintaining work participation in chronically ill persons.

Funding This study was funded by Schweizerischer Nationalfonds zur Förderung der Wissenschaftlichen Forschung (CH), Grant Number PDFMP3_137125/1.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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