

## ORIGINAL ARTICLE

# A German survey of the abdominal transplantation surgical work force

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## Conflicts of interest

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## Introduction

Transplant surgery has undergone significant changes over the last two decades and advanced from a more experimental field of surgical pioneers to a well-established subspecialty of surgery [1,2]. Some countries, including the United States (US), Canada, and the United Kingdom, have assisted in this development with the establishment of structured training programs and the formal specialization of transplant surgeons [3,4]. In these countries, transplant surgery has progressed to

## Summary

This manuscript reports the results of a nationwide survey of transplant surgeons in Germany, including the demographics, training, position, individual case loads, center volumes, program structure, professional practice, grade of specialization, workload, work hours, salary, and career expectations. We contacted all 32 German transplant centers that perform liver, kidney, and pancreas transplantation. Surgeons engaged in transplantation were asked to reply to the survey. Eighty-five surgeons responded, with a mean age of  $44 \pm 8$  years, 13% of whom were female. The median transplant frequency per active transplant surgeon was relatively low, with 16 liver transplants, 15 kidney transplants, and three pancreas transplants. The median reported center volumes were 45 liver transplants, 90 kidney transplants, and five pancreas transplants per year. Most of the surgeons reported a primary focus on hepatopancreato-biliary surgery, and only 10% of effective work time was actually dedicated to perform transplant surgeries. The majority of respondents estimated their weekly work hours to be between 55 and 66 h. When asked about their career satisfaction and expectations, most respondents characterized their salaries as inappropriately low and their career prospects as inadequate. This survey provides a first impression of the transplant surgery work force in Germany.

an independent full-time career option. In Germany, in contrast, transplant surgery continues to be a less recognized specialty of general and visceral surgery. Consequently, there is a lower grade of specialization and a higher turnover of transplant specialists, and the field lacks an attractive end-position [5]. For transplant surgery to secure its future and quality in Germany, there must be an appropriately motivational career path progression to attract young surgeons [6].

To guide the development of transplant surgery in Germany, the Transplant Working Group (Chirurgische

Arbeitsgemeinschaft Transplantation (CAT) der Deutschen Gesellschaft für Allgemein- und Viszeralchirurgie) of the German Society of General and Visceral Surgeons has decided to gather relevant work force data on German “transplant” surgeons.

## Methods

A 19-item survey consisting of topics that are considered important for German abdominal transplant surgeons was drafted and reviewed by the steering committee of the CAT. The survey encompassed demographics, training, position, individual caseloads, center volumes, program structure, professional practice, grade of specialization, workload, work hours, salary, and career expectations of transplant surgeons in Germany. The complete survey in German, and translated into English, can be found in the Supporting information. The online survey tool *Survey-monkey*® was used to conduct the survey. The responses were collected anonymously.

As transplant surgery in Germany is not organized as a separate surgical society, there is no defined registry to identify active transplant surgeons. Transplant surgeons can only be identified through the individual transplant centers. In January 2014, we contacted all 32 active German transplant centers via their surgical chairmen and the official heads of the transplant programs as stated on each center’s homepage. In a cover letter that explained the purpose of the study, we requested the distribution of the Web-based questionnaire to all active transplant surgeons and encouraged their participation in the survey. Together with the cover letter, we e-mailed the link for the Web-based survey with a request to forward the link to any relevant surgeons. A subsequent reminder was e-mailed to all centers 3 weeks later.

Data were analyzed using descriptive statistics with GraphPad Prism for Mac. Because some survey respondents did not answer all survey questions, the tables and figures that depict the survey data specify the number of respondents to the particular survey question relative to the number of survey participants.

## Results

### Demographics

Overall, 85 surgeons from 14 (of 16) federal states responded. The demographics and the position of the individual surgeons within the hospital hierarchy are detailed in Table 1. Given that the hierarchy and hospital ranks differ among health systems, we converted German positions to the most equivalent US ranks. (e.g., Surgical Director/Chairmen = Chefarzt/Ordinarius, Head of Transplant Department = Sektionsleiter Transplantation/Oberarzt in Leitungsfunktion; Attending

**Table 1.** Demographics and distribution of transplant surgeons within the hospital hierarchy.

|                           | <i>n</i> = | Male     | Female   |
|---------------------------|------------|----------|----------|
| All respondents           | 85         | 75 (88%) | 10 (12%) |
| Department chairs         | 12 (14%)   | 11 (92%) | 1 (8%)   |
| Attending surgeons        | 51 (60%)   | 48 (92%) | 3 (8%)   |
| Fellows                   | 7 (8%)     | 5 (71%)  | 2 (29%)  |
| Residents                 | 15 (18%)   | 11 (73%) | 4 (27%)  |
| Age of all respondents    | 44 ± 8     | 44 ± 7   | 38 ± 2   |
| Age of department chairs  | 51 ± 1     | 50 ± 5   | 57       |
| Age of attending surgeons | 44 ± 1     | 44 ± 6   | 47 ± 5   |
| Age of fellows            | 38 ± 6     | 40 ± 6   | 34 ± 1   |
| Age of residents          | 32 ± 4     | 32 ± 4   | 31 ± 4   |

Surgeon = Oberarzt; Fellow = Facharzt, Resident = Assistenzarzt ohne Facharzt). The majority of respondents were attending surgeons with 20% of them being the heads of the transplant program; 88% of the respondents (*n* = 75) were male, and only 12% (*n* = 10) were female.

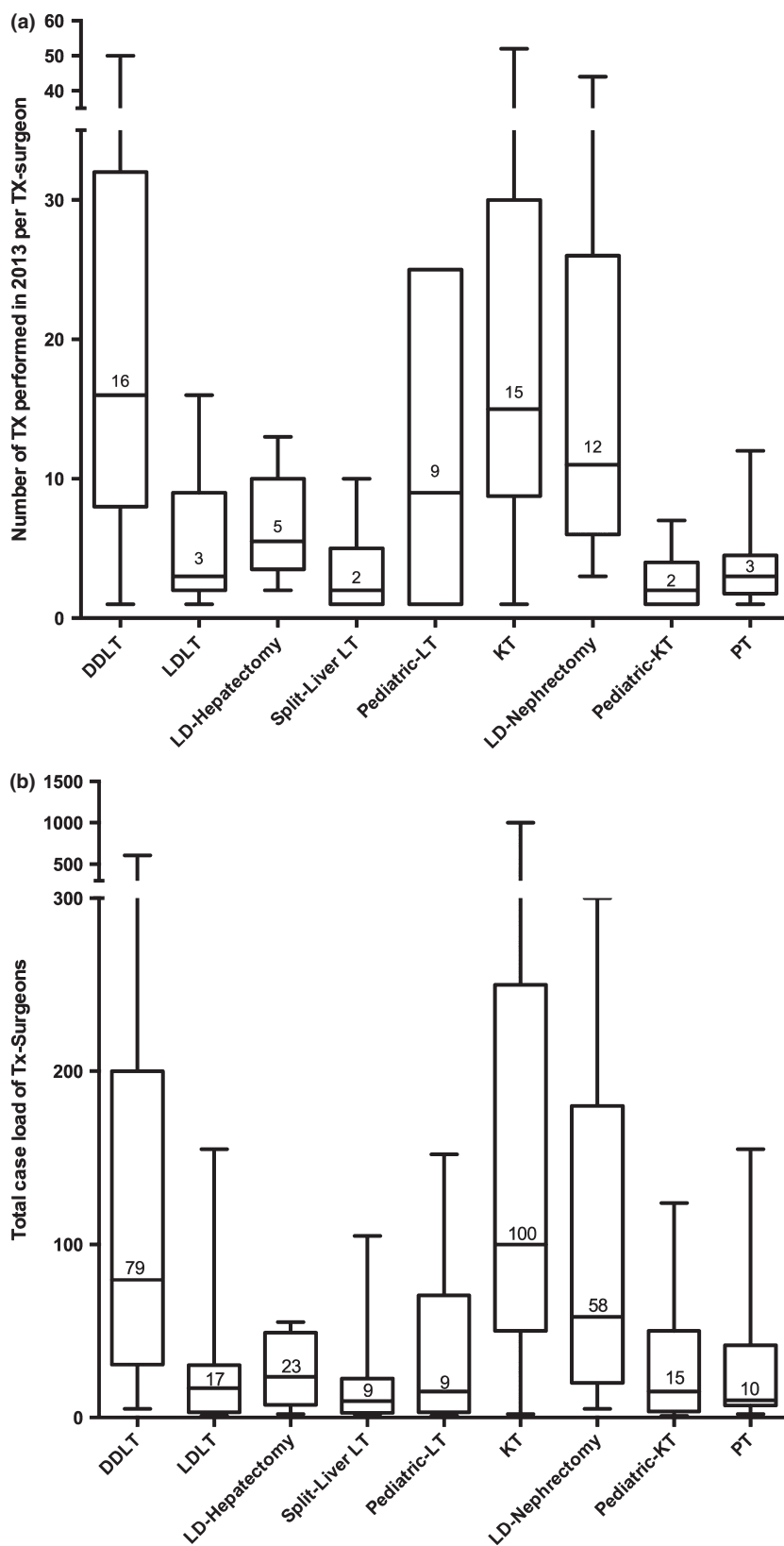
To emphasize the purpose of the survey, the participants who had not yet performed transplant procedures independently were excluded from further analyses. As expected, these respondents only represented the 15 residents who responded to the survey.

### Training

Participants were asked to describe their surgical specialization, and multiple qualifications were allowed. The majority of respondents were specialized general (*n* = 37/70; 53%) and visceral surgeons (*n* = 51/70, 73%). Only 17% (*n* = 12/70) completed an accredited transplant fellowship of the American Society of Transplant Surgeons (ASTS) (*n* = 3) or had a diploma from the European Board of Transplant Surgery (EBS) (*n* = 10), a section of the European Union of Medical Specialists (UEMS), which is awarded on the basis of transplant procedures performed and documented in a surgical log book and after passing only a theoretical examination.

### Professional practice

Survey participants were asked to state their individual caseload for 2013 (Fig. 1a) and their entire professional life (Fig. 1b). For the analysis, only surgeons who actually performed a particular procedure were included (*n* = 42/70). The median number of liver transplants performed in 2013 is shown in Fig. 1a. The annual average number of transplants performed per surgeon was relatively low, with a median of 16 liver transplants, 15 kidney transplants, and three pancreas transplants. The number of living donor and pediatric transplants was even lower. To date, only seven transplant centers have an active pediatric liver



**Figure 1** (a) Reported individual transplant procedures in 2013 per surgeon. (b) Reported total individual surgeon caseloads.

transplant program in Germany. Additionally, the median total surgeon caseload was only 79 liver transplant cases, 100 kidney transplant cases, and 10 pancreas transplant cases during their entire professional career (Fig. 1b).

**Center volumes**

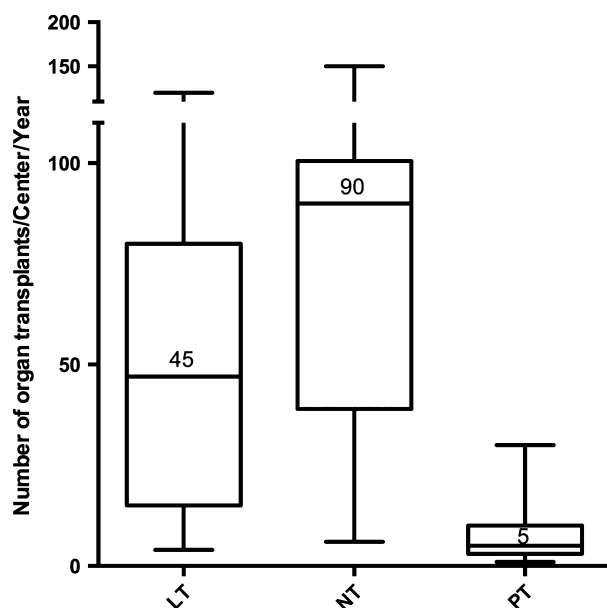
Participants were asked to report their center volumes of liver, kidney, and pancreas transplantation in 2013 (respondents  $n = 42/70$ ). The reported median volumes were 45 liver transplants, 90 kidney transplants, and five pancreas transplants (Fig. 2).

**Center work force**

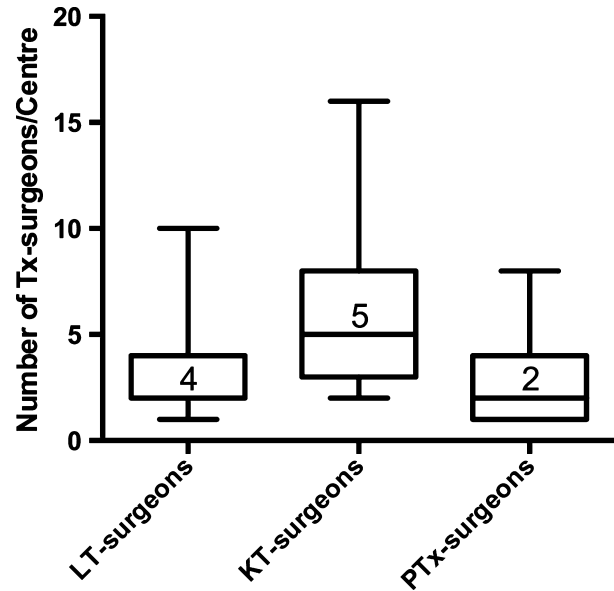
Participants were asked about the number of surgeons who were available for each transplant program (respondents  $n = 42/70$ ). The median number of transplant surgeons in liver transplant programs was four, in kidney transplant programs was five, and in pancreas transplant programs was two. There was a wide variation within the reported work force. Four respondents reported having only one liver transplant surgeon running the program, and 10 respondents reported having only one available pancreas transplant surgeon (Fig. 3).

**Professional practice**

Participants were asked to rank their professional practice. Most surgeons considered themselves as hepatobiliary sur-



**Figure 2** Reported center volumes for liver-, kidney-, and pancreas transplant programs in 2013.



**Figure 3** Available transplant surgeons per center for liver-, kidney-, and pancreas transplant programs in 2013.

geons ( $n = 20/45$ , 44%); transplant surgery was ranked second ( $n = 11/45$ , 25%). Generally, the surgeons stated a wide range of subspecialties other than transplant surgery (e.g., general surgery, upper-GI-surgery pancreatic surgery, and colorectal surgery).

**Operation time dedicated to transplant surgeries**

Participants were asked to state how much time of their operative practice was dedicated to transplant surgery (respondents  $n = 45/70$ ). The responses showed that actual transplant surgery was not in the primary focus of academic “transplant” surgeons. The median time spend on transplant cases was rated by the surgical chairmen, attending surgeons and residents to be only 10%. Only the head of transplant departments dedicated a higher percentage (25%) of time to transplant surgery.

**Work hours and salary**

Half of respondents ( $n = 22/44$ ; 50%) estimated their work hours to be between 55 and 66 h per week, and twenty-two respondents (50%) estimated their workload to be over 66 h per week.

A further burden was the substantial numbers of on-call days. More than half of the surgeons ( $n = 27/45$ , 60%) reported more than 15 on-call days per month (Fig. 4).

Participants were asked to state their total annual salary including additional hours beyond the 48 h/week limit and overtime benefits. A significant number of respondents skipped this question ( $n = 13/44$ , 30%) (Fig. 5).

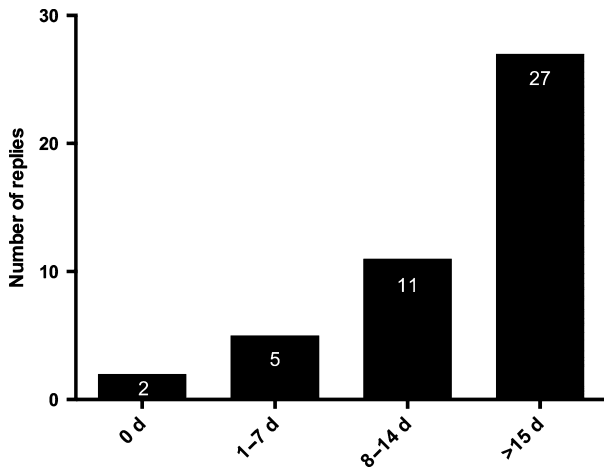


Figure 4 Monthly days of on-call service.

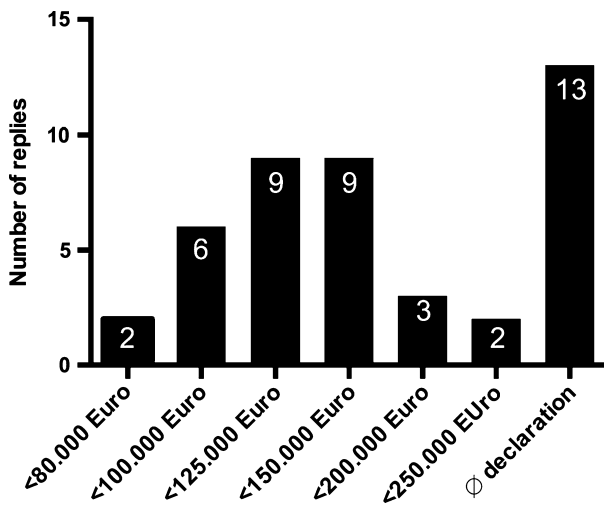


Figure 5 Indicated total annual salary of the respondents.

Of all respondents, 71% ( $n = 32/45$ ) considered their salaries to be inappropriately low. In particular, attending surgeons were dissatisfied with their income (16/21, 76%) (Fig. 6).

**Career expectations**

Half of the respondents ( $n = 22/43$ , 51%) assumed that they would leave transplant surgery within the next 10 years (Fig. 7). Most surgeons aspire to attain a position as chairman of a department (head of surgery) at an academic hospital with a connected transplant program ( $n = 16/41$ , 39%). Alternatively, surgeons would like to work in a collegial system following the North American model ( $n = 12/41$ , 29%). The preferred “escape” strategy was becoming the director of surgery (Chefarzt) at a nonacademic, nontransplant hospital ( $n = 7/41$ , 17%).

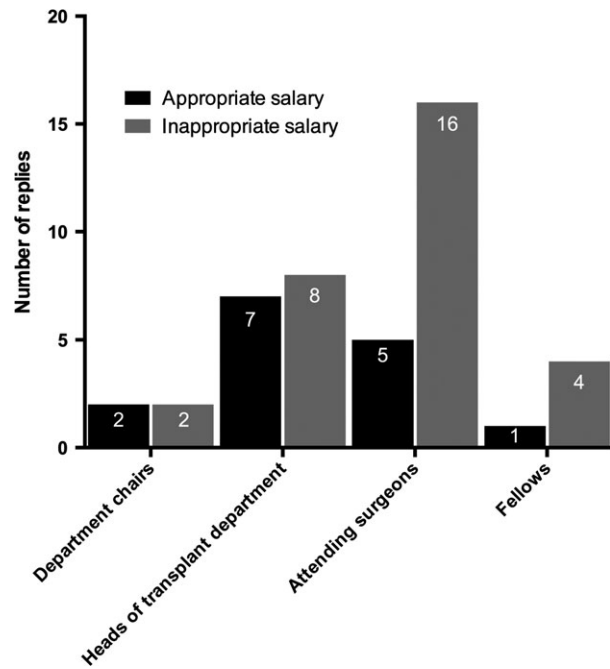


Figure 6 Salary satisfaction of the respondents.

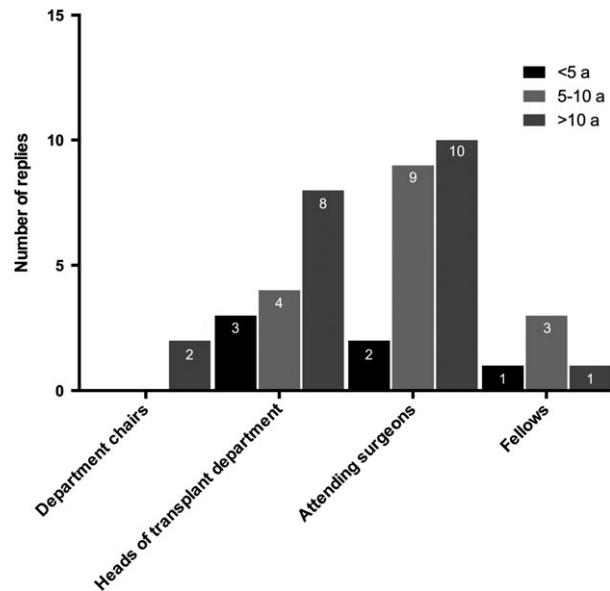


Figure 7 Estimated future time in transplant surgery.

Finally, the participants were asked whether they would recommend transplant surgery to a young surgeon. Only 62% ( $n = 26/42$ ) of transplant surgeons would actually recommend a transplant surgery career, and 38% ( $n = 16/42$ ) would not.

In the free text section of the survey, the following aspects were most frequently stated as barriers to transplant surgery: “limited career options,” “inadequate salary,” “poor

work/life balance,” “inadequate professional structure,” “unstructured training,” and the “fear of medicolegal risks.”

In contrast, the stated recommendations for pursuing a career as a transplant surgeon were as follows: “early surgical training on complex operations,” “maximal knowledge of the anatomy,” “knowledge of immunology and intensive-care treatment,” and “multidisciplinary.”

## Discussion

Transplantation is no longer a pioneering undertaking and is firmly established in the treatment of end-stage organ failure [2]. Due to the complexity of the field and the need for an interdisciplinary approach, transplant surgery departments or services are primarily located in academic centers, and in most countries, transplant surgery has evolved to an independent subspecialty. In Germany, transplant surgery is considered a less recognized specialty of general and visceral surgery, and it is deemed to be a good training ground for major surgery. Data regarding the actual work force of dedicated transplant surgeons are scarce. This survey is the first to collect relevant work force data (on demographics, training, position, individual case loads, center volumes, program structure, professional practice, grade of specialization, workload, work hours, salary, and career expectations) of German transplant surgeons.

The results of the survey suggest a reasonable picture of the current German transplant work force. However, limitations of the survey must be considered, such as the representativeness, response rate, anonymity, and skipped answers.

There were 85 responses from 32 transplant centers from a total of 40 in Germany. Based on our estimates, we consider this to be a fairly good response rate. However, the exact response rate is unknown as the denominator – number of transplant surgeons in Germany – is unknown. Furthermore, due to the anonymous nature of the questionnaire, we cannot directly link the responses to a particular transplant center. This, in turn, does not allow definitive conclusions regarding the completeness of the data. Skipped individual questions may also skew the data analysis. Finally, although the demographics suggest a reasonable representation of all hierarchical positions, we cannot rule out that the results may be skewed by nonrespondent bias.

Different positions in the hospital hierarchy participated in the survey. The most striking difference in the demographics of the survey was the low percentage (13%) of female transplant surgeons. This inequity of males and females in transplant surgery is a known phenomenon and is consistent with other studies examining workforce data in surgery [7–10]. Although women comprise more than

50% of medical school graduates [11], their percentage in transplant surgery continues to be underrepresented – including the younger age groups as well. The poor work-life balance typically associated with the job of a transplant surgeon, and the lack of female role models may be reasons to explain these differences [12–14].

Most respondents are general and visceral surgeons and have typically been trained in transplant surgery in traditional, unstructured, mentor–protégé arrangements. Only a minority of surgeons have undergone formal transplant surgery training in ASTS-accredited fellowship programs ( $n = 3$ ) or have passed the European Board of Surgery Transplant Surgery examinations ( $n = 10$ ), which requests only self-written reporting on surgical activities. Currently, there is no specialty training for transplant surgery in Germany. However, there are efforts to establish a specialization in “transplantation medicine” which is accessible from surgery and other professions related to transplantation medicine.

Although there are a few high-volume transplant centers in Germany, the median volume of all transplant centers is relatively low. Most transplant programs are too small to provide an adequate caseload for a surgeon, and some very small programs may even have difficulties with effectively training new transplant surgeons – especially in pancreas transplantation. Considering the low caseload and the potential negative effects on post-transplant outcomes, surgical expertise should be emphasized [15–19].

The annual caseload of most transplant surgeons is low. Of those surgeons who perform transplant surgeries regularly, the median number of transplants performed in 2013 was 13 liver transplants, 15 kidney transplants, and three pancreas transplants. In regard to even more specialized procedures, such as living donor liver transplantation or pediatric transplantation, these numbers decrease even further. Consequently, the total caseload of surgeons is relatively low, and some surgeons may not ever reach the end of their learning curve [5,18]. As the individual caseload was shown to correlate with outcomes after transplantation [20–22], the above-mentioned fact may also impact patient safety.

One reason for the diversity of transplant programs is the lack of specialization. In the self-evaluation, most surgeons who perform transplant procedures do not consider themselves to be primarily transplant surgeons, but as general and/or visceral surgeons. This is also reflected by the number of procedures they perform in transplantation and in other surgical fields. Most of the surgeons involved in transplantation, including chairmen of transplant institutions, claim that transplantation only accounts for 10% of their clinical practice. Even staff surgeons with leading positions in transplant programs state that their involvement is only 25%, as a median.

The reported work hours of almost all transplant surgeons far exceed the regular European working hours. The majority of transplant surgeons report weekly work hours of 55 and above; 50% report values above 66 h per week. In addition, the number of on-call days was substantial. More than half of the respondents claimed to have on-call service 1 of 2 days. The reported weekly work hours and the on-call time closely match the recently reported work times of transplant surgeons in the United States [8]. Transplant surgeons also report more work hours compared with nonsurgeons [23,24]. The number of on-call days seems to be a particular burden for transplant surgeons.

Finally, the job satisfaction was questioned. In Germany, the disclosure of individual salaries is not common, and therefore, we were not surprised that a significant number of respondents declined to answer – especially respondents holding more senior ranks. Therefore, the results in this section could be skewed by a nonresponder bias. Nevertheless, it becomes clear that the salaries of a typical staff surgeon in transplantation, including compensation for additional work time, ranges between 80 and 150 000 €. This is far less than the income of chairmen in nonacademic, nontransplant hospitals in Germany and is also less than their peers in North America and some parts of Europe. In North America, liver transplant surgeons usually belong to the top income group within the medical profession. Consequently, 71% of the respondents claimed that their salary is inadequately low.

Most of the surveyed surgeons consider their current position as transient. Most aspire to the position of a department chair in an academic hospital with a link to a transplant program. Of note, there are 24 such positions in Germany. Alternatively, the surgeons would prefer to work in a collegial system, following the North American model – which currently remains nonexistent in Germany. Currently, most of the surgeons would prefer to leave transplantation and become chairman of a nonacademic nontransplant hospital if they were unable to achieve one of the above-mentioned career options.

It alarms that only 62% of the transplant surgeons would encourage young surgeons to seek a transplant surgery career. The surgeons in “sandwich positions,” typically leading the transplant program in a consultant position, are particularly disillusioned. In the free text section of the survey, commonly reported problems were the unclear career options and the fear that surgeons who show themselves as “maverick” transplant surgeons would lower their market value for nontransplant positions. Female gender, poor work–life balance, and inadequate salary expectations were also stated as discouraging for a transplant career. Lastly, fueled by recent legal cases against transplant surgeons, there

is an increasing fear of medicolegal prosecution. On the other hand, respondents repeatedly noted the fascination with transplant surgery that is based on the complexity of the operative procedures, the interdisciplinary approaches, and the treatment of critically ill patients.

In summary, this survey draws a mixed picture of the current workforce situation in transplant surgery. Within the next 10 years, half of the current work force will leave transplant surgery and will need to be replaced. Transplant surgery in Germany has to address the challenges of the significantly different lifestyle and career expectations of young female and male surgeons so that both can be retained. The ability to meet these requirements is becoming an obstacle to attracting the best surgeons to the transplantation field. The current survey may provide some guidance regarding how to develop attractive transplant positions for future generations of transplant surgeons in a specific national setting.

### Authorship

MNT and MG: designed the survey, collected and analyzed the data and wrote the manuscript. SN, PS, AP, GMK, FB, TB and BN: designed the survey and corrected the manuscript.

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### Supporting Information

Additional Supporting Information may be found in the online version of this article:

**Appendix S1.** Survey questionnaire.

**Appendix S2.** Survey questionnaire.

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