Why Is Organ Transplantation Clinically Important?

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Solid organ transplantations save lives in patients affected by terminal organ failures and improve quality of life. Organ transplantations have gradually ameliorated in the last two decades and usually provide excellent results in children and young adults, and are increasingly challenged by the growing proportion of elderly transplant patients with comorbidities. Renal transplantation increases patient survival over dialysis, and lifesaving transplants are indispensable to treat patients with liver, heart, or lung irreversible diseases. Solid organ transplant programs activity has been steadily growing but is still far from global needs, with great differences among countries. Solid organ transplantations are essential for developed and mature health care systems.

The introduction of antibiotics, massive vaccinations of the general population to prevent infectious diseases, and organ transplantation may be considered the miracles of twentieth century medicine. Organ transplantation is the best therapy for terminal and irreversible organ failure. Kidney transplantation introduced in the 1950s was the pioneer solid organ transplant to treat patients with end-stage renal disease (ESRD) in an era when renal replacement therapies were in their first steps. The gradual introduction of dialysis increased the recipients’ pool of renal transplant candidates, who may abandon dialysis after a successful transplantation. In the so-called era of conventional immunosuppression based on the use of azathioprine and steroids, the rejection rates and early graft failure were high, and nonrenal solid organ transplant programs without supportive replacement therapies had poor results with very few of them having regular activity until the early 1980s. The introduction of cyclosporine 30 years ago improved transplant outcomes, and solid organ transplant programs were generalized all over the developed world.

According to activity data reported to the Global Observatory on Donation and Transplantation (GODT) (World Health Organization 2012a), analysis from 2010 transplant activity for 95 countries, representing nearly 90% of the worldwide population, shows that ≈ 106,879 solid organ transplants were performed worldwide: 73,179 kidney transplants (46% from living donors), 21,602 liver transplants (15% from living donors), 5,582 heart transplants, 3,927 lung transplants, 2,362 pancreas transplants, and 227 small bowel. This activity increased 2.12% during 2009, but it is estimated...
that it is far from global needs. On the other hand, there are huge geographical differences on transplant activity ranging from >70 per million population (p.m.p.) in developed countries to 0–2.4 p.m.p. in developing countries. The implementation of transplant programs requires social altruism for organ donation, optimization of transplant clinical practices, and an economic effort by the distinct health care systems. Such commitments around organ transplantation aim to improve the life expectancy, clinical condition, and quality of life of solid organ transplant recipients.

The clinical importance of solid organ transplantations may be evaluated according to their impact on patient survival, the reduction of comorbidity, improvement of labor life, and global quality of life of transplant population. ESRD patients may survive with supportive dialysis, and diabetic patients with insulin therapy. In contrast, in the absence of long-lasting artificial organ support or inefficient pharmacological treatment, solid organ transplantation becomes a lifesaving therapy in patients with irreversible liver, heart, and respiratory failures.

As the distinct solid organ transplants will be addressed in specific articles in this collection, this introductory article will be mainly focused on transplant outcomes and benefits derived from organ transplantations, which obviously give sense to these therapies.

**KIDNEY TRANSPLANTATION**

Despite that renal transplantation is considered the best therapeutic option for the treatment of ESRD, access to transplantation varies among centers (Ravanant et al. 2010) and countries (Stel et al. 2005). The mean percentage of ESRD prevalent patients included in the waiting list is ∼20%–25%, but some centers and countries may have lower percentages of ESRD patients listed. Comorbidity and demographic factors may account for differences in the access to transplantation. Activation on the waiting list in the first 2 years of the start of renal replacement therapy (RRT) significantly decreases with older age, nonwhite ethnicity, and diabetes mellitus, and the probability of receiving a kidney transplant follows a similar trend. According to the United Kingdom Transplant Registry, the probability of receiving a kidney allograft is reduced by >40% in older recipients in comparison with young patients, and by >30% in nonwhites in comparison with Caucasians. Differences among centers on the time taken to activate inclusion on the waiting list and the proportion of listed patients with ESRD may widely vary, and a similar observation also applies regarding the access to transplantation (Ravanant et al. 2010). These center disparities may not be strictly explained by patient-related factors and might reflect distinct center criteria on a candidate’s evaluation for renal transplantation. A patient starting dialysis in a nontransplanting renal center was less likely to be registered for transplantation (odds ratio 0.85, 0.77 to 0.94) or receive a transplant from a donor after cardiac death or a living kidney donor (0.69, 0.59 to 0.80) compared with patients cared for in transplanting renal centers but with similar chances of receiving a transplant from a donor after brain stem death. In another study conducted in England and Wales, specific variables significantly associated with listing were age, primary renal disease, graft number, social deprivation, and ethnicity but not gender. In contrast with the previous publication, other investigators have reported that whether the renal unit was also a transplant unit was not significant (Dudley et al. 2009). A multinational European study based on the ERA-EDTA Registry (2010) analyzing the access to transplantation by country and comorbid status showed that the relative risk of receiving a first transplant within 4 years after the start of renal replacement in four European countries varies from 0.26 to 4.10 in patients without comorbidity and from 0.12 to 3.19 in patients with comorbidity. These international differences in access to transplantation were attributed to differences in the availability of donor kidneys in relation to the number of dialysis patients, and were only partly owing to comorbid variability (Stel et al. 2005). This and other previous studies (Jager et al. 2001; Miskulin et al. 2002) show that sicker patients remain on dialysis programs and the healthier patients are selected for renal transplantation to have
acceptable graft and patient survivals with this therapeutic modality, taking into account the limited number of organs available nowadays for renal transplantation. Clinical guidelines for the evaluation, selection, and preparation of the potential kidney transplant recipient may help to standardize access to renal transplantation (Dudley and Harden 2011). This approach is especially relevant with the current high incidence and prevalence of patients with ESRD. According to the recently published annual 2009 renal replacement report of the ERA-EDTA Registry (van de Luijtgaarden et al. 2012), in Europe the overall incidence rate of ESRD patients was 125 p.m.p., and the overall prevalence was 730 p.m.p., with wide variations among countries. From 2005 to 2009, the relative change of the hemodialysis (HD), peritoneal dialysis (PD), and transplantation distribution (at day 91 after the start of RRT) was an overall 0.5% decrease in HD, 1.4% decrease in PD utilization, and, interestingly, a 1.8% increase of patients living on a functioning graft. The assessment of waiting list dynamics may help to provide a better understanding of the limitations and contributions of renal transplantation to the treatment of ESRD. The Renal Patients Registry of Catalonia (2010) shows that for new cases in 1990–2010 that were not excluded from the waiting list at the start of RRT, at 10 years, 54% had a functioning transplant, 5.2% were on the waiting list, 2.3% were pending study, 8.1% were excluded, and the remaining 30.2% had died. According to the same registry, despite the older age and the increase of incident and prevalent ESRD patients in the last two decades, the waiting list size has not increased, the proportion of patients excluded because of clinical reasons remains quite constant, the exclusion for age has decreased by 50%, and the proportion of patients with a functioning transplant has increased from 30% in 1990 to 54% in 2010. These data suggest new clinical attitudes to offer renal transplantation to a larger number of ESRD patients despite their older age and comorbidity. In some European countries with very active transplant programs such as Norway, 70% of the patients on RRT were living with a functioning graft (591 p.m.p.). Also, the number of kidney transplants performed p.m.p. in 2009 widely varied among countries, the highest being in some regions of Spain (Cantabria, Catalonia) with ≥70 transplants p.m.p. These wide variations on the incidence and prevalence of ESRD and transplant activities across Europe strongly suggest that there is room for improving an integrated approach in the diagnosis and treatment of ESRD patients, including active policies to promote organ donation and transplantation.

The selection of transplant candidates with better clinical conditions may contribute to the better patient survival in comparison to the distinct dialysis modalities. In the cohort of patients between 2000 and 2004, 5-yr patient survival on dialysis adjusted for age, gender, and primary renal disease was 48%. Adjusted patient survivals for first deceased donor transplantation were 91%, and for living donor 94%. Adjusted 5-year graft survival during this same time period were 79% and 85% for deceased and living donor kidney transplants, respectively (Fig. 1) (van de Luijtgaarden et al. 2012). Children have excellent transplant outcomes. In 2011, according to the Scientific Registry for Transplant Recipients, for deceased and living donor transplants, the estimated 1-year conditional half-lives were 11.9 years and 15.3 years in pediatric populations.

According to the 2012 USRD Annual Data Report, ~117,000 new patients began treatment for ESRD in the United States in 2010 (incidence rate 348 p.m.p.), 10 times more patients than 30 years ago. The majority of ESRD patients started on HD (91%), 7% on PD, and 2% received a kidney allograft. The number of prevalent patients was almost 600,000. Of the ESRD population, 30% had a kidney transplant, 65% of them are on HD, and 7% are treated with PD. Importantly, the mortality of patients on dialysis has decreased 26% since 1985. However, mortality for dialysis patients is still far higher than in the general population and transplant patients (USRDS Annual Data Report 2012). In the 2005 patients’ cohort, 5-year adjusted survival probabilities were 35% for HD, 41% for PD, and 73% for kidney transplant recipients. The adjusted 10-year graft survival
for deceased donor transplants has increased from 18.8% in 1980 to 42.7% in 2000, and from 46.2% in 1980 to 58.6% in 2000 for living donor transplants. This gradual amelioration of transplant results is especially relevant taking into account the permanent increase of age of incident and prevalent patients with RRT, which has augmented by \( \approx 10 \) years from the mid-1980s to 2010 up to 64.8 years and 60.8 years for incident and prevalent patients, respectively (Renal Patients Registry of Catalonia 2010).

Another benefit of renal transplantation may be the reduction of hospital readmissions. Rates of hospitalization for ESRD patients are double those of the general population. Renal transplantation has importantly reduced hospitalization indexes in comparison with HD, for which the rate is 36% for all-cause rehospitalization. The total admission rates for dialysis patients have barely changed in the last decade as per 1000 patient years; period-prevalent patients by age, gender, ethnicity, and primary diagnosis were 1889 in 1993 and 1856 in 2010. For transplant patients, the rates were 1020 in 1993 and 841 in 2010.

**Preemptive Renal Transplantation**

Among the distinct alternatives for the treatment of ESRD, renal transplantation may also be the first therapeutic option of RRT to avoid dialysis. Prolonged dialysis time is considered a detrimental factor for transplant survival (Meier-Kriesche et al. 2000; Meier-Kriesche and Schold 2005; Kasiske et al. 2010) and increases the risk of hospital admission after transplantation (Gram et al. 2012). Preemptive renal transplantation (PRT) may avoid dialysis-related comorbidity, improve quality of life, and provide better transplant outcomes. Data reported a decade ago showed that longer waiting times on dialysis negatively impact on posttransplant graft and patient survival. In a paired kidney study on the impact of pretransplant dialysis on graft survival, dialysis time before transplantation longer than 2 years was associated with 29% 10-year graft survival rates in comparison with 63% in patients with 0–6 months on dialysis (Meier-Kriesche and Kaplan 2002). As PRT is associated with better patient and graft survival than transplantation after dialysis, this therapeutic option might be favored in all ESRD patients at the time of initiation of RRT and has been more common in the last 15 years. It has also been performed at higher levels of estimated glomerular filtration rate (eGFR), particularly among recipients of live-donor transplants (Friedewald and Reese 2012). In the United States, preemptive listing for kidney transplantation has increased in the last decade (Davis 2010) and occurs in 16.6%–21.3% of listed patients. Patients with less comorbid clinical entities, such as patients with polycystic kidney disease (41.9%) and glomerulonephritis (24.6%), were more often listed before dialysis than those with hypertension (12.2%) and diabetes (14.4%) (Keith et al. 2008).

Because of the better outcomes of pancreas–kidney transplantation (PKT), it has been claimed as the optimal therapy for patients...
with ESRD, especially if a living donor is available. PKT might be favored with an improved patient access to nephrology and transplant care, and better education of the community and healthcare personnel (Davis 2010). Nevertheless, recent studies have raised new concerns about the consequences of early versus late PKT (Friedewald and Reese 2012) and how to find an adequate “balance of benefit (maximization of utility) and justice (fairness in organ allocation)” (Petrini 2009).

Owing to the benefits of PKT, we might see a wider adoption of this therapeutic alternative in the coming years (Huang and Samaniego 2012).

Renal Transplantation in Older Recipients

The age of patients with ESRD initiating RRT has gradually increased in the last decade. According to the ERA-EDTA Registry, in 2009, the mean age of incident patients was 64.1 years. This implies that the proportion of patients older than 60 years on RRT in some areas may be higher than 60% and patients older than 70 years account for more than 50% (Renal Patients Registry of Catalonia 2010). This results in an increasing proportion of older patients on waiting lists and, in the last years of the past decade, >30% of kidney transplant recipients were 60 years or older. This translates to an increment of prevalent older patients with a functioning allograft that was very low in the mid-1980s, whereas in 2010 it accounted for 34% of patients with a kidney transplant. The growing proportion of elderly patients has also been observed in other solid organ transplant programs, especially in lung and heart transplants (Abecassis et al. 2012). Although it is well known that graft and patient survival are poorer in older suitable patients than in younger recipients, renal transplantation from deceased or living donor decreases mortality in older patients by >30% over those patients remaining on dialysis (Table 1) (ERA-EDTA Registry 2010). Older transplant recipients frequently suffer from comorbid conditions such as cardiovascular disease, infections, malignancies, physical limitations, cognition alterations, and overall reduced quality of life. Older age is associated with an increased frequency of early readmissions after transplantation (McAdams-DerMarco et al. 2012). The risk of death is also exacerbated in older recipients. The mortality rate in patients older than 60 years in the first year after transplantation is more than double that in younger recipients (10.5% vs. 4.4%), which is aggravated with comorbidities and whether the patient received an ECD kidney. Nevertheless, older recipients have shorter life expectancies than younger patients and might benefit from receiving kidneys from ECD donors to increase access to transplantation. The potential utility of allocating kidneys from donors ≥65 years to recipients of the same age (old to old), regardless of human leukocyte antigen (HLA) matching and with short cold ischemia time, was addressed in the Eurotransplant organization 10 years ago in the so-called Eurotransplant Senior Program (ESP) (Frei et al. 2008). In this program, graft and patient survival were not negatively affected by the ESP allocation when compared with standard allocation, suggesting that donor/recipient age matching could increase the number of elderly recipients transplanted, which might result in a longer life expectancy compared with dialysis.

**SOLID ORGAN TRANSPLANTATION IN DIABETIC PATIENTS**

The World Health Organization (WHO) estimates that 347 million people worldwide have diabetes, >80% of people with diabetes live in low- or middle-income countries, and projects that diabetes deaths will double between 2005 and 2030 (World Health Organization 2012b).
The most severe and well-known complications of diabetes such as retinopathy, cardiovascular disease, neuropathy, and nephropathy greatly deteriorate the diabetic patient clinical condition and reduce life expectancy. According to the WHO, a total of 57 million deaths occurred in the world during 2008; 36 million (63%) were attributable to noncommunicable diseases, principally cardiovascular diseases (17 million), cancer (7.6 million), chronic respiratory diseases (4.2 million), and diabetes (1.3 million). Diabetes entails a high risk of ESRD and premature mortality, even higher than in cancer patients. The mortality risk of patients with diabetes and nephropathy is higher than the average mortality rate of all types of cancer (Lambers Heerspink and de Zeeuw 2011). Diabetic nephropathy is now not only the leading cause of ESRD in much of Australasia, Europe, and North America, but also in less wealthy countries, including India, several Latin American countries, Malaysia, and Turkey (White et al. 2012). Diabetic nephropathy accounts for ~35% of ESRD in Australasia, ~38% in the United States, and ~28% in Europe.

RRT therapy in diabetic patients with ESRD consists of supportive dialysis, and, in suitable candidates, renal transplantation, and also simultaneous kidney/pancreas transplantation or pancreas alone, reverse diabetes and attenuate or prevent diabetic complications. In Europe, in the cohort of incident patients in 2001–2005, diabetics on dialysis programs had the worst 5-year survival, either on PD or on HD, with an average rate of 39%, below the 50.9% observed in all patients (ERA-EDTA Registry 2010). In this registry, in eligible patients, renal transplantation increased 5-year survivals up to 85.1% in deceased donor transplants and up to 85.6% in living donor transplants, although below the rates reported for all patients (91% for deceased donor and 94.2% for living donor transplants).

Besides kidney transplantation alone in ESRD diabetic patients, the beneficial effects of pancreas transplantation have been a matter of discussion. Pancreas transplant programs were initiated more than 20 years ago in several countries and have progressively ameliorated their results. According to a recent summary of the International Pancreas Registry (Gruessner 2011), “at the end of 2010 more than 35,000 pancreas transplantations have been reported; 24,000 transplantations in the United States and more than 12,000 outside the United States. The types of pancreas transplantations performed have been simultaneously with a kidney (SPK) (75%), those given after a previous kidney transplantation (PAK) (18%), and pancreas transplantation alone (PTA) (7%).” In these last three decades, optimization of surgical techniques and the introduction of low-toxicity immunosuppression have gradually improved the outcomes of pancreas transplantation, regarding patient survival and graft function. “Patient survival now reaches over 95% at 1 year post-transplant and over 83% after 5 years. The best graft survival was found in SPK with 86% pancreas and 93% kidney graft function at 1 year. PAK pancreas graft function was 80%, and PTA pancreas graft function reached 78% at 1 year.”

The beneficial effects of euglycemia on diabetic complications may not be clearly evident in the short term after transplantation but may be noticed in the long term. In nonuremic patients with long-term type 1 diabetes, with mild to advanced diabetic nephropathy lesions at baseline, no significant changes were observed after 5 years of pancreas transplantation. But in most patients, glomerular, tubular, and interstitial lesions markedly improved at 10 years, indicating that a prolonged time of normoglycemia may heal diabetic nephropathy (Fioretto and Mauer 2011).

Diabetic retinopathy is a leading cause of blindness. Despite initial controversies on the beneficial effects of pancreas transplantation on this severe complication, PTA seems also to improve or stabilize diabetic retinopathy in >50% of patients 2 years after transplantation (Giannarelli et al. 2006), suggesting that a functioning pancreas graft may prevent visual loss in diabetic patients. Successful pancreas transplantation may also improve sensory or motor neuropathy according to electrophysiology studies (Allen et al. 1997; Martinengo et al. 1997; Navarro et al. 1997), findings recently supported by experimental data (Spadella et al. 2012).
Islet transplantation may be a therapeutic alternative to pancreas transplantation to restore normal glucose metabolism in type 1 diabetes, providing a 59% insulin independence rate in comparison with 75% with PTA, which might suggest that islets transplantation should be offered as a first alternative only in patients with high surgical risk, although the debate is still open on the role of these two types of transplantation in the treatment of diabetes (Maffi et al. 2011).

**LIFESAVING SOLID ORGAN TRANSPLANTS**

**Liver Transplantation**

Liver transplantation (LT) is the second most frequently performed transplant after kidney transplantation. According to the 2010 report of the European Liver Transplant Registry, the main indications for LT are cirrhosis (58%), cancers (14%), cholestatic diseases (10%), acute hepatic failure (8%), metabolic diseases (6%), and other diseases (4%). Data from the same registry show that 1-year and 5-year patient survivals according to the number of liver transplantations were 87% and 62% in patients with first LT, 75% and 47% for second LT, and 75% and 44% for third LT, respectively. 5-Year graft survivals according to the number of transplants were 55%, 29%, and 36%, for first, second, and third LT, respectively (European Liver Transplant Registry 2012). In the increasing proportion of elderly recipients (> 60 years), patient survivals are slightly lower, but acceptable, than in all patients with same indications for transplantation. Liver transplant activity has increased in Europe since the 1980s, peaking in 2007 with > 6000 LT, probably owing to wider acceptance donor criteria, including older donors. Advanced donor age significantly reduces 10-year-graft survivals from 65% 10-year patient survival in recipients aged 15–45 years, 59% in 45–60 years, and 49% in patients ≥60 years. Despite the negative impact of donor and recipient age on LT outcomes, survival rates reported are considered clinically relevant in patients with life-threatening irreversible liver failure. Other transplant registries show similar data on LT (Scientific Registry of Transplant Recipients and OPTN Annual Data Report 2011).

**Heart and Lung Transplantation**

Heart transplantation is indicated in patients suffering from refractory cardiac failure owing to cardiomyopathy (53.5%), coronary artery disease (30.8%), congenital heart diseases (9%), retransplant because of previous graft failure (2.6%), valvular heart disease (1.4%), and for other entities (2.7%) (International Society for Heart and Lung Transplantation Registry 2011). Heart transplant activity and outcomes have greatly improved. This accounts for the growing number of patients living with a functioning heart transplant, which in the United States is more than 20,000 people. Short-term graft failure (6 months and 1 year, adjusted for age, sex, and race) has been declining over the past decade, and in general is low, 0.07 at 6 months and 0.09 at 1 year for patients who underwent transplant in 2010, and graft failure at 3, 5, and 10 years posttransplant has steadily declined. Half-life increased from 11.5 years in 1991 to 14 years in 2009, and overall 5-year graft survival was 74.9%, and similar among all disease groups (Scientific Registry of Transplant Recipients and OPTN Annual Data Report 2011). The highest survival rates are observed among young and pediatric recipients. In the United States, graft survival for heart transplants performed in children in 2005 was 87.5% at 6 months, 84.6% at 1 year, and 72.1% at 5 years. In these transplant patients, for heart transplants performed in 2009–2010, the 1-year conditional graft half-life was 17.4 years in comparison with 9.8 years for those performed in 1991–1992. As in other solid organ transplants, older donor and recipient age negatively influence patient survival.
The main indication for lung transplantation is respiratory insufficiency secondary to idiopathic pulmonary fibrosis (30%), emphysema/chronic obstructive pulmonary disease (26%), and cystic fibrosis (14%) (International Society for Heart and Lung Transplantation Registry 2011). Lung transplant activity has gradually increased. The number of adults living with a transplanted lung was 9,000 in the United States last year, more than twofold than in 2000, and the number of pediatric recipients has remained stable for the last decade. In lung transplantation, a new organ allocation scheme was introduced 7 years ago, the so-called Lung Allocation Score (LAS), which takes into account the risk of death without transplant and posttransplant, regardless of the waiting time, disincentivizing early listing. This implies that “patients listed are those with more immediate need of transplant” (Scientific Registry of Transplant Recipients and OPTN Annual Data Report 2011). After an initial decline following the implementation of LAS, the waiting list has steadily increased. The LAS has increased as well, from 36.6 in 2006 to 40.8 in 2011, reflecting the increased illness severity of candidates, which may account for the increasing mortality rates among wait-listed candidates. LAS correlates with patient survival, being around 50% at 5 years in recipients with LAS < 50 and reduced by ~10% in higher scores. Despite this more complex scenario in lung transplantation and the growing number of older recipients, early and late graft failure have diminished. Early graft failure dropped to 5.3% in 2011, and long-term outcomes seem to have also improved, as indicated by the increment in conditional survival of at least 1-year adult half-life from 5.2 years in 1991 to 7.7 years in 2009. This positive evolution of lung transplantation has occurred despite the well-identified comorbidity accompanying lung transplant patients. Concerning pediatric lung transplantation, the number of listed and transplanted patients has declined the last few years, and the highest 5-year patient survival, around 60%, is observed in children >1 year old, which is reduced by 20% in patients <1 year.

Heart–lung transplantation has remained almost stable in the last three decades and the major indications are congenital heart disease (35.7%), pulmonary arterial hypertension (27.6%), and cystic fibrosis (14%) (Christie et al. 2012). According to the corresponding registries, during the last part of 2011, 106 heart–lung transplants were performed in the United States and 50 in Europe. The results of heart–lung transplantation have progressively ameliorated in the last 30 years, mainly owing to the reduction of early mortality. Recipients who survive the first year have generally good outcomes, with a half-life of 10 years conditional on surviving at least 1 year.

QUALITY OF LIFE AND COMORBIDITY IN SOLID ORGAN TRANSPLANTATION

All solid organ transplant recipients suffer from transplant-inherent-related comorbidities, such as hypertension, new-onset diabetes mellitus, cardiovascular events, infections, and cancer, and in nonrenal transplants a high percentage of patients develop chronic kidney disease (CKD). Despite these limitations, solid organ transplants increase life expectancy and generally improve quality of life.

In a systematic review of clinically relevant outcomes in adult kidney transplantation compared with dialysis, in addition to the reduction of mortality, renal transplantation compared with dialysis reduced cardiac events, heart failure, ischemic heart disease, hospitalization, and hospitalization for infection (Tonelli et al. 2011). A quality of life analysis using the SF-36 also significantly favored transplantation. In another study (Wyld et al. 2012) on patients with advanced CKD on utility-based (0 represents death and 1 full health) quality of life, transplant patients had a mean utility of 0.82, which was 0.11 lower in dialysis patients and 0.20 lower in patients under conservative therapy. Interestingly, mean utility in transplant patients increased from 0.66 in the 1980s to 0.85 in the 2000s. The growing number of elderly transplant candidates with poorer clinical conditions than young patients, challenges solid organ transplant programs, and data on quality of life in older patients are scarce (Kniepeiss et al. 2012).
Despite that the quality of life in pediatric renal transplant patients is slightly lower than in the general population, and school attendance and performance is also lower, employment rates in adulthood are similar to the general population (Dehennault 2011). However, in LT young adults still have physical and psychological sequelae that affect health status two decades after transplantation (Mohammad et al. 2012). Employment rate may also reflect quality of life in transplant recipients. Unfortunately, labor insertion in solid organ transplanted patients is usually lower than in the general population, and some studies have reported employment rates <50% (Kristen et al. 2010; Huda et al. 2012). Social coordinated efforts should be made to reintroduce transplant patients to labor life.

CONCLUSIONS

Solid organ transplantations save lives in patients affected by terminal organ failures and improve quality of life. Solid organ transplant programs provide excellent results in children and young adults and are increasingly challenged by the expanding proportion of elderly transplant patients. Solid organ transplant program activity has been growing in the last two decades, and is essential for developed and mature health care systems.

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