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Nephrectomy Complication Is a Risk Factor of Clinically Meaningful Decrease in Health Utility among Living Kidney Donors

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ABSTRACT

Objectives: To assess the clinically relevant change in health state utility (HSU) in living kidney donors and whether this change value is constant across measures and clinical conditions and is useful for health economics studies. We aimed to 1) measure the change in the HSU score for living kidney donors from before donation to 3 months after donation and 2) estimate the minimal important decrease (MIDe) in the HSU score for living kidney donors and its associated clinical factors. **Methods:** Data from a prospective multicenter observational study measuring quality of life of kidney donors by the three-level EuroQol five-dimensional questionnaire (EQ-5D-3L) and the six-dimensional health state short form (SF-6D) before donation and at 3 months after donation provided HSU scores. Two methods were used to derive the MIDe: the anchor-based method and the distribution-based (standard error of measurement) method. Logistic regression was used to identify clinical factors associated with the MIDe after donation. **Results:** In total, 228 and 216 donors completed the EQ-5D-3L and the SF-6D, respectively. Mean HSU scores were 0.932 and 0.823 before donation and 0.895 and 0.764 at 3 months after donation. HSU scores were significantly decreased at 3 months, and 18.5% of donors rated their global health as "somewhat worse." By the EQ-5D-3L and the SF-6D, the MIDe was estimated at −0.113 and −0.116 with the anchor-based method and −0.075 and −0.077 with the distribution-based method. Risk of decreased HSU score was significantly associated with clinical complications but only marginally with surgical technique. **Conclusions:** A short-term clinically relevant decrease in HSU was significantly associated with clinical complications in kidney donors. Preventing perioperative complications is of prime importance in kidney donation.

Keywords: clinical complications, health state utility, living kidney donors, minimal important decrease.

Introduction

The number of living kidney donations has increased in recent years in European countries [1,2]. The most important reason for this increase is the expanding gap between the availability of deceased-donor organs and the demand for kidney transplants because of the increasing number of patients with permanent kidney replacement therapy. Receiving a kidney from a living donor is better for all health outcomes than receiving one from a deceased donor [3]. Nevertheless, these apparent medical benefits for transplantation recipients have to be balanced against the possible harms to living donors. Although many potential kidney donors are willing to accept the risk of nephrectomy to help their loved ones, the medical community must quantify these risks as well as possible and make this information available to people considering donation.

Several studies have shown that living kidney donation is safe and associated with low risk of complications and even low risk of mortality [4,5]. Living kidney donation is practiced with the expectation that the risk of short- and long-term harm to the donor can be outweighed by the psychosocial benefits of donor altruism and the improvement in recipient health. The practice, however, involves minimally invasive nephrectomy among young and relatively healthy adults, which implies that mortality or perioperative complications are not sufficient to evaluate the health consequences of donation. In this case, evaluating the

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psychological harms to donors, such as their health-related quality of life (HRQOL), is of prime importance [6].

The concept of health state utility (HSU) was developed by economists for cost-utility analyses and reflects patient and society views. It does not refer to the usefulness of the individual or the condition of the individual but rather refers to the desirability or preference the individual exhibits for the condition [7]. The HSU score ranges from 0 (dead) to 1 (representing the best imaginable health). Some instruments allow for a negative value, corresponding to a state perceived worse than death.

Living kidney donation is a societal issue that involves the society view in addition to the donor view. The HSU is an important outcome for measuring the impact of donation combining the society and donor views. The health impact of donation is measured as the change in the HSU score from pre- to postdonation. Although donors and physicians are not directly interested in HSU scores in routine practice, they might be interested if practices were improved by the results of utility research studies. So, one of the challenges with use of the HSU is determining the significance of any differences observed.

The minimal important difference (MID), developed by Jaeschke et al. [8], is defined as "the smallest difference in score in the domain of interest which patients would perceive as beneficial and which would mandate, in the absence of troublesome side-effects and excessive cost, a change in the patient's management." The MID is a measure of responsiveness representing the smallest subjective difference in an outcome score that represents a clinically important change for the patient. Then, determining the magnitude of change from pre- to postdonation corresponding to an MID of living kidney donors would be helpful and meaningful for researchers and would help improve practice.

Because donors are considered healthy before donation, we may expect a decrease in the HSU score in the short-term after donation. Thus, one could determine the minimal important decrease (MIDe), which measures the negative impact of kidney donation. The MIDe is useful when such a decrease is clinically relevant. This impairment can be related to postsurgical clinical conditions of the donor. Therefore, we aimed to 1) measure the change in the HSU score for living kidney donors from before donation to 3 months after donation and 2) estimate the MIDe in the HSU score for living kidney donors and its clinical associated factors.

Methods

Kidney Donors

We used data for donors included in the DOVIREIN (DOnneurs VIvants de REIN) study from June 2010 to November 2012. This was an observational multicenter prospective study monitoring the HRQOL of living kidney donors by surgical techniques used for kidney sampling. The study started in June 2010 and was approved by the institutional review board (CCTIRS notification OMG/JD/10.033; CNIL authorization 910068, ClinicalTrials.gov no. 10.039). From 22 public hospitals covering the whole French territory, all donor-recipient couples were invited to participate and were included after they gave their written informed consent before donation surgery.

Demographic and Clinical Data

Demographic and clinical data were collected before and after donation and included surgical techniques used (lombotomy, laparoscopic surgery hand-assisted, laparoscopic surgery, and robotic surgery), the nephrectomy side, clinical complications, and number of complications. Clinical complications referred to surgical or medical health events (hematoma, infections, disembowelling, thromboembolic, and other) that occurred during the first 3 months after donation.

HSU Measurement

The HSU can be empirically generated by generic preference-based measures such as the HRQOL. The HRQOL of donors was measured by generic instruments, the three-level EuroQol five-dimensional questionnaire (EQ-5D-3L) [9] and the Medical Outcomes Study 36-item short form (SF-36) [10], and was collected the day before donation and at 3-month follow-up.

The six-dimensional health state short form (SF-6D) [11] was developed from 11 questions of the SF-36. It is a multidimensional health classification system assessing the six domains of physical functioning, role limitation, social functioning, pain, mental health, and vitality, with one to six levels for each domain. An SF-6D health state is defined by one level from each domain, for 18,000 possible health states. The SF-6D scoring algorithm was developed by the standard gamble method [12] from a sample of 249 among a representative sample of the UK population. HSU scores generated by the SF-6D range from 0.29 to 1.00, with 1.00 representing full health and 0.29 representing the worst possible health state defined by the SF-6D (i.e., all domains being at the worst level) [12].

The EQ-5D-3L consists of five items or dimensions (mobility, self-care, usual activity, pain/discomfort, and anxiety/depression) with three answer categories—no problem (1), some problems (2), or severe problems (3)—for 243 possible health states. The EQ-5D-3L can be reported as a preference-based single number, with mean values obtained for the general population in France [13] by using the time trade-off method. This resulting HSU score ranges from −0.543 to 1.00, with 1.00 representing "full health," 0 "death," and negative values a health state "worse than death" [14].

MIDe Estimation

We derived the MIDe for the EQ-5D-3L and the SF-36 by using the most common methods for estimating the MIDe for HRQOL instruments: the anchor-based and distribution-based methods [15,16]. For the anchor-based method, we used a Global Rating of Change (GRoC) scale with seven levels, asking donors at the end of follow-up how they rated their general health as compared with 3 months ago: "much better" (1), "better" (2), "somewhat better" (3), "about the same" (4), "somewhat worse" (5), "worse" (6), or "much worse" (7). Given that donors are considered "relatively healthy before donation," it made sense to determine the MIDe, which measures the negative impact of kidney donation, and we assumed that a subgroup with a response of "somewhat worse" would represent a group with a small but meaningful decrease in the HSU score after donation. The MIDe of the HSU was the mean change score from baseline to follow-up for donors who rated their health "somewhat worse" [8,17]. For the distribution-based method, the MIDe was defined as 1 standard error of measurement (SEM) [18], estimated in the entire sample as follows:

$$\mathrm{SEM} = \sigma_x \times \sqrt{1 - \mathrm{ICC}_{(t1,t2)}},$$

where σ_x is the SD of the instrument at baseline and $\mathrm{ICC}_{t1,t2}$ is the intraclass correlation coefficient (ICC) between the HSU scores measured before donation (t1) and 3 months after donation (t2). To interpret the MIDe in the context of living kidney donors, data are presented as negative values. Only donors with a negative change equal or greater than the MIDe were considered to have a clinically relevant decrease in the HSU score.

Response Shift

Changes in internal standards may hamper the interpretation of within-individual changes over time. The most commonly used