

*Saunders, Katharina Maria*

*Essays on Health Economics*

**Dissertation**  
**for obtaining the degree of Doctor of Business and Economics**  
**(Doctor rerum politicarum - Dr. rer. pol.)**

**at WHU – Otto Beisheim School of Management**

*23.04.2019*

**First Advisor:** *Prof. Dr. Christian Hagist*

**Second Advisor:** *Prof. Dr. Alistair McGuire*

## **Acknowledgement**

I am grateful for all the people who accompanied me throughout my academic journey.

Special thanks go out to my supervisor Prof. Dr. Christian Hagist and Prof. Dr. Alistair McGuire for sharing their knowledge, their outstanding support and for inspiring me to get the best out of myself.

I would like to thank Prof. Dr. Christian Schlereth for his permanent support, for sharing his knowledge with me and his assistance through my discrete choice adventure.

This dissertation would not have been possible without the respondents of my surveys. I am very grateful for each participant in my studies and for all the people who supported my ideas and assisted me to get access to the target group. Thank you for promoting academic research.

I also would like to thank Priv. Doz. Dr. med. Erwin Kollig for his constant support and his valuable insights throughout my whole professional and academic career.

I am thankful for my family who supports me ever since and ever will.

Finally yet importantly, I am beyond grateful for my husband Daniel who always believes in me, even if I don't. I could not have done this without you.

To Daniel

# List of content

<b>List of tables</b> .....	I
<b>List of figures</b> .....	I
<b>Foreword</b> .....	II
<i>Paper I</i> .....	III
<i>Paper II</i> .....	III
<i>Paper III</i> .....	V
<b>A systematic review of the literature on a nurse’s intention to leave the profession</b> .....	1
<b>1. Introduction</b> .....	1
<b>2. Method</b> .....	2
2.1 <i>Search method and outcome</i> .....	2
2.2 <i>Data abstraction and synthesis</i> .....	3
<b>3. Review results</b> .....	3
<b>4. Key themes</b> .....	8
4.1 <i>Defining Job satisfaction</i> .....	8
4.2 <i>Occupational stress, mental stress and burnout</i> .....	9
4.3 <i>Work environment</i> .....	11
<b>5. Discussion</b> .....	12
<b>Nursing without caring. A discrete choice experiment with surgical technologist trainees in Germany</b> .....	16
<b>1. Introduction</b> .....	16
<b>2. Methods</b> .....	19
2.1 <i>Overview of the study</i> .....	19
2.2 <i>Selection of attributes and levels</i> .....	19
2.3 <i>Experimental design</i> .....	21
2.4 <i>Analysis</i> .....	21
<b>3. Results</b> .....	23
3.1 <i>Respondent characteristics</i> .....	23
3.2 <i>DCE results - Parameter estimates and importance weights</i> .....	24
3.3 <i>Monetary assessment of less favourable profession characteristics</i> .....	27
<b>4. Discussion</b> .....	28
<b>Preferences of a new health care profession. A pilot study with anaesthesia technologist trainees in Germany</b> .....	33
<b>1. Introduction</b> .....	33
<b>2. Method</b> .....	35
2.1 <i>Discrete choice experiments</i> .....	35
2.2 <i>Experimental study</i> .....	35
2.3 <i>Analysis</i> .....	37
<b>3. Results</b> .....	38
3.1 <i>Respondent characteristics</i> .....	38
3.2 <i>DCE results - Parameters and importance weights</i> .....	39
<b>4. Discussion</b> .....	45
<b>Summary</b> .....	48
<b>Appendix</b> .....	58

## List of tables

Table 1: Study characteristics .....	4
Table 2: Study aims and findings .....	5
Table 3: Summary of employed attributes and levels .....	20
Table 4: Illustration of a choice set .....	21
Table 5: Respondent characteristics .....	23
Table 6: Results HB estimation.....	25
Table 7: Compensation rates .....	28
Table 8: Respondents characteristics .....	38
Table 9: HB estimation .....	40
Table 10: HB estimation gender.....	41
Table 11: HB estimation trainings year.....	42
Table 12: HB estimation work experience .....	43
Table 13: Compensation rates .....	44
Table 14: Results HB estimation female/male .....	58
Table 15: Results HB estimation age .....	59
Table 16: Results HB estimation training year .....	60
Table 17: Results HB estimation work experience .....	61
Table 18: Results HB estimation hospital provider .....	62
Table 19: Selected research on nurse’s labour supply .....	63

## List of figures

Figure 1: Review process; source: own depiction.....	2
Figure 2: Relationship between the major drivers of the intention to leave .....	13

## Foreword

*“Nursing is an art: and if it is to be made an art, it requires an exclusive devotion as hard a preparation as any painter’s or sculptor’s work; for what is the having to do with dead canvas or dead marble, compared with having to do with the living body, the temple of God’s spirit? It is one of the Fine Arts: I had almost said, the finest of Fine Arts.”*

Florence Nightingale (1871) in *Una and the lion*, p.6

Florence Nightingale introduced nursing as an own profession in the 19<sup>th</sup> century and being a nurse and being a physician have been the classic health care professions ever since. Even though, the nursing education advanced over the decades, less people are attracted to do this job. Stressful working conditions, inflexible working schedules as well as poor wages contribute to the unattractiveness of a nursing career. Even fully trained and experienced nurses leave their profession due to a lack of job satisfaction or due to overblown psychological and physiological demands (Buchan and Dovlo 2004; Buchan and Aiken 2008; Heinen et al. 2013; Dall’Ora et al. 2015). Additionally, the poor image of becoming a nurse from a public perspective contributes to the decreasing numbers of nurses as it is seen as a recruitment hurdle (Morris-Thompson et al. 2011). Since today, various clichés of a nurse are still existent: the unskilled handmaiden of the doctors or the sexualised naughty nurse for instance. The influence of the media contributes to forming this image in a public eye (Ó Lúanaigh 2017). Several TV series interfere the picture of a sexy nurse working in a hospital to find a well-situated doctor to wed. In addition, even music songs are dedicated to nurses, which disqualify them to pure sexual objects. In the real world, nursing is all but sexy. The tasks of a nurse are complex. Alongside the daily routine of caring duties such as feeding and bathing the patient, being an assistant to the doctor, dealing with administrative tasks as well as giving comfort to the patient and relatives, a nurse need to care independently for their patients. Hence, the responsibility to realise if a patient needs an urgent treatment or if to call the doctor can increase the psychological pressure of a nurse. Even though, nursing stands for a high responsible job, the self-esteem and self-perspective of nurses are low (Fletcher 2007). This poor self-image may also be derived from feeling less valued from other health care groups within the hospital, even from their own peers as well as feeling less accepted from a public point of view. Thus, two major issues arises: fully trained nurses who leave the profession due to dissatisfaction with the working conditions and a lack of people willing to join the nursing profession in the first place. This circumstances result in a shortage of skilled labour force in health care, especially nurses. The demographic change impairs this situation. Due to medical innovations, the life expectancy rises constantly, whereby the birth rates, especially in developed countries, decrease. Hence, less young people need to care for more elderly people. Besides, the current workforce is characterised by an aging workforce. Retirement of currently working nurses needs to be taken into account as well.

To cope with the labour supply issues, hospitals in Germany introduced several new professions to substitute current professions and to release professional’s time. Previous research identified the job preferences of nurses and the importance of appropriate working conditions as a solely

wage increase cannot increase the labour supply (Di Tommaso et al. 2009; Kankaanranta and Rissanen 2009). However, the preferences of the new profession groups are not considered to a greater degree until today. Nevertheless, to provide successful recruitment and retention strategies as well as to prevent premature leaving it is necessary to understand fully the choice behaviour of such profession groups.

This dissertation therefore investigates the choice behaviour of two new profession groups within the German health care system. The dissertation contains of three paper:

### *Paper I*

#### *A systematic review of the literature on a nurse's intention to leave the profession*

The first paper deals with the nurse's intention to leave the current position and/ or the nursing profession altogether. The motivation of the paper was to get a deeper understanding of a nurse's choice behaviour and to understand the main reason to leave the current job in the first place and eventually leave the profession. We applied a systematic literature search to identify relevant studies. The outcome of this literature review helped us as to build a theoretical framework for our empirical research part.

In this literature review, we were able to identify three main themes: job satisfaction, occupational stress / mental stress and burnout as well as work environment. We discussed these main themes in depth to identify the corresponding variables. We found that job satisfaction is linked to several variables such as working hours, stress and management support. Furthermore, job dissatisfaction is associated with a higher intention to leave. Besides, stress and burnout can be derived from extensive working hours and inflexibility with the working schedule. Burnout is stated to be a major reason for nurses to quit and leave the profession. Furthermore, an appropriate work environment, mainly based on the social work environment, supports nurses to stay within the job.

We identified the relationship between all three main themes as job satisfaction is related to less stress and a good work environment can provide a less stressful working atmosphere. We also found a lack of consensus between the definitions of the three main themes, which is recommended for further research as a common understanding of the wording is necessary in order to provide appropriate management strategies.

### *Paper II*

#### *Nursing without caring. A discrete choice experiment with surgical technologist trainees in Germany*

The profession of surgical technologist exists since approximately twenty years in Germany. The aim of a surgical technologist is to replace the operating room nurse. This occupation has been developed by the hospitals in order to cope with the nurse's shortage, especially in specialised units such as the operating room. The tasks of an operating room nurse and a surgical technologist are identical. The training of both profession groups lasts three years and contains practical parts within the hospital and a theoretical education. A difference lays in the education itself. A nurse learns caring and nursing activities and is versatile on the job site. The training

of a surgical technologist is highly specialised to operating room tasks only. Thus, the place of action is limited to the operating room and occasionally to the emergency room and endoscopy unit. However, the main difference is the missing official certification of the profession of surgical technologists. This lack of certification is linked to several disadvantages. The hospitals need to pay fully for the training, whereby a nursing education is reimbursed through the sickness funds. The disadvantages for an individual are even worse. Further education such as university studies or being an officially certified supervisor for other trainees is nearly impossible as the entry barriers require an officially certified training. Besides, in case of unemployment for any reasons, the individual will be treated as an unskilled worker, which can negatively influence the social payment.

The motivation behind this paper and the empirical primary research was to identify the motivation of individuals to choose a non-certified profession as well as to estimate the importance of an officially certified profession to the respondents. It is worth noting, that the nursing profession offers an alternative career path with any disadvantages.

Our study used a discrete choice experiment (DCE) to measure the job preferences of surgical technologist trainees in Germany. We decided to survey trainees, as the decision process is still recent as well as to avoid potential biases due to extended work experiences. The DCE study covers 80% of the target population (n= 1064) and is thus representative without any selection bias. We analysed our multi nominal logit model with the hierarchical Bayesian estimation.

Even though, earnings was the most important attribute, work content plays a major role. Positions, which include caring activities, caused a massive loss in utility. We calculated a compensation rate, an additional price to be paid monthly to accept a position with caring activities, of 1145€ gross. This is an increase of over 46% and does not reflect the real world of an annual wage increase of 2%. The results show a vigorous disfavour towards any perceived nursing job characteristics such as caring activities, hierarchical work environment or shift types. Interestingly, an official certification is valued fewest of all. This may derived from the excellent labour market situation from the supply side.

We understand that our study is the first DCE study to cope with the preferences of specialised health care worker as well as the first DCE on job preferences in health care. Besides, we are first in collecting data of surgical technologist in Germany.

The results could inform policy makers about the importance to focus not only on the nursing profession but also to take into account the existence of a group of people who are willing to work within the health care system, however, associated with strong preferences against nursing activities, especially caring. In addition, those people accept rather a job without official certification than taking advantage of an official certified nursing degree. Thus, implementing new and specialised profession through reallocating former nursing tasks should be considered while coping with labour shortage.



### *Paper III*

#### *Preferences of a new health care profession. A pilot study with anaesthesia technologist trainees in Germany*

The profession of anaesthesia technologist is a relatively new profession in Germany. The German hospital Association published the first training guideline in 2011. Likewise the surgical technologist profession, the profession of anaesthesia technologists are not officially certified. Hence, similar disadvantages such as further career restrictions and uncertainties in case of unemployment exist. Even the hospitals need to cover the full training expenses. The training of an anaesthesia technologist lasts three years, containing of practical work experience within the anaesthesia units such as the post-anaesthesia caring unit and a theoretical education. The action site is limited to the anaesthesia units only. An anaesthesia technologist is an assistant to the doctor and takes care of the patient before, during and after the anaesthesia. Since the anaesthesia technologist profession is a very young profession group, little is known about the preferences of this group. However, hospital manager need to understand the individual preferences to be able to provide a target group tailored recruitment.

The motivation was to provide results to inform the human resource management of hospitals about the preferences of the very young profession group of anaesthesia technologist with respect to contribute to a successful development of this profession in order to cope with the current labour shortage crisis.

This pilot discrete choice study of the preferences of anaesthesia technologist was incorporated within a DCE on job preferences of surgical technologist trainees. Hence, we surveyed two different target groups, Surgical Technologist trainees and anaesthesia technologist trainees, but provided a similar questionnaire. The reason behind this approach is at the basis of the huge heterogeneity nature of both groups. To avoid any biases and to provide qualitative results we decided to treat both groups independently though using the same method.

We covered approximately 23% of the anaesthesia trainee population. However, our study is supposed to be a pilot, since the profession is very young and only 250 training places are available. Even though, we are aware of the small number, the results demonstrated a clear trend. We found the attribute earnings as the most important attribute to the respondents. However, from a great importance is also a good and friendly work environment. This is quite different to the results of the surgical technologists who gained more utility out of positions without caring activities. We calculated a hypothetical compensation rate of 649.90€gross per month in order to accept a rather formal and impersonal work environment. We found some differences in the preference structure within the subgroup analyses, especially if the respondents had prior work experience.

The results inform especially human resource manager about the preferences of a very young profession group in order to develop appropriate recruitment strategies and to enhance the development of this young profession.

# **A systematic review of the literature on a nurse's intention to leave the profession<sup>1</sup>**

## **1. Introduction**

The effect of the demographic change expressed in a higher life expectancy combined with low fertility rates, especially in developed countries, let the society face major challenges. As people get older, the need of care rises constantly and contributes to the exacerbation on the health care labour market. Already today, most OECD countries suffer from a shortage of health care worker, especially nurses. For instance, the nursing profession in Germany is officially classified as profession with serious shortage issues; 13 out of 16 federal states experience a shortage of skilled labour forces in nursing and the remaining three federal states show first signs of a labour shortage issue (Federal Employment Agency 2018). A job advertisement stays approximately 149 days vacant, a plus of 39% compared to the average of all other professions (Federal Employment Agency 2018). Countries such as Canada will need up to 60,000 registered nurses by 2022 (Canadian Nurse Association 2018) whereby the UK faces a decrease of new registered (UK) nurses as well as a massive drop of EU nurses due to Brexit (Royal College of Nursing 2018).

However, not only the newly registered nurses are of great importance to the health care labour market. Buchan and Aiken (2008) stated, that the shortage of nurses may also be influenced by the unwillingness of trained nurses to work under current conditions. The intention to leave the organisation or even to leave the profession seems to be a key issue. In addition, a US 10-year panel study found 17.5% of newly graduated nurses leave their job within the first year (Kovner et al. 2014). However, leaving the job causes disadvantages for the hospital though leaving the profession causes disadvantages for the society (Heinen et al. 2013). Invested training costs as well as advanced knowledge and practice experiences vanish and need to be replaced. Even though, studies showed a relationship between poor staffing and patient outcomes. Aiken (2002) described a higher risk adjusted 30-days mortality rate as well as a higher failure-to-rescue rate for surgical patients in hospitals with a high patient-to-nurse ratio. Rafferty et al. (2007) found similar results with a 26% higher mortality rate in hospitals with a high patient-to-nurse ratio. Hence, nursing shortage is also problematic in terms of patient safety and outcomes. Back then, Florence Nightingale wrote “If a patient is cold, if a patient is feverish if a patient is faint, if he is sick after taking food, if he has a bed-sore, it is generally the fault not of the disease, but of the nursing.” (Florence Nightingale 1859, p.5/6).

To prevent premature turnover and to be able to set up successful retention strategies it is utmost important to understand the reasons behind leaving the job and/or the profession altogether. Many studies exist in order to explain the nurse's behaviour and decision-making to quit the job or leave the profession (Flinkman et al. 2010). It is already stated that a nurse first leaves

---

<sup>1</sup> Saunders K., Hagist C., McGuire A. (2018) A systematic review of the literature on a nurse's intention to leave the profession. Unpublished working paper.

the ward, secondly leaves the hospital and eventually leaves the profession (Krausz et al. 1995; Morell 2005; Flinkman et al. 2010). Hence, it is necessary to understand why a nurse tends to leave the workplace and why a nurse eventually quits the profession.

The aim of this paper is to identify the recent literature coping with the reasons of the intention to leave the job and/or the profession, to summarize these findings and get a better understanding of the nurses' perception.

## 2. Method

### 2.1 Search method and outcome

We searched the database PubMed by using the keywords nurse/nurses \*intention to leave, turn over, work environment, job satisfaction, retention\*. We ran an additional search with Google Scholar. We included original research papers from 2013-2018 and limited the language to only English written literature. We did not consider conference papers, reports or other grey literature.

359 potentially relevant items had been identified during the first search and after rejecting double matches. Next step included screening the results regarding relevant titles, e.g. contented the intention to leave, which have resulted in 184 abstracts for further assessment. 30 full article had been examined and finally 20 studies have been included in this review. All selected studies had been recently published and cope with the intention to leave the organisation and/or the nursing profession. The studies analyse the reason for a strong intention to leave the organisation and/or nursing. Some studies had tested the intention to leave in association with relevant factors such as burnout or work environment. All studies dealt with registered hospital nurses, whereby some studies examined the attitude of newly graduated nurses.

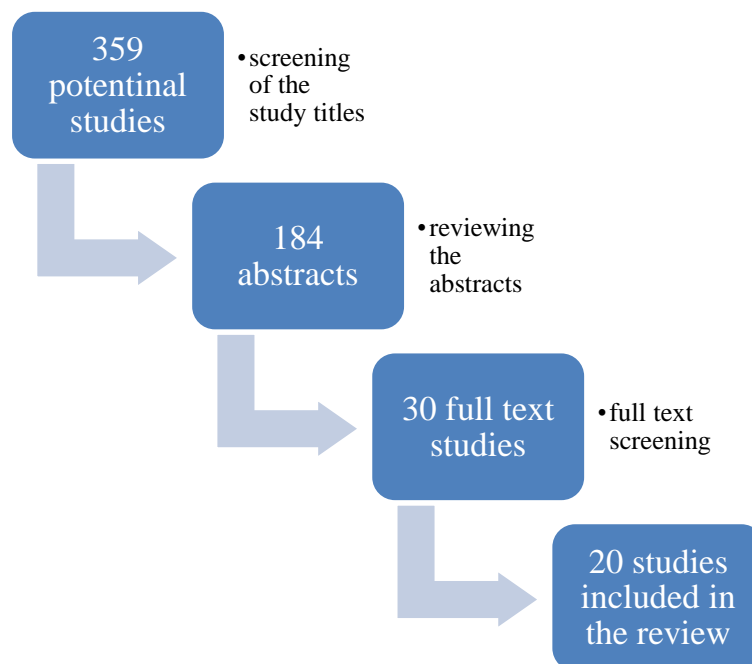


Figure 1: Review process; source: own depiction

## *2.2 Data abstraction and synthesis*

The studies had been examined aiming to identify the major themes relating to a nurses intention to leave the organisation and to leave the profession of hospital nurses. The extracted data were summarised and contain the following information: author's name and year; method, data source, data type, sample size and sample country. An additional table had been generated implicating the study aim as well as the key findings. Following key themes were identified through the study content analysis: (1) job satisfaction, (2) occupational stress, mental stress and burnout, and (3) work environment. For detailed information on the studies' characteristics, see Tables 1 and 2.

## **3. Review results**

Most studies were quite homogenous with regard to the study design and method. The majority of the papers applied quantitative cross-sectional studies (14); two longitudinal observational studies were identified as well as only one qualitative study. Four studies did not state the study design adequately. All studies, except one, used (secondary) data derived from quantitative surveys. One qualitative study applied an interview approach.

Five studies used a multi country approach and included data from up to 12 countries in their studies. Three of these studies used the same database from the RN4CAST, a European financed project to identify nurses leaving intention throughout Europe (RN4CAST 2018)<sup>2</sup>. One study was from Brazil, China and the USA (2), Finland (1), Turkey (1), Netherlands (1), Sweden (2), Australia (1), Japan (1), Taiwan (1), New Zealand (1) and Thailand (1).

All studies examined registered nurses working in hospitals. One study also included midwives. Three studies included newly graduated and young nurses. Respondents were mainly female; however, each study included males as well. The sample sizes vary between 15 nurses within the qualitative studies and up to 162,405 nurses for the quantitative studies. Two studies (Burmeister et al. 2018; Lindqvist et al. 2014) included sample sizes of different countries, which vary largely e.g. 118 respondents of Lebanon nurses versus 3,538 nurses from the US in one study (Burmeister et al. 2018). In statistical terms, these sample differences may bias the results.

All studies, except the qualitative interview based study, used different rating scale instruments to measure the intention to leave and the associated variables such as job satisfaction. The most common instrument was the Likert scale, with different amounts of items.

---

<sup>2</sup> RN4CAST is an EU financed project to estimate the leaving intention and retention of nurses as well as patient outcomes with respect to organisational features of hospitals. 12 EU countries and 500 acute care hospitals took part from 2009-2010.

Table 1: Study characteristics

Study	Method	Data source	Data type	Sample size	Sample country
Burmeister et al. (2017)	Quantitative	Database (MISSCARE)	Cross-sectional	5,845	Australia Iceland Italy South Korea Lebanon USA
Dall'Ora et al. (2015)	Quantitative	Database (RN4CAST)	Cross-sectional	31,627	Belgium England Finland Germany Greece Ireland Netherlands Norway Poland Spain Switzerland Sweden
de Oliveira et al. (2017)	Quantitative	Survey	Cross-sectional	3,229	Brazil
Flinkman M. and Salanterä S. (2015)	Qualitative	Interview	N/A	15	Finland
Han et al. (2015)	Quantitative	Database (Nurses work life and Health Study)	Cross-sectional	2,168	USA
Heinen et al. (2013)	Quantitative	Database (RN4CAST)	Multi-country, multicentre, cross-sectional	23,159	Belgium UK Finland Germany Ireland Netherlands Norway Poland Spain Switzerland
Homburg et al. (2013)	Quantitative	Survey	Cross-sectional	318	Netherlands
Ishihara et al. (2014)	Quantitative	Survey	N/A	148	Japan
Leinweber et al. (2016)	Quantitative	Database (RN4CAST)	Cross-sectional	23,076	Belgium England Finland Germany Ireland Netherlands Norway Poland Spain Switzerland
Lindqvist et. al (2014)	Quantitative	Database (RN4CAST)	N/A	15,900	Finland Sweden Norway
Lindqvist et. al (2015)	Quantitative	Database (RN4CAST)	N/A	11,015	Sweden
Lo et al. (2017)	Quantitative	Survey	Cross-sectional	162,405 (2011 & 2014)	Taiwan
Mazurenko et al. (2015)	Quantitative	Database (National Sample Survey of Registered Nurses)	Cross-sectional	8,796	USA
Moloney et al. (2017)	Quantitative	Survey	Cross-sectional	2,876	New Zealand

Nantsupawa A. et al. (2016)	Quantitative	Survey	Cross-sectional	1,351	Thailand
Perry et al. (2017)	Quantitative	Survey	Cross-sectional	4,592	Australia
Rudman et al. (2014)	Quantitative	Database (LANE)	longitudinal observational study	1,702	Sweden
Sabanciogullari S. and Dogan S. (2015)	Quantitative	Survey	Cross-sectional	2,122	Turkey
Yang et al. (2017)	Quantitative	Survey	Cross-sectional	785	China
Zang et al. (2017)	Quantitative	Survey	Longitudinal study	343	China

Table 2: Study aims and findings

Study	Aim	Findings	Intention to leave the position	Intention to leave nursing
Burmeister et al. (2017)	To identify factors associated with the intention to leave their positions and absenteeism.	Findings vary significantly between the countries, whereby the intention to leave within 12 months was highest in Lebanon; whereby the highest level of absenteeism was experienced by Australia and Iceland. These findings were associated with perceived staffing adequacy of units, job satisfaction and nurse's age (younger nurses tend to quite more likely).	Yes	N/A
Dall'Ora et al. (2015)	To examine a nurse's job satisfaction, burn out and intention to leave in association with long shifts of 12 hours.	Shifts of 12 hours + is associated with a higher burnout rate, job dissatisfaction, dissatisfaction with the working schedule flexibility and intention to leave. Besides, shifts of eight hours + also decreased the job satisfaction.	Yes	N/A
de Oliveira et al. (2017)	The authors defined the study outcome as thoughts of leaving the profession sometimes a month or more; the analysis was based on hierarchical logistic regression models (three blocks of determinants: sociodemographic data, occupational factors and health conditions).	22.1% stated to their intention to leave the profession. Factors associated with the intention to leave the profession are: highly demanding work, passive work, effort-reward imbalance, poor self-rated health, over commitment to the job, male sex, poor supervisor support, not holding a leadership position. However, the study concluded, the strongest intention to leave is associated with self-rated health combined with work environment factors generating psychological stress. From a socio demographic point of view, male nurses and younger nurses are less likely to stay in the profession.	N/A	Yes
Flinkman M. and Salanterä S. (2015)	To investigate why the participants already left the previous organisation and why they intended to leave the profession.	The results of this study centred around three themes; poor nursing practice work environments, lack of support, orientation and mentoring as well as nursing a second best career choice.	N/A	Yes

Han et al. (2015)	To enhance retention strategies, the study work-related factors associated with job satisfaction and intent to leave the current position should be observed.	The study demonstrated that dissatisfaction is significantly associated with higher psychological demand and poor autonomy as well as long working hours and a lack of supervisor and peer group support. Nurses who intent to leave the job experienced lower autonomy and less support from their peer group.	Yes	N/A
Heinen et al. (2013)	To determine the factors associated with intention to leave the profession due to job dissatisfaction of hospital nurses -> determine the characteristics of nurses and the work environment associated with the intention to leave the profession -> to describe possible differences across EU countries.	On average 9% of the nurses tend to leave the profession (lowest 5% in the Netherlands, distinct highest 17% in Germany). Burnout is a key factor for leaving the profession within and across European countries. Less clear and factors, which vary between the EU countries associated with the intention to leave are unsatisfactory nurse-physician relationship, leadership, participation in hospital affairs, older age, female gender and working full time.	N/A	Yes
Homburg et al. (2013)	To identify the determinants of the intention to leave the current position and/or the profession and to understand post-exit choices (e.g. switching positions in one hospital) This study aims to present recommendation to stakeholders to prevent premature leaving.	The intention to leave is influenced by the dissatisfaction over pay and benefits as well as management and leadership. Dissatisfaction in this case led nurses to change jobs within the hospital setting. However, with growing dissatisfaction with the management/leadership nurses tend to opt for extramural choices (e.g. Practitioners practice). Diminished job satisfaction and too much work-to-home interference.	Yes	Yes
Ishihara et al. (2014)	To examine the intention to leave associated with organisational factors and work environments of newly graduated nurses.	8.1% of the respondents indicated a highly to extreme highly intention to leave the profession. Significant factors for the intention to leave were nursing work index total, social support, work barriers, commitment to workplace, job satisfaction and burnout.	Yes	Yes
Leinweber et al. (2016)	To investigate the relationship of the nurse's practice environment, the satisfaction with schedule flexibility and the intention to leave.	The results showed that the intention to leave is linked to dissatisfaction with the practice environment and schedule flexibility. The nurse's individual sense (on a unit level) seem to influence the intention to leave the workplace, however, leaving the profession is more related to personal factors plus dissatisfaction with the practice environment and schedule flexibility.	Yes	Yes
Lindqvist et al. (2014)	To determine the relationship of RN's patient workload & level of involvement in direct patient care as well as a RN's job satisfaction & intention to leave the current hospital or the nursing profession in Finland, Sweden and Norway.	3-4% of the nurses of all three countries are very dissatisfied, whereby 23% in Finland and 18% in Norway and Sweden are a little dissatisfied. 48% of the nurses from Finland stated to leave the hospital within the next year due to job dissatisfaction. 10% of the sample of Finland, 9% for Norway and 7% for Sweden stated to be interested to	Yes	Yes

		leave the nursing profession due to job dissatisfaction.		
Lindqvist et al. (2015)	To examine if hospital characteristics such as hospital size has an impact on nurses outcome such as the intention to leave as well as burnout and care-quality.	Nurses in medium and large hospitals showed a stronger intention to leave as nurses working in small hospitals. Non-university hospitals also lead to a lesser intention to leave and vice versa. Nurses working in low-density areas also showed lesser intentions to leave. Nevertheless, the structural factors were considered as less important regarding the research aim.	Yes	N/A
Lo et al. (2017)	To identify the relationship between job stress and leaving intention of full-time bedside clinical nurses based on a hypothesized model.	The study results indicate that job stress directly contributes to leave the hospital in first place and then the profession. Job stress also indirectly contributes to the intention to leave through job satisfaction and depressed mood. Stress adaption alleviate the intention to leave though.	Yes	Yes
Mazurenko et al. (2015)	To identify the relevant factors of the decision to change the workplace or leave the profession.	Leaving the workplace was associated with high stress level, poor management, lack of further career opportunities and poor compensation. Whereas nurses who experienced burnout, work related disability, illness, dissatisfaction with the schedule and staffing were most likely to leave the profession.	Yes	Yes
Moloney et al. (2017)	The authors aimed to conduct a model of nursing turnover intentions through the effects of job and personal requirements as well as personal and job resources on burnout and work engagement and thereat on the intention to leave the organisation and profession.	The results indicate burnout is associated with lower engagement though has significant effects in intention to leave. Greater workload and greater work-life interferences pander burnout thus classified as strongest predictor of the intention to leave. In contrary higher engagement through emotional demands and greater self-efficacy, lower the intention to leave as higher engagement is associated with less intention to leave the organisation and the profession.	Yes	Yes
Nantsupawa A. et al. (2016)	To examine how work environment is associated with job dissatisfaction, burnout and the intention to leave.	The results showed that a poor work environment negatively influenced job satisfaction, exhaustion and intention to leave.	Yes	N/A
Perry et al. (2017)	To investigate the quality of life of nurses and midwives as well as to assess the influence of health and work-life characteristics on quality of life and the effect on labour force retention.	Job satisfaction and intention to leave were significantly associated with quality of life.	Yes	N/A
Rudman et al. (2014)	To investigate the rate of the intention of newly graduated nurses to leave the profession as well as to examine the intention to leave through the first five years of practice plus the influence of sex, age, occupational preparedness	The strong intention to leave increased from 9.1% to 18.1% within the first five years of work. 30% of the respondents (five-year cumulative incidence) had strong intentions to leave the profession. Burnout was the key determinant to for a strong intention to leave the profession.	N/A	Yes



	and burnout on the intention to leave the profession.			
Sabanciogullari S. and Dogan S. (2015)	To identify the relation between job satisfaction, professional identity and the intention to leave the profession.	15.5% of the nurses stated the intention to leave the profession nurses with lower professional identity and lower job satisfaction suffer a greater urge of intention to leave.	N/A	Yes
Yang et al. (2017)	To investigate the relationship of work pressure and the intention to leave.	19% of the nurses stated the intention to leave as strong/ very strong. A key to leave the profession is work pressure. Associating factors enhancing work pressure were age, experience and workload.	N/A	Yes
Zang et al. (2017)	To investigate the longitudinal change of intention to leave as well as to determine the potential factors of the intention to leave within the first year after graduation.	17.2% intended to leave after starting the career; the intention to leave increased with four months (59.6%), with eight months (74.7%) and 12 months (71.8%). Occupational stress and a low professional identity were observed as intention to leave equally for the whole period of one year. However, additional factors from month four onwards regarding the intention to leave were for nurses (who graduated with a degree) starting shift-rotation and/or work independently on night shifts.	N/A	Yes

## 4. Key themes

The identified key themes of the nurses' intention to leave the workplace and/or the profession altogether are discussed in more depth in this section.

### 4.1 Defining Job satisfaction

Every (hospital) manager might be aware of the importance of job satisfaction, a common definition of what job satisfaction really is does not exist (Brikend 2011). However, a great amount of the included studies linked low job satisfaction to the intention to leave the organisation and/ or the nursing profession (Lindqvist et al. 2014; Heinen et al. 2013; Han et al. 2015; Homburg et al. 2013; Burmeister et al. 2018; Lo et al. 2018; Perry et al. 2017; Sabanciogullari and Dogan 2015; Ishihara et al. 2014; Nantsupawat et al. 2017; Dall'Ora et al.; Leineweber et al. 2016). The understanding of job satisfaction's characteristics and related factors in relation to the intention to leave however vary between the studies. Lindqvist et al. (2014) for instance used secondary data of the RN4CAST EU project to identify, among other factors, the association between job satisfaction and the intention to leave of registered nurses of Sweden, Finland and Norway. The level of job satisfaction was surveyed by asking the respondents how satisfied they are with their job. Respondents could choose between 1= very dissatisfied to 4= very satisfied. Lindqvist et al. (2014) found out that 3-4% of the nurses of all three countries are very dissatisfied, whereby 23% in Finland, and 18% in Norway and Sweden are a little dissatisfied. However, it is not clear to the reader what the comparison between very dissatisfied and a little dissatisfied is and if this comparison makes any difference regarding the

intention to leave. 48% of the nurses from Finland stated to leave the hospital within the next year due to job dissatisfaction. 10% of the sample of Finland, 9% for Norway and 7% for Sweden stated to be interested to leave the nursing profession due to job dissatisfaction (Lindqvist et al. 2014). Even though, the study demonstrated the relationship between level of involvement in direct patient care and job satisfaction (Lindqvist et al. 2015) as well as the associated intention to leave the hospital, the reasons of job satisfaction in relation to the intention to leave the profession remains rather unclear. In comparison to the study of Lindqvist et al. (2014), Han et al. (2015) focused on the intention to leave the current position due to job satisfaction associated with work related factors such as autonomy or work schedule. Han et al. (2015c) found that nurses with highly demanding positions (e.g. longer working hours, poor autonomy and poor support) experience a stronger intention to leave the position. This findings are similar to Homburg et al. (2013) who defined job satisfaction as "...worker autonomy (Larrabee et al. 2003), appraisal, challenges encountered, and variety in tasks.". The results indicated a higher intention to leave associated with lower job dissatisfaction. However, the authors distinguished between job satisfaction and satisfaction with payment and benefits as well as satisfaction with management and leadership. In contrary, Han et al. (2015) for instance related job satisfaction to work factors, so did Dall'Ora et al. (2015) who found a relation between job satisfaction and long shifts. Lo et al. (2018) examined the effect of job stress on job satisfaction though did not define job satisfaction. Burmeister et al. (2018) combined job satisfaction with satisfaction with the current position, the occupation and teamwork. Hence, the work environment in this case seems relevant in order to increase job satisfaction. The findings of Nantsupawat et al. (2017) who linked job satisfaction to a nurses work environment support this assumption.

Obviously, all studies found a strong relationship between low job satisfaction and the intention to leave the organisation and/or the nursing profession. Factors such as highly (psychological and physical) demanding positions, long working hours, poor support (management) and the work environment seem to highly influence a nurses job satisfaction. However, the interpretation of job satisfaction differed throughout the studies due to a lack of consensus regarding the term. Besides, job satisfaction seems to be strongly related to work factors such as working hours, payment and autonomy. Hence, it is very difficult to understand if job satisfaction should be seen as a hypernym compound of various (personal/work) variables or as an individual and independent reason why someone tends to quit the job. In this regard, Burmeister et al. (2018) highlighted the importance to understand the contributing variables to job satisfaction in order to develop appropriate retention strategies.

#### *4.2 Occupational stress, mental stress and burnout*

In 1974, Herbert J. Freudenberger, a US psychoanalyst, developed the term "burnout" associated with emotional and mental exhaustion and targeted it to social and health care workers (Scherrmann 2015). Freudenberger characterised symptoms such as increased cynicism and exhaustion due to massive workload (Scherrmann 2015). However, a consistent definition of burnout is not existent ever since (Burisch 2006; Scherrmann 2015). Maslach et al. (2001,p.5) stated burnout as a response to "chronic emotional and interpersonal stressors on the job". Hence, massive work stress and mental stress can eventually lead to burnout. Included studies coped with workload/occupational- and mental stress (Oliveira et al. 2017; Han et al.

2015; Lo et al. 2018; Perry et al. 2017; Yang et al. 2017; Zhang et al. 2017) as well as burnout (Heinen et al. 2013; Moloney et al. 2018; Rudman et al. 2014; Ishihara et al. 2014; Dall'Ora et al. 2015; Lindqvist et al. 2015; Nantsupawat et al. 2017) and the associated intention to leave the organisation and/or the nursing profession.

Oliveira et al. (2017) observed 3,229 (public) hospital nurses and their intention to leave the profession in Brazil by using the effort-reward imbalance model and the demand-support-control model to examine psychosocial job factors. Oliveira et al. (2017) reported in their study that the intention to leave is 149% more likely when nurses have a highly demanding job than a low-demand position. Besides, the study results indicated the intention to leave twice as high for nurses experience a strong effort-reward imbalance. Moreover, nurses who are heavily committed to the job were 87% more likely to leave (Oliveira et al. 2017). Poor supervisor support also lead to a 33% increased intention to leave. In a study ran in Taiwan, Lo et al. (2018) found a direct link of job stress and the intention to leave; however, to add on this, the results indicated that job stress influenced the intention to leave through job satisfaction and depressed mood. Furthermore, job stress also had an effect on stress adaption on an individual level and forwarded this effect on job satisfaction and depressed mood (Lo et al. 2018). Lo et al. (2018) characterised job stress "...as the perceived stress level from the work environment...". The data were obtained by using a Likert scale, including stressors on a micro level such as lack of support as well as on a macro level by using stressors like external policy (Lo et al. 2018). The depressed mood was observed by asking the respondents about their perceived depression mood, again based on a Likert scale. In comparison, other authors used recognised instruments such as the Maslach Burnout Inventory (MBI) to obtain psychological based data (Heinen et al. 2013; Lindqvist et al. 2015; Dall'Ora et al. 2015). Dall'Ora et al. (2015) and Zhang et al. (2017) found similar results on the intention to leave. Zhang et al. (2017) observed newly graduated nurses and identified an unbalanced lifestyle and shift-work contributed to a high occupational stress level, which was one of the influencing factors of the intention to leave. Dall'Ora et al. (2015) who included data from 12 European countries, reported an increased burnout rate and intention to leave for nurses operating shifts of 12 hours and more. Likewise other studies, Dall'Ora et al. (2015) also included job satisfaction linked to working hours, as working eight hours plus negatively affect job satisfaction. Whereby Heinen et al. (2013) reported a significant intention to leave the profession due to burnout Moloney et al. (2018) claimed a higher job engagement with a lower intention to leave but associated burnout with a lower engagement, thus a higher intention to leave. To add on this, Rudman et al. (2014), who used the Oldenburg Burnout Inventory, found a relationship between burnout whilst completing the nursing education and leaving during the first year as an employee. Similar to Moloney et al. (2018), Rudman et al. (2014) described a low engagement with one's studies during education led to a higher intention to leave, again during the first year of employment. Furthermore, Rudman et al. (2014) stated the intention to leave (also in a five year time period of employment) is more associated with low engagement and trumps exhaustion. These findings contradict in some way to the findings of Oliveira et al. (2017) as the authors found an association to over-commitment to the job and a higher intention to leave. Thus, it seems necessary to find an appropriate balance between low engagement and over-commitment to the job in order to prevent psychological burdens and/or burnout.

All studies associated job stress, mental stress and burnout with a higher intention to leave the organisation and/or the profession. However, different factors relating to burnout were identified and vary between over demanding workload to interferences with the schedule and disengagement with the job. Besides, important factors associated with burnout and stress, can be directly influenced by the hospital manager such as schedule, workload and even supervisor support. By contrast, missing engagement needs to be defined more precisely. Evidently, low engagement lead to a higher intention to leave, however, it is necessary to understand the reasons and variables behind the disengagement. Further research is indicated in order to develop appropriate burnout and stress prevention strategies.

#### *4.3 Work environment*

The work environment is classified as a place where the work is done and it usually contains of the geographical site as well as the corresponding office buildings with all its surroundings such as fresh air and noise plus facilities like free parking for instance (Business Dictionary 2018). Even though, these facts contribute to a good work environment, the social and psychological work environment should never be underestimated. Stansfeld and Candy (2006) described the importance of the psychological work environment relating to the employees mental health. The authors of this meta-analysis included psychological factors such as social support, psychological demands as well as effort-reward imbalance in their paper (Stansfeld and Candy 2006). It is worth noting, that many papers included in this review already incorporated those psychological factors. Oliveira et al. (2017) for instance described job satisfaction with a high effort-reward imbalance, whereby Lo et al. (2018) linked the stress level to the work environment. However, these studies did not mention their research focus within work environment though rather focus on job satisfaction or burnout and stress levels. Nonetheless, some studies included in this review cope with the nurses work environment and the intention to leave or give recommendations about the work environment to develop appropriate retention strategies (Leineweber et al. 2016; Lindqvist et al. 2015; Nantsupawat et al. 2017; Rudman et al. 2014; Flinkman and Salanterä 2015; Oliveira et al. 2017).

Lindqvist et al. (2015) aimed to examine the hospitals structural characteristics and the associated nurse-reported care quality, work environment, burnout and leaving intentions. The authors referred to the structural characteristics such as hospital size, geographic location and university status. Hence, the study coped with the influence of the structural work environment rather than with the social work environment. However, the authors wanted to investigate a relationship between structural characteristics and the (mental) perception and possible consequences such as leaving the organisation and/or profession. The results showed that nurses working in medium and large hospitals had stronger intention to leave than working in small hospitals with significantly less intention to leave. Working in a non-university hospitals lead also to less leaving intentions and vice versa. To add on this, nurses working in low-density areas as well reported less intention to leave. In comparison, Nantsupawat et al. (2017) focused more on the social work environment of nurses from university hospital by using the Practice Environment Scale of the Nursing Work Index. This scale includes for instance a good nurse-physician relationship, support and leadership from the nurse manager and appropriate staffing. The authors found out that a poor work environment negatively influenced job satisfaction, exhaustion and intention to leave. The approach from Leineweber et al. (2016) is comparable

to Nantsupawat et al. (2017) as the authors as well focused more on a social work environment by using also the same scaling tools. Results of 10 European countries showed that the practice environment (on a unit level, not only on an individual level) highly influenced nurses' intention to leave the workplace due to dissatisfaction. The intention to leave the profession was smaller though. A different approach to investigate the intention to leave was fulfilled by Flinkman and Salanterä (2015) who conducted qualitative interviews with 15 young registered nurses in Finland. The work environment was also referred as practice environment and had been rated poorly by the nurses. Staffing shortages, highly demanding workload and being unable to provide appropriate care were just few variables that negatively influenced the practice environment. To add on this, Rudman et al. (2014, p.623) who examined the influence of burnout on the intention to leave recommended "...a resourceful work environment..." in order to enhance the individuals personal and professional growth.

Again, all studies found a relationship between the work environment and the intention to leave the workplace and/or the profession. However, only one study focused on the structural perspective of the work environment, whereby all other studies incorporated the social and psychological aspects of the work environment. The social work environment included for instance an appropriate relationship between the nurse and the physician, an adequate staffing, a capable workload as well as a sophisticated management support scheme. Obviously, to change the structural work environment of a hospital, e.g. changing the geographical location, seems often impossible or in economic terms not efficient. Nevertheless, the hospital manager can influence the social work environment by investing in team building, providing social agreeable schedules and adequate staffing for instance.

Nonetheless, the term (social) work environment should be defined more precisely as many variables of a good (social) work environment are also related to job satisfaction and work stress and burnout.

## 5. Discussion

This review identified three main themes of nurses' intention to leave the current workplace and/or the profession. Even though, stress and burnout, job dissatisfaction and a poor work environment seem to be the major drivers for nurses to quit. Besides, we did identify three key themes, it is obvious that the reason of the research goal to investigate the intention to leave the job and/or the profession contains of many versatile variables. Albeit, every study defined its own research aim, it is notable that the three major drivers on the intention to leave seem to depend on one another. Having said this, work environment for instance could be seen as an umbrella term for the intention to leave. It is worth noting that a general definition of social and psychological work environment could not be identified within the literature<sup>3</sup>. However, the variables included in work environment vary to great extent but are associated with the other themes such as job dissatisfaction and stress/burnout. For instance, a physical and psychological demanding work environment such as nursing (Flinkman and Salanterä 2015) causes stress and dissatisfaction (Han et al. 2015; Lo et al. 2018) and results in a higher intention to leave the

---

<sup>3</sup> Structural work environment such as geographical location seems not to matter to a great degree.

current workplace and/or the profession. Thus, a poor work environment can cause stress and dissatisfaction. Even though, many studies included in this review did not refer to work environment precisely, the variables used to describe job dissatisfaction matches with those describing work (practise) environment but also matches with variables describing job and mental stress.

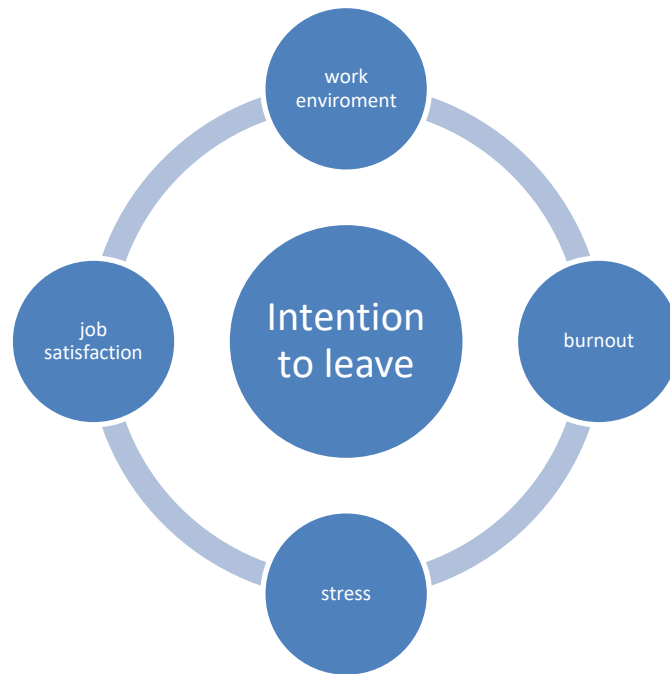


Figure 2: Relationship between the major drivers of the intention to leave; source: own depiction

To be able to develop generalizable retention strategies as well as to prevent premature leaving it seems necessary to develop a common interpretation of work environment, job satisfaction and stress/burnout supported with a sophisticated list of included variables and interpretations for each term. Otherwise, it could be confusing if one does not exactly know how to interpret for instance job dissatisfaction and which variables belong to this term.

Besides, the majority of the included studies used a rating based scale (or secondary data based on a rating scale) for data collection. Even though, rating scales are a common instrument in order to collect data, it has been highly criticized though. Albeit, the theoretical approach is straight forward, some issues regarding the respond styles were observed (Louviere et al. 2013; Auger, P.et al. 2007). Respondents might have a different cultural background, the labels could be inconclusive or even the understanding and the application of the rating scale might be diverse (Louviere et al. 2013; Lee et al. 2007; Lee et al. 2008). Besides, Louviere et al. (2013 p.3) stated "... that individuals tend not to discriminate between response categories when they are not asked to respond in ways that elicit trade-offs or *relative* preferences for the objects being valued...". Nevertheless, in order to target a large sample size and to examine a rather subjective matter such as one's own happiness the researcher needs to take the economic value versus the economic effort into account. This means a rating based scale could be preferred over e.g. qualitative interviews as the effort of conducting qualitative interviews with a massive sample size is not feasible or even not efficient in economic terms. Still, further research projects could consider other methods

which avoid numbers to derive the strength of the individual preferences such as best-worth scaling (Louviere et al. 2013).

Furthermore, the sample sizes of some studies were hardly comparable towards the setting and the amount of respondents. Burmeister et al. (2018) for instance compared different settings such as Australia, USA, Iceland, South Korea, Italy, Turkey and Lebanon. However, due to cultural differences and different settings within the countries, results should be interpreted with caution. Besides, the number of respondents vary between 3.523 respondents in the US to 114 respondents in Lebanon (Burmeister et al. 2018). Hence, unbalanced and non-representative sample sizes are difficult to compare from a statistical point of view. Besides, the majority of the studies derived data from the RN4CAST EU project. These studies compared also different countries, though the setting were quite similar as the development of EU countries is on a comparable level.

Secondarily, macroeconomic factors such as responsiveness to wages and a potential link to an increased intention to leave the profession are not covered within the studies to a greater degree. Even though, some studies covered an unbalanced effort-reward system (Oliveira et al. 2017) the factor wages has not been taken into account. Even if studies already showed that payment is less important to nurses compared to appropriate working conditions and job satisfaction (Heyes 2005; Kankaanranta and Rissanen 2008; Di Tommaso et al. 2009); research also indicates a clear impact of wages to nurses. Hanel et al. (2014) found a higher labour supply elasticity than previous research expected. The authors stated an increase in wages with respect to an increase labour supply is more promising than previously considered. Elliott et al.(2007) reported the impact of wage differentials between the nurse's job and other profession has had a huge impact on the attractiveness of a nurse's job and retaining strategies. Additionally, Phillips (1995) identified a great responsiveness to wage changes. Hence, to identify the intention to leave the job or the profession altogether, thus to estimate a nurse's choice behaviour, the impact of wages should be considered.

To sum up, the intention to leave the current workplace and/ or the nursing profession is a common and international issue. The studies included in this review highlighted the major drivers of nurses to leave and provide important information for policy maker and hospital manager in order to develop decent retention and prevention strategies. Nevertheless, some methodological problems has been identified in this review. In this regard, comparable samples as well as advanced scaling methods need to be considered for future research approaches. Besides, an equal understanding in terms of the wording (such as job satisfaction) is necessary to compare studies as well as to be able to provide detailed recommendations.

However, to analyse completely the shortage of nurses, one has also to look on new entrants into the profession. The labour market situation changed fundamentally since the first woman Dr. Elizabeth Blackwell graduated 1849 as the first US female doctor. (U.S. National Library of Medicine 2015). Health care could be seen as a female profession since the beginnings (OECD 2017), however nowadays more and more women are working as doctors. The average percentage share of female doctors increased from 29% in 1990 to 46% in 2015 (OECD 2017). Even though, this trend is beneficial in terms of gender equality, it can be assumed that a shift of the supply curve of nurses in favour of the supply curve of doctors has happened. This means,

women who formally become nurses, become doctors. Additionally, more specialised health care professions, such as surgical technologists or anaesthesia technologist developed in order to substitute the classic health profession of nursing to deal with labour shortage. Derived from the current health care labour market situation and its varied opportunities, it is also necessary to focus on the supply of new staff and not solely to focus on retaining the current staff. However, new developed professions of a more technical nature, such as the surgical technologist, might also attract more male staff as the nursing profession has an image of a female only job (Seago et al. 2006). However, hospital manager need to know the preferences and the socioeconomic characteristics of those new professions in order develop appropriate recruitment strategies. Even though, the preferences and choice behaviour of nurses might be similar to other health care professions, it is not evidently certain as research still focuses on the classic health care professions of nurses and doctors. However, to satisfy the needs of the ever changing health care environment further research needs to take new health care profession into account to support hospital manager with target group tailored information. Hence, the focus of retaining nurses, such as in this review, need to be adapted by changing the perspective towards newly created professions and its potential in dealing with the health care labour shortage.



# **Nursing without caring. A discrete choice experiment with surgical technologist trainees in Germany<sup>4</sup>**

## **1. Introduction**

Germany, like many other OECD countries, faces a shortage of nurses, at least at the level of the individual hospital. In 2016, 51% of all German hospitals were unable to fill open nursing positions, an increase of 14% in vacancies since 2011 (Blum et al. 2016). Affected hospitals lacked on average 6.6 positions. Within specialised units, like the operating room (OR), the shortage of (specialised) certified nurses is especially problematic as 44% of the German hospitals were, on average, not able to staff their open OR positions (Blum et al. 2016). Therefore, two positions on average are open in German ORs (Blum et al. 2016). To curb this problem in the OR, German hospitals started to train a new profession, “surgical technologists” from 1997 on (German Association of surgical technologists 2017). Surgical technologists are specialised health care workers who act as substitutes for OR nurses in Germany, but they are not certified and not allowed to work on the general ward. In contrast to Anglo-Saxon and Scandinavian countries, Germany’s hospital system is de-centralised and the development of a specialised health care workforce to assist or replace nurses has been comparatively slow.

Surgical technologists are substitutes for certified nurses in the OR (or sometimes in the endoscopy unit of the emergency room) but lack the flexibility of certified OR nurses who can work also on the general ward or in other units like intensive care. The education process to become a nurse or a surgical technologist is nearly similar regarding the timeframe. Both occupations undergo three years of training. The training for both professions includes regular school attendance and working in different areas throughout the hospital. The surgical technologist trainee is limited to the operation room, the emergency room and the endoscopy unit. An approximately six-week internship on a ward is included though. In contrary, the nurse’s trainee is allocated throughout the entire hospital. The main difference of the training lies within the range of duties. Whereby the nursing education focuses on a broad range of skills, including caring activities, the surgical technologist’s education aims to interfere solely special OR tasks such as preparing the OR room and assisting the physician/surgeon. Due to the high versatility of a nurse, the nurse is able to choose whether to work on the ward or in specialised units such as the OR. However, the tasks of a nurse or a surgical technologist within the OR are identical. A formal key determination of both occupations is the official certification of a nurse<sup>5</sup>, which is missing for the surgical technologists. What does this mean for the parties involved?

From a hospital provider position, financing the education of nurses in Germany is shared by the federal states as well as the sickness funds, which are reimbursing hospitals the educational costs. However, this is not the case for surgical technologists; the hospitals face all educational costs on their own. From the regulation side, hospitals have a wide range of freedom when it

---

<sup>4</sup> Saunders K., Hagist C., McGuire A., Schlereth C. (2018a) Nursing without caring. A discrete choice experiment with surgical technologist trainees in Germany; Submitted at WHU Economics working paper series assigned number 19/01, presented at the German Conference on Health Economics 2018; presented at the European Conference on Health Economics 2018.

<sup>5</sup> Government approved and regulated occupation.

comes to train these specialists, as legally in the end the physician is responsible for their actions. All certified professions are regulated and underlie special requirements by law, such as a standardised educational curriculum. Moreover, certified professions are associated with a secured occupational title, which allows only people with the relevant training to carry the official (job) title (German Bundestag 2016). Furthermore, in line with the EU directive (2005/36/EG) certified professions are acknowledged EU wide, which acknowledges that a health care profession is associated with having direct impact on other people's life. Surgical technologist is a non-certified profession and discussions are going on whether surgical technologist is a health care profession at all. Even though, surgical technologists substitute OR nurses, it is claimed that a surgical technologists has less contact to a patient and thus a low risk potential compared to other health care professions.

What does this mean from a surgical technologist's point of view? Due to the lack of flexibility and national and international certification, one could argue that surgical technologists are a "dead end" job which gives the employer adverse advantages. Career perspectives are also limited, as further trainings often require certified degrees. In addition, it is still legally challenging how surgical technologists will be treated in the German social systems as they are officially classified as "unskilled" which might cause disadvantages in Germany's social safety net. Moreover, the nurse's payment sticks to pay-scales supported by the labour union and binding for the respective hospital. Again, this is not the case for surgical technologists due to the missing certification. Thus, payment of a surgical technologist may vary depending on the hospital provider (private, public etc.); however, on average the salary of a surgical technologist and a nurse is nearly similar.

The amount of surgical technologists has been steadily increasing. Therefore, one could conclude that hospitals obviously are taking the costs of training, which they have to cover completely themselves, as a profitable investment. Another indicator for this is that the biggest surgical technologist training schools are run by private hospitals. The larger economic question is why people are deciding to opt for this career path when certified nurse spots are vacant? Therefore, we derive two main research questions: 1) What motivates surgical technologists to choose a non-certified health care profession? 2) How important is the official certification to the surgical technologists themselves?

Understanding health care workers preferences, respectively the trade-offs that they face whilst choosing a job, is crucial to enhance current recruiting strategies to cope with labour shortage. A suitable method to measure preferences and trade-off decisions is the discrete choice experiment (DCE). This method collect data using surveys and simplifies data analysis because factors of interest can be experimentally manipulated and tested in a controlled experimental environment. Instead of relying on ratings or rankings that are artificially translated into preferences, discrete choice experiments ask respondents to repeatedly make choices between a carefully designed set of alternatives. Given the similarity to real-world purchase decisions, discrete choice experiments are able to explain actual purchasing behaviour well, and they have a firm foundation in sociology and behavioural research (Swait and Andrews 2003). More specifically, with random utility theory, these experiments are backed-up by a long-standing, well-tested theory of choice behaviour that can take inter-linked behaviours into account (see

(McFadden 1974)<sup>6</sup>. For a recent review of the literature regarding DCE in health economics see Clark et al. (2014).

Previous research on nurse's shortage and nurse labour supply aimed to understand the nurses' choice behaviour. These studies mostly investigated the elasticity of the supply curve responding to changes in wages or non-monetary characteristics. Di Tommaso et al. (2009) investigated the importance of wages for nurses in Norway in order to increase labour supply. The authors found labour supply rather inelastic and concluded a generic wage increase solely could not solve the labour shortage since non-pecuniary characteristics need to be taken into account. Shields and Ward M. (2001) found the opposite, namely that absolute pay is the main driver of job satisfaction. Hanel et al. (2014) found similar results as they identified the labour supply elasticity tend to be higher than previous research suggested. Hence, an increase in wages to increase labour supply is more promising than expected. Phillips (1995) also found respondents to be highly responsive to wage changes. Yoo and Doiron (2013) set up a best worst scaling experiment (Case 2) to compare preferences on nursing jobs and found stronger monetary preferences. In comparison, Kankaanranta and Rissanen (2008) found a rather small wage elasticity, however identified a strong and significant impact on the working hours supplied. The authors concluded a wages increase as inefficient to increase labour supply as non-monetary characteristics play a major role. Heyes (2005) linked a nurse with a poor wage to higher performance on the job as the nurse experiences a stronger vocation towards the job. For a detailed information on these studies, please see table 19 in the appendix.

Taken together, we know that existing professions in the health care sector value work environment and job conditions to a great extent (Scott et al. 2015; Heyes 2005; Di Tommaso et al. 2009; Blaauw et al. 2010; Kankaanranta and Rissanen 2008). However, we are also witnessing an expansion of new roles into the health care sector, many of which substitution for the tasks of existing professions. This may be efficient, in that it releases professionals' time. However, there is little understanding of what motivates these new professions in entering or remaining in these newly created roles. This study tries to evaluate the preference structure of one of these new staff groups, surgical technologist, through examining the preferences of trainees, defined over a number of attributes, in this group.

No study could be identified which focuses on specialised health care worker such as surgical technologists during a literature research. Our study is, therefore, the first DCE to analyse surgical technologists, with a particular geographical focus on Germany. In addition, we are the first to collect data of surgical technologist on an academic basis, as the profession is not considered within the annual public statistical elicitation of profession due to the missing official certification. Moreover, we believe it to be the first DCE to study the job preferences of specialised health care workers in general. Therefore, our paper has not only have academic value but is also providing information for policy-makers for questions such as an official certification of the ongoing debate about nurse's shortages.

---

<sup>6</sup> More detailed information on DCE as a method can be found elsewhere Train 2009; Louviere et al. 2000.

## 2. Methods

### *2.1 Overview of the study*

The study on surgical technologist's trainee preferences through DCE took place across Germany between January and July in 2017. We decided to target surgical technologist trainees rather than to survey fully trained surgical technologists as we suggested the mind-set to be less biased through work experience regarding the decision why someone decides to opt for a non-certified position. Moreover, the personnel investment costs to undergo the training are not that high at this stage and thus might not be taken into account much on entry to the profession. Moreover, the choice of career and appropriate education is a fundamental individual professional entry choice.

This study included trainees of all training levels (year 1-3). We contacted relevant training centres via email, of which thirty training centres agreed to participate. A formal study approval process took place, as every training centre required at least the approval of the CEO as well as of the head of education. Within the majority, approval of the staff council as well as the data security manager were also mandatory. Most training centres requested paper-based surveys as they acknowledged distributing the survey during class to maximise the responds rate. Paper-based surveys with a reply paid envelope attached were sent out as well as an online-link to training centres with appropriate email access for the trainees.

The survey was generated using the software DISE (Schlereth and Skiera 2012). Initially, participants were provided with general background information regarding the survey content and structure. We divided the survey into three parts. First, respondents answered socio-demographic characteristics followed by the DCE part with fourteen choice sets. The DCE instruction for the participants stated to imagine the time before starting the training and respondents were asked always to choose one out of two possible provided positions that seem the most favourable option. The survey finished with specific questions regarding the training. Respondents needed 15-20 min to finish the survey. As an incentive for the respondent, we followed a common practice and donated one euro to cancer research organisation for each completed survey. The authors privately funded the donation. No third parties were involved; hence, no conflict of interest exists.

### *2.2 Selection of attributes and levels*

For the empirical study, we followed the approach suggest in Helter and Boehler (2016) and primarily identified attributes through literature search as well as additionally experts' talks with politicians, teachers and health care professionals followed. After generating a draft of ten possible attributes and levels, focus group interviews took place. All over, thirty surgical technologist's trainees participated. Attributes and levels were discussed regarding realism as well as wording and comprehensibility. Subsequently, the focus group participants were asked to rank the possible attributes and levels in order to identify their importance. We identified eight attributes and their respective levels. In a pre-test study, which we ran with thirty participants, we examined the feasibility as well as the tangibility of the questionnaire. One attribute had to be rejected completely as it led to massive confusion and thus the danger of a broaden bias within the results was too high. Furthermore, some changes in wording were

required. Eventually, we identified seven final attributes and their respective levels as presented in Table 3. After updating the survey, a second test round ran with ten participants, which resulted into the eventually used questionnaire. Table 4 provides an exemplary choice set from the questionnaire.

Table 3: Summary of employed attributes and levels

<i>Attributes</i>	<i>Attribute levels</i>	<i>Reasoning</i>
<i>Officially certified profession</i>	L 1: yes L 2: no	Attribute is of major interest and a key political issue. As the surgical technologist profession is not officially approved, some disadvantages for the trainees as well as the hospitals arise. Hence, the attribute was included to evaluate the value of a government-approved position from a trainee point of view.
<i>Shift types</i>	L 1: no weekend shifts L 2: three-shift operation L 3: on-call duty	Shift types, especially the night shift can have negative effects on a person's health (Harrington 2001). In comparison to nurses, surgical technologists are normally used to on-call duty after finishing time (amount of on-call duties depending on the size of the team); nevertheless, undesirable working hours are unavoidable. Work-life balance seemed highly correlating with control over the working schedule (Tausig and Fenwick 2001b);hence; this attribute was included within the survey.
<i>Autonomy</i>	L 1: low responsibilities L 2: distinct responsibilities	Job satisfaction is associated with a highly autonomous working environment, which the focus group participants emphasized. The attribute was rather of a general nature to provide the respondents with more flexibility through their own interpretation (Scott et al. 2015a).
<i>Work environment</i>	L 1: friendly and open relationship between physicians and other health care workers L 2: respectful and very professional relationship between physicians and other health care workers L 3: impersonal and formally relationship between physicians and other health care workers	A positive workplace environment can lead to a larger job satisfaction as well as to higher motivational level (Nordin et al. 2017). In high demanding jobs, like nursing, a positive workplace environment could be essential to cope with stress and other challenges more effectively. We used "workplace environment" as an indicator for teamwork between all sort of health care professions.
<i>Work content</i>	L 1: none to very low nursing activities L 2: mostly nursing activities	This attribute is of high relevance for our study as it is the most important ranked attribute within the focus group and during expert talks. It consists of two level, which allow us to evaluate if someone is in favour of nursing, or not. Hence, if one is also prone to become a nurse instead of a specialised health care worker without any nursing activities.
<i>Earnings</i>	L 1: 2,500€ L 2: 2,900€ L 3: 3,300€	This attribute reflects recent average salary (before taxes) of a surgical technologist as well as two changes in the salary, which were aligned with experts to provide a realistic scenario.
<i>Workload</i>	L 1: low L 2: middle L 3: high	Workload is also a major determinant of job satisfaction. We kept the attribute more general with room for own interpretations as the workload quiet differs depending on the hospital's medical speciality and it's actual size.

### 2.3 Experimental design

For the 14 choice sets in the DCE, we employed the techniques in Street and Burgess (2007) and created a d-optimal (2·3·2·3·2·3·3) fractional factorial design. These designs provide a high degree of efficiency (for our design 98% d-efficiency) and they are suitable for a diverse range of research questions. In our study, each choice set showed two different positions, which we illustrated in and subsequently asked the respondent in which of the two positions they rather prefer to work.

Table 4: Illustration of a choice set

<b>1 OUT OF 14</b>	<b>JOB A</b>	<b>JOB B</b>
<i>OFFICIALLY CERTIFIED PROFESSION</i>	yes	no
<i>SHIFT TYPES</i>	three shift operation	on call duty
<i>AUTONOMY</i>	low responsibilities	distinct responsibilities
<i>WORK ENVIRONMENT</i>	friendly and open relationship between physicians and other health care workers	impersonal and formally relationship between physicians and other health care workers
<i>WORK CONTENT</i>	none to very low caring activities	mostly caring activities
<i>EARNINGS</i>	2,500€	3,300€
<i>WORK LOAD</i>	middle	high
	<input type="checkbox"/>	<input type="checkbox"/>

We decided for the two alternatives, without an opt-out option as our target group consists of trainees who already decided for the profession of a surgical technologists. An opt-out option bears the risk of massive information loss (Louviere et al. 2000) as the respondent could use it as a quick way to finish the survey and the researcher is left to none information regarding the prior utility (Schlereth and Skiera 2017).

### 2.4 Analysis

We estimated preferences using a hierarchical Bayes procedure developed by Train (2009) in Matlab. We based our estimation on random utility theory (Thurstone 1927), thereby, making the implicit assumption that respondent  $h$  maximises his or her utility  $u_{h,i} = v_{h,i} + \varepsilon_{h,i}$  for the profession  $i$ , where  $v_{h,i}$  is the deterministic part of the utility function, which contains observable information, such as the attributes and levels shown in the choice sets and the observed covariates of respondents and the error term,  $\varepsilon_{h,i}$ , is stochastic and explains unobserved behaviour. Louviere et al. (2000,p.8ff.) discussed related assumptions regarding the cognitive processes of respondents and the extent to which these assumptions are typically fulfilled.

We used an additive model for the utility of the profession  $v_{h,i}$ , consisting of a vector of parameters  $\beta_h$  to be estimated times the effects-coded design vector  $X_i$ ; (i.e.,  $v_{h,i} = \beta_h \cdot X_i$ ). For the error term  $\varepsilon_{h,i}$ , we followed the work of McFadden (1974), and assumed an extreme value-distribution. This distribution has a similar functional form as the normal distribution, but it provides appealing mathematical properties, such that computers can quickly calculate probabilities in a closed form. For each choice set  $a$ , the probability that respondent  $h$  chooses profession  $i$  is:

$$(1) \quad \Pr_{h,a}(i) = \frac{\exp(v_{h,i})}{\sum_{i' \in C_a} \exp(v_{h,i'})} \quad (h \in H, i \in I, a \in A),$$

where  $H$  refers to the set of respondents,  $A$  to the set of choice sets and  $C_a$  to the set of shown professions in choice set  $a$ . Train (2009, p.34ff) provided the full mathematical derivation for the logit model, and discussed the underlying assumptions. Furthermore, Chandukala et al.(2007) summarised related work to the logit model, which challenged its mathematical properties. They concluded that even though some of the assumptions are violated (e.g., the extreme value distribution of the error term) that the estimated parameters captures the underlying preferences very well.

Despite observing just 14 choices, we were able to obtain a vector of individual parameter estimates  $\beta_h$  for each respondent through the use of hierarchical Bayes estimation techniques (c.f., Rossi and Allenby, 2005 for an exhaustive, statistical introduction and Train, 2009 for its use in case of discrete choice experiments). Hierarchical Bayes estimates the results on two layers: The higher level captures the aggregated behaviour of households, i.e., it assumes that the behaviour of all households can be described by a distribution, which is multivariate normal in our case. At the lower level, we captured household specific behaviour. Thereby, we assumed that, given an individual's parameters, the multinomial logit model governs his/her probability of choosing a particular alternative.

To obtain the parameter estimates, hierarchical Bayes uses an iterative process, the Monte Carlo Markov Chain: the estimates in each iteration are determined from those of the previous iteration by a constant set of probabilistic transition rules that are described in Train (2009). The iterative process is quite robust, and its results do not depend on starting values. In our case, we used 40,000 iterations, of which we removed the first 30,000 iterations of the estimation. The remaining 10,000 iterations served as input. Each draw is one point forming together a distribution, i.e., the posterior distribution.

In contrast to classical estimation, we did not interpret significant levels, such as t-test statistics, when estimating with hierarchical Bayes. The reason is that the posterior distribution nearly always is significant, because of the high number of iterations that is commonly used.

We tested for robustness of the results. In particular, we wanted to avoid that average values of parameter estimates were affected by parameter estimates of very few respondents. Therefore, we randomly assigned respondents into two data sets, and re-ran the estimation again, where we found similar results. We also tested, whether online surveys provided substantially different results compared to the surveys from the classroom, but again, found qualitative similar results.

### 3. Results

#### 3.1 Respondent characteristics

One thousand and sixty four surgical technologists' trainees completed the survey. This is a response rate of ~89%<sup>7</sup> and covers approximately 80% of the total surgical technologists trainee population (n=1342). Given that we covered nearly the whole target population, we argue that the results are representative without any selection bias. Compared to other studies, we were able to examine a very large share of the population (see appendix, table 19). We do not provide online results and paper-based results separately since 95% of the respondents filled out the paper-based survey, and only 5% took part online<sup>8</sup>. 82% of the respondents were females which clearly emphasises the dominance of female population of health care workers (WHO 2008;OECD 2017). The average age was 22.3 years, independent of gender. Respondent's trainings level as well as the current workplace provider were equally distributed. Nearly half of the respondents, i.e., 49%, have high school certificates equivalent to university entrance in Germany<sup>9</sup>. For detailed information about the respondent's characteristics, see Table 5.

Table 5: Respondent characteristics

	<i>Survey respondents</i>	<i>Percentage share<sup>10</sup></i>
<i>Number of ORT trainees</i>	1,064	Total population 1,342 <sup>11</sup> (80%)
<b><i>Personal resp. characteristics</i></b>		
<i>Female</i>	876	82%
<i>Male</i>	188	18%
<i>Average age female</i>	22,3 years	
<i>Average age male</i>	22,4 years	
<b><i>Educational background</i></b>		
<i>Secondary modern school qualification</i>	14	1.3%
<i>High-school diploma</i>	314	30%
<i>vocational baccalaureate diploma</i>	201	19%
<i>A level</i>	526	49%
<i>University studies</i>	9	0.8%
<b><i>Years of training</i></b>		
<i>1<sup>st</sup> year of training</i>	392	37%
<i>2<sup>nd</sup> year of training</i>	350	33%
<i>3<sup>rd</sup> year of training</i>	322	30%
<b><i>Current workplace</i></b>		
<i>University hospital</i>	206	19%
<i>Private hospital</i>	207	19%
<i>Public hospital</i>	244	22%
<i>Ecclesiastical hospital</i>	303	28%
<i>Not sure</i>	104	10%

<sup>7</sup> 1200 paper-based survey were distributed.

<sup>8</sup> Only few training centre provide an email account for the trainees and distributing the survey via private email accounts is rather difficult in terms of data security.

<sup>9</sup> Nursing training nor surgical technologist training is a university degree in Germany.

<sup>10</sup> Rounded number.

<sup>11</sup> German Government, 2014.



### 3.2 DCE results - Parameter estimates and importance weights

To test for goodness of our estimation, we calculated internal and predictive validity in terms of first choice hit rates. Thereby, we excluded two choice sets from the estimation and calculated for the internal validity, i.e., the percentage of choice sets, in which the chosen alternative actually had the highest deterministic utility according to the individual parameter estimates. For the predictive validity, we calculated the same percentage for the two choice sets, which we did not use for the estimation. The internal first choice rate is 99.65% and the predictive first choice hit rate is 82.01%. All first choice hit rates vastly exceed the 50% threshold of a random choice. Table 6 shows the averages over respondents' parameter estimates for each attribute level and their corresponding importance weights for each attribute (calculated for each attribute  $j$  as  $IW_{h,j} = (\max(\beta_{h,j}) - \min(\beta_{h,j})) / \sum_{j' \in J} (\max(\beta_{h,j'}) - \min(\beta_{h,j'}))$ ). All parameters are of expected sign.

Earning was the most important attribute with an average importance weight of 28%; work content followed on second place with 25%, implying that nursing activities provided a high disutility for the choice of a profession. A friendly and open relationship between the team and the physicians, hence, an enjoyable work environment was also key to the respondents. However, when it comes to working hours, free weekends are privileged. In support of this conclusion, a three-shift system as well as an on-call duty regime are both not a favoured option to respondents. A three-shift system is commonly part of a nurse's job in Germany, where an on-call duty regime is often associated with working in a specialised unit within the hospital such as OR's. Autonomy, defined as distinct responsibilities being preferred over low responsibilities, however does not affect the respondents greatly with an average important weight of 8.1%. The official certification of the surgical technologist's profession seemed rather unimportant to the participants. This might derive from the outstanding labour market situation in health care, whereby people do not expect unemployment hence any disadvantages. Workload was the least important attribute, whereby high workload is associated with a utility loss. Interestingly, an average amount of workload (middle) was also preferred over a low amount of workload.

Table 6: Results HB estimation

<i>Attribute</i>	<i>Level</i>	<i>Parameters (standard deviation across household- specific posteriors)</i>	<i>Importance Weights</i>
<i>Official recognised profession</i>	- Yes	0.230 (0.186)	4.8%
	- No	-0.230 (0.186)	
<i>Shift types</i>	- No weekend shifts	0.681 (0.457)	11%
	- Three-shift operation	-0.436 (0.476)	
	- On-call duty	-0.245 (0.418)	
<i>Autonomy</i>	- Low responsibilities	-0.389 (0.426)	8%
	- Distinct responsibilities	0.389 (0.426)	
<i>Work environment</i>	- friendly and open relationship between physicians and other health care workers	0.733 (0.380)	18%
	- respectful and very professional relationship between physicians and other health care workers	0.242 (0.323)	
	- impersonal and formally relationship between physicians and other health care workers	-0.975 (0.684)	
<i>Work content</i>	- none to very low caring activities	1.192 (1.026)	25%
	- mostly caring activities	-1.192 (1.026)	
<i>Earnings (=price factor, per 1,000€)</i>	- 2,500€	2.010 (1.457)	28%
	- 2,900€		
	- 3,300€		
<i>Workload</i>	- low	0.178 (0.233)	4.2%
	- middle	0.098 (0.048)	
	- high	-0.236 (0.227)	

**N=1064**

Furthermore, we divided the data set into five subgroups: (1) female / male, (2) training year, (3) age, (4) prior work experiences/ none work experiences and (5) type of hospital provider (employer). For detailed results, see appendix, table 14. We found differences in preferences in the female / male group for the attributes work content and earnings. Females tend to face a larger utility loss when it comes to caring activities compared to their male colleagues. The male group however stated higher preferences in earnings compared to the female group. A small difference was also found for work content, where males value a low workload slightly more than females. However, earnings and none-caring activities were valued most in both groups compared to all other attributes.

We divided the subgroup “age” into four sections: (1) aged 16-20 years, (2) aged 21-24 years, (3) aged 25-29 years and (4) aged 30 years+. Age group one and age group four stated lesser preferences for an official recognition of the profession than age group two and three. Age group one also had lesser preferences for earnings compared to age group three with the highest preferences for earnings. The greatest utility loss if the job contains caring activities faced again age group three. Age group four however had lesser preferences for work environment, workload and autonomy compared to all age groups but especially compared to age group one. Age group one faced the highest utility loss compared to all age groups for an impersonal relationship with physicians and other health care workers but gained the highest utility, again

compared to all age groups, out of distinct responsibilities. All remaining age groups gained more utility out of free weekends compared to age group one, whereby age group four faced the highest utility loss when facing a three-shift operation. However, earnings and none-caring were again valued most in all four groups compared to the other attributes. For detailed results, see appendix, table 15.

We divided the subgroup “training years” in (1) training year one, (2) training year two and (3) training year three. Earnings were again valued most for all three groups, whereby respondents of the training year three gained the highest utility out of earnings. Respondents of the training year two faced the highest utility loss if the position contained caring activities, followed by year one and three. Again, respondents of training year two showed the highest preferences for the attribute work environment by facing a utility loss for an impersonal relationship with physicians and other health care workers and gaining utility out of a friendly and open relationship. Distinct responsibilities were also preferred the most by respondents of training year two, this preferences dropped for respondents of training year three. For detailed results, see appendix, table 16.

We found differences in preferences for the respondents with prior work experiences before starting the training compared to respondents without any work experiences mainly for the attribute earnings, whereby respondents with work experiences valued earnings more compared to the group without work experiences. Besides, respondents with work experiences had lesser preferences for an official recognition of the profession compared to the respondents without work experiences. Furthermore, respondents without work experiences preferred a lower workload than the comparison group with work experiences. Earnings and none-caring were again valued most in both groups, followed by work environment and compared to the other attributes. For detailed results, see appendix, table 17.

The final subgroup consisted of the hospital provider the individual respondent work for. All existent provider in Germany were included and the subgroup divided in (1) public hospital, (2) ecclesiastical hospital, (3) private hospital, (4) university hospital and (5) respondents who were not sure for which provider they work. The latter was included within the survey as some respondents within the pre-test struggled to answer the question for which hospital provider they work. Again, earnings and work content were valued most for all groups, however, respondents working for a university hospital and ecclesiastical hospital valued earnings the most, followed by respondents of public hospitals, private hospitals and respondents not sure which provider they work for. The greatest utility loss from caring activities suffered the respondents of public hospitals, followed by respondents of private and ecclesiastical hospitals. Distinct responsibilities were preferred the most by respondents from a university hospital and less preferred from respondents who were not sure about the employer. The same scenario was found for the attribute workload, whereby a low workload is preferred by university hospital respondent and less valued by respondents with unknown provider. Work environment was similar important to all respondents in the groups of hospital provider. For detailed results, see appendix, table 18.

### 3.3 Monetary assessment of less favourable profession characteristics

It is clear from the analysis that monetary reward is an important attribute. However, there may be possible trade-offs across monetary and non-monetary characteristics of the job. Hospital manager require an understanding of how to monetary assess less favourable characteristics of the nursing profession. To gain such an understanding, we used the results of the DCE in a counterfactual simulation. Thereby, we considered a simplified case, in which a nurse has the choice between two hospital offers: the first hospital offers the most preferred attribute levels, however, the salary is only 2,500€ per month. The second hospital offers in one of the attributes a less attractive working condition. For each of the attributes, we aimed to identify the change in probability of choosing the second hospital, if the second hospital does not compensate the less attractive attribute through, e.g., a higher salary ( $\Delta Pr$ ).

$$(2) \Delta Pr = 0.5 - \frac{1}{|H|} \sum_h \frac{e^{v_{h,Hospital 2}}}{e^{v_{h,Hospital 1}} + e^{v_{h,Hospital 2}}},$$

Where  $|H|$  is the number of respondents  $h$ ,  $v_{h,Hospital 1}$  refers to the deterministic utility of choosing Hospital 1 and  $v_{h,Hospital 2}$  is the deterministic utility of the less attractive second hospital.

In a second step, we identify the required increase in salary ( $\Delta s$ ) that would compensate for the less employee-friendly working environment. Therefore, we minimise

$$(3) \min_{\Delta s} \left( 0.5 - \frac{1}{|H|} \sum_h \frac{e^{v_{h,Hospital 2} + \beta_s \cdot \Delta s}}{e^{v_{h,Hospital 1}} + e^{v_{h,Hospital 2} + \beta_s \cdot \Delta s}} \right)^2,$$

where  $\beta_s \cdot \Delta s$  specifies the required increase in earnings to compensate for the less attractive attribute level. Table 7 reports the percentage point decreases in choice shares as well as the earning equivalents.

Table 7: Compensation rates

Attribute	Level	Change in probability $\Delta Pr$	Compensations in salary $\Delta s$
Official recognised profession	No	10.98%	229.73€
Shift types	Three-shift operation	22.63%	553.97€
	On-call duty	19.79%	463.25€
Autonomy	Distinct responsibilities	15.96%	372.04€
Work environment	-Respectful and very professional relationship between physicians and other health care workers	11.93%	244.69€
	-Impersonal and formally relationship between physicians and other health care workers	30.39%	869.01€
Work content	Mostly caring activities	30.75%	1,145.79€
Workload	Middle	3.19%	64.50€
	High	9.41%	201.04€

Baseline: not official recognised profession, no weekend shifts, distinct responsibilities, friendly and open relationship between physicians and other health care workers, low workload, 2,500€ salary

The highest compensation rate is related to work content. An extra payment of 1,146€ gross per month is required if nursing/caring activities are demanded. Based on the current average starting surgical technologist's salary of 2,500€ per month before taxes, this means a massive salary increase of over 45.96%. According to the pay-scale in force, an average increase of 2.5% per year reflects the real world. Vice versa no monetary compensation is required if the position does not involve any nursing/ caring activities. A more unobservable factor is work environment. In our study, we characterised work environment as the relationship between the trainee and the physician and other health care worker. Even though, it is unrealistic to compensate for a tense relationship between the staff, we calculated a high compensation rate of 869€ to accept an impersonal and formal relationship instead of a friendly or respectful work environment. The large amount demonstrated once again the importance of a good work environment per se. A three shift operation needed to be compensated with 553.97€, whereby an on-call duty will rather be accepted with a compensation rate of 463.25€. Even though, low responsibilities and high workload seemed more of a subjective matter. The price tag of 372€ to accept low responsibilities and 201€ to accept a high workload exemplified the indifferent importance. The compensation to embrace a position without an official certification is 229.73€.

#### 4. Discussion

It turned out, that earnings play a major role in choosing the job for a surgical technologist trainee. Even though, by dividing the dataset in subgroups, earnings gained the highest utility throughout. At a first glance, this seems natural as in the end a job enables a living. However, several studies showed the importance of other attributes to implement policy interventions to cope with labour shortage. Blaauw et al. (2010) reported about better occupational opportunities

in Africa as well as health insurance coverage in Thailand to attract nurses in rural areas. In contrary, Scott et al. (2015) found out that autonomy is significantly important to nurses and midwives in Australia. Our findings, of earnings to be most important to our target group might mismatch the common expression of health care worker, especially nurses, to be less focus on their wages but more motivated through different soft factors like a positive working environment (Di Tommaso et al. 2009). Morris and McGuire (2002) associated a negative net financial benefit of becoming a nurse with the tendency to decide for another career path. Likewise, McHugh and Ma (2014) described the relation between wages and job dissatisfaction with intent to leave the job, so did Shields and Ward M. (2001) as they linked job dissatisfaction to a low wage and higher intention to quit. A recent paper of Hanel et al. (2014) supported the increase of wages in order to increase labour supply as they stated it to be a more promising tool than previous research stated. As opposed to that, Heyes (2005) claimed that increasing wages to attracted more people for a nurses job, attracted the “wrong sort of person” (Heyes 2005) as an over-performing nurse is associated with a low wage and stronger vocations and vice versa.

Surgical technologists are specialised health care worker with the primary tasks to assist the physician as well as to prepare the OR before, during and after the surgery. They are responsible to coordinate the whole surgery procedure. The tasks are more of a technical nature and the direct and personal contact to the patient is limited. When the patient arrives in the OR, the narcosis is commonly already initiated and the patient is fast asleep. Caring activities such as nurses fulfil are hence limited to a minimum. In our study, we aimed to examine the impact of work whilst choosing a profession. We believe it to be the first DCE study including the attribute “work content” focusing on caring activities. We found the attribute work content had a major impact in the respondents’ preferences. Positions, which involve caring activities seemed unattractive to the respondents. Hence, it derives from the results, that choosing a nursing training seems not to be an option compared to the more technical position of surgical technologists. Within the survey, 738 respondents emphasised this assertion as they reported not to be willing to opt for a nursing (caring) profession or other health care profession other than what they already chose. Moreover, paying a monetary compensation rate of 1,145.79€ gross per month (+45.96% salary increase) in favour to accept caring activities is rather unrealistic as it is not affordable for the health care system to cope with this extra costs. To a greater degree, such a high increase in wages could emphasise a cascade effect as other health care workers could demand a pay rise as well.

Things have come full circle regarding the two most important attributes. Earnings on one hand were very important to the target group simultaneously work content, here no nursing activities, had a strong influence too. The willingness to accept nursing activities has its price in terms of a very high compensation rate. Relating to Heyes (2005) to pay the high compensation rate would end up in a highly paid underperforming (less vocation) nurse. Obviously, positions with few to none nursing activities seem attractive to a special group of people, willing to work within the health care sector. This is a key finding within this study as it informs politics of gaining labour force through specialised position whereby otherwise this group of persons would not be available for the health system. Thus, focusing on attracting nurses is absolutely worth striving for; however, it seems necessary to evaluate for which tasks within a hospital

nursing skills are mandatory and for which ones a specialised training is more favourable. Again, other countries, for instance within the commonwealth and the US seem more efficient to reallocate nursing tasks by supporting specialised health care positions.

Another important aspect for a surgical technologist's trainee was a friendly and open relationship between the staff, especially between doctors and other OR staff. A compensation rate of 869.01€ to accept an impersonal work environment highlighted these findings. Previous research has shown that the intention to leave nursing and the morale and job satisfaction of nurses is associated with a poor relationship between the nurse and the physicians (Heinen et al. 2013; Rosenstein 2002; Manojlovich 2005). During the focus group interviews, working on the ward was associated with a more formal and more hierarchical work environment between nurses and medical doctors. Finkelman and Kenner (2013) strengthened this view as an external factor of nurse's missing voice and self-esteem due to hierarchical structures within the health care system as well as the perceived authority of doctors. On the contrary, working in the operating room was associated with being an active and respected part of the whole team. It is an important finding as other studies linked an esteeming workplace culture to higher employee motivation (Tumulty et al. 1994). McHugh and Ma (2014) described the significant influence of the work environment for (good) nurses outcomes. To build a sophisticated and team-oriented work environment seems a relevant goal for every hospital, not only to attract labour force but also to be able to keep it. Image campaigns as well as team building trainings seem one possible way to invest in appreciated work environment.

Scott et al. (2015) concluded in his paper the striving for great autonomy is based on problematic relationships between the management and other health care workers. Nevertheless, autonomy with an average important weight of 8.5% was not valued in our study to such extend compared to the other attributes. One possible explanation, is the differences between the study groups (nurse's vs surgical technologist's trainees) as well as the work environment (ward/OR). Working within the OR means to follow clearly the physician's order, whereby working on the ward means to be able to cope with situations even though without a doctor immediately on the side. Hence, the attitude and awareness of nurses compared to surgical technologists regarding autonomy may differ. Nevertheless, a compensation rate of 372.04€ for accepting low responsibilities however indicates that autonomy is not trivial but anyway valued to a lower extend.

When it comes to shift types, obviously, free weekends are highly preferred. Nevertheless, it is common practice in Germany to operate either an on-call duty or a three-shift regime. Usually, nurses on the ward in Germany stick to a three-shift system, whereby the working schedule of an OR worker depends on the hospital. Large hospitals with a huge amount of patients can generate revenues by operating a 24/7 surgery regime, hospitals with a smaller number of patients or other limited resources might not be able to do so. Hence, an on call-duty is widely used. Nevertheless, both options had a negative impact to the respondents, as both is associated with undesirable working hours. However, a three-shift operation – and again a nurse's job characteristic- faced a utility loss to a greater degree than an on-call duty regime linked to a compensation rate of 553.97€. Work-life balance correlates highly with control over the working schedule (Tausig and Fenwick 2001) hence, offering an flexible working schedule

compared with an attractive payment seems to be mandatory to attract labour force. Besides, previous research showed higher burnout rates through extensive long shifts (Dall'Ora et al. 2015) as well as decreasing job satisfaction (Han et al. 2015). Burnout and job dissatisfaction are main drivers for nurses to quit their job or to leave the nursing profession altogether (Flinkman et al. 2010). To keep in mind, personnel costs are the main cost driver within companies, however, downtime for instance in the OR would not only effect the health outcome of a patient but also generate a revenue loss which might trumps personnel costs.

Interestingly, an official recognised profession was less important to the respondents also associated with a low compensation rate of 229.73€ to accept a missing official certification. Due to the labour shortage in health care, the labour market situation is excellent. Facing unemployment appears to be unlikely. Nevertheless, this practice involves personnel disadvantages for the surgical technologists as well as monetary disadvantages for the hospitals. However, Hayek (1944) argued against government regulations within the markets, thus anybody would be able to work in a profession one likes. Eventually, demand induces supply and transparency and market interactions secure quality. Particularly, this seems comparable to the special surgical technologist's case, the demand prevails the supply and hospitals helped themselves by creating a new profession.

Briefly, the importance of earnings is obvious and matches with previous research (Elliott et al. 2007; Shields and Ward M. 2001; Phillips 1995; Morris and McGuire 2002; Hanel et al. 2014) and should be considered by policy makers as one instrument to attract further staff and in order to retain staff. Increasing wages, however is seen as short term solution (Phillips 1995). To implement adequate recruitment and retaining strategies policy makers need to face the market in a long run (Phillips 1995) and taking other, non-monetary attributes into account (Di Tommaso et al. 2009). In our study, we showed how the preferences of a surgical technologist trainee demonstrate a vigorous disfavour towards any perceived nursing job characteristics such as caring activities, hierarchical work environment or shift types. On one hand, our results inform policy makers about the importance to focus not only on the nursing profession but also to take into account the existence of a group of people who is willing to work within the health care system however associated with strong preferences against nursing activities, especially caring. In addition, those people accept rather a job without official certification than taking advantage of an official certified nursing degree. Thus, implementing new and specialised profession through reallocating former nursing tasks- what hospitals already did with the surgical technologists- should be considered while coping with labour shortage. On the other hand, policy maker and hospital provider can also benefit from our results relating to the nursing profession. Interventions to enhance the external and internal awareness of the nursing profession seems necessary. Whereby, work content, in our study caring activities, could be considered as strong facts; hence, people need to be willing and able to full fill caring tasks, attributes such as shift types, work environment and earnings could be influenced by hospital provider and policy maker. It is worth to add our target group were composed of 80% women; hence, no gender effect observable. Since our study is representative for the group of trainees, we are able to show a clear trend against caring activities from this profession group.



It would be interesting to address further health care labour market research to observe the preferences of graduated and experienced surgical technologists. Moreover, involving nurses with specialised trainings e.g., OR nurses would be advantageous to reflect their willingness to go back to perform nursing duties such as caring tasks on the ward. Besides, measuring the job preferences of nursing trainees could also be worth striving for. If quality of care is affected due to a missing official regulated standard training of surgical technologists is not considered within this paper, however is as well indicated as further research potential.

# Preferences of a new health care profession. A pilot study with anaesthesia technologist trainees in Germany<sup>12</sup>

## 1. Introduction

OECD countries appear to be increasing the amount of non-physician health care workers. To attract more people to work within the health care system, it may be increasingly necessary to develop job positions other than the classic nursing or physician role. Canada for instance introduced the position of physician assistant in order to increase the efficiency of health care through the substitution of lower skilled workers for physicians, allowing physicians to concentrate on higher level skills and increase higher quality outcomes (Delucas 2014). In Europe, at least three countries introduced the physician assistant recently, among them Germany (Merkle et al. 2011). The trend of these specialised professions expand in many areas. Different positions within the operating room or the public sector for instance are available in UK aiming to support or to substitute current professions (NHS 2018).

Indeed the German hospital system appears to implementing a range of new health care positions. One example is the position of anaesthesia technologist, a relatively new field in Germany and comparable to the anaesthesia technologist in the US (America Society of Anesthesia Technologist and Technicians 2018) and Canada's anaesthesia technician (Tipping 2018). In 2011, the German hospital association published the first training guideline to become an anaesthesia technologist (German Hospital Association 2011). The tasks of an anaesthesia technologist in Germany include being a direct support to the responsible anaesthetist by e.g. monitoring the patient during narcosis as well as taking care of the patients within the post-anaesthesia care unit. The training takes three years and includes a practice part within the hospital and theoretical education in school. An anaesthesia technologist is able to work in the operation theatre area and the included units such as the post-anaesthesia care unit; however, is not able to work on the intensive care unit as the training do not involve learning any caring or nursing activities. The training is thus aiming to educate a much specialised profession group. There are currently approximately 250 training positions in Germany available, compared to the 1500 surgical technologist training in Germany. Hence this young profession is still developing<sup>13</sup>.

All this progress in the health care labour market seems beneficial in terms of attracting and developing the optimal composition of the future workforce. Hospital managers therefore require a deeper knowledge over each staff group's preferences to be able to provide maintain an optimal recruitment process. In general, the recruiting process is part of the human resource management and is characterised by providing the appropriate quantity combined with pertinent quality of labour force in a decent timeframe to satisfy the company's needs (Staehele 1989). Human resource management is easily described as "...management of work and management

---

<sup>12</sup> Saunders K., Hagist C., McGuire A., Schlereth C. (2018) Preferences of a new health care profession. A pilot study with anaesthesia technologist trainees in Germany; Submitted at WHU Economics working paper series assigned number 19/02, presented at the German Conference on Health Economics 2019.

<sup>13</sup> It is not yet a fully official certified profession/ training of health care professions such as nursing, Anaesthesia technician are an apprenticeship not university studies.

of people to do the work.” (Boxall and Purcell 2011, p.3). However, one key challenge, especially in health care is to attract the appropriate workforce to do the work.

The image of health care profession is currently not good. The nurse’s profession appears to suffer from low self-esteem as well as a stereotype public image such as the unskilled handmaiden or being sexualised (Fletcher 2007; Hammer and Tufts 1985; Ó Lúanaigh 2017). Emeghebo (2012) outlines the negative image of nurses as perceived by other nurses within the hospital sector; the perception of senior nurses towards young nurses is also negative. Only nurses within child-/maternal care nurses appear to retain high levels of perceived image (Emeghebo 2012). In line with these perceptions, Fletcher (2007) stated that the negative image of nursing is a result of the negative self-image of nurses which is interdependent with the public image. However, a survey by Seago et al. (2006) in the US shows that the public perceive nursing income to be good. Yet they also found that the general image professional image tended to be negative, as a nurse’s job was seen to afford little independence and this was partly attributable to the nursing post being a “female” job.

Morris-Thompson et al. (2011) described the negative public image as a recruitment hurdle which needs to be removed to enable recruitment of an appropriate workforce. While Buchan and Aiken (2008) stated that the origins of nurses shortage may not lay with a lack of qualified nurses but within the amount of nurses not be willing to work in current conditions. Poor working conditions are associated with job dissatisfaction and a higher intention to leave nursing. Working conditions consist of a wide range of variables such as payment, working hours as well as the relationship between nurses and physicians. Shields and Ward M. (2001) found a nurses perception of poor payment compared to other profession linked to job dissatisfaction as well as the importance of the work environment quality. Kankaanranta and Rissanen (2008) concluded a long-term strategy, which focuses on work environment such as schedules that are more flexible, is needed to keep nurses within their job. In another paper, Kankaanranta and Rissanen (2009) found that solely wages cannot increase labour supply as working conditions need to be taken into account. Similar results were found by Eberth et al. (2016) who identified that flexible working conditions as well as better career perspectives may increase labour supply. Dall’Ora et al. (2015) stated that nurses who work extensive long shift ( $\geq 12$  hrs.) tend to be dissatisfied with their job and have a higher intention to leave. Heinen et al. (2013) found a higher intention to leave associated with a poor relationship between the nurse and the physician. The role of the relationship between the nurse and the physicians has been discussed within the literature and stated as a main source of conflict and stressful work environment (Rosenstein 2002; Greenfield 1999; Heinen et al. 2013).

Hence, key human resource management obstacles are self-perception of nurses and the public image as well as to provide an appropriate work environment. Studies like the NEXT study, a EU financed project to identify the job exit behaviour of nurses (Simon et al. 2005) is useful to understand why an individual leaves the job or the profession altogether to provide appropriate retention strategies. However, hospital manager’s should be aware of why someone choses the profession in the first place to be able to provide adequate recruitment strategies. The literature mainly covers the job preferences of the classic health care profession of nurses and doctors. We know that especially nurses value work environment and job satisfaction to a greater degree

compared to high wages (Di Tommaso et al. 2009; Kankaanranta and Rissanen 2009; Buchan and Aiken 2008; Kankaanranta and Rissanen 2008; Shields and Ward 2001). However, as response to the labour shortage of nurses we experience a change away from the classic nursing profession towards more specialised professions. These newly created roles within the health care markets seem efficient in terms of unleashing professional time but little is known about the preferences of this new profession groups (Saunders et al. 2018a). However, the preferences of a nurse cannot be compared to the preferences of, a surgical technologist for instance as the sample population and the target group differs in background, training and many other characteristics. A previous study on job preferences on surgical technologist's trainees shows a high disutility against caring activities, giving one preference-based explanation as to why this group self-selects into surgical technology instead of becoming a nurse (Saunders et al. 2018a).

This study of the job preferences of anaesthesia technologist trainees aims to identify the motivation of the very young profession group of anaesthesia technologist in Germany to enter this profession. No study could be identified which focuses on anaesthesia technologist. Hence, our study is the first discrete choice experiment (DCE) to analyse the preferences of anaesthesia technologists. Besides, this is the first study, which collects data of anaesthesia technologist in Germany, as the profession is not official certified thus not considered by the Federal Office of Statistics. The results should support hospital managers and policy makers to understand the choice behaviour of this very young professional group in order to develop appropriate recruitment strategies in favour of the further development of this profession.

## 2. Method

### 2.1 Discrete choice experiments

To obtain the relevant primary data we relayed to discrete choice experiments which are increasingly used in health economics to estimate the choice behaviour and thus to identify the preferences and willingness to pay for health care of individuals. The preferences are estimated through a defined number of attributes with different levels. Regarding to Lancaster K.J. (1966) the different levels represent the value, thus, the difference in utility of each level. The survey usually contains of a number of choice sets, based on hypothetical scenarios. The respondents can choose their preferred scenario between two or more possible alternatives, whereby all choice possibilities are linked to a price. Generally, respondents choose the scenario with the highest expected utility (Ryan et al. 2007). For a recent review of the literature regarding to discrete choice experiments in health economics please see Clark et al. (2014).

### 2.2 Experimental study

We contacted trainings centres via Email and after a formal approval process thirty training centres agreed to participate<sup>14</sup>. It is worth noticing, that the Anaesthesia Technologist training

---

<sup>14</sup> The study on job preferences of Anaesthesia Technologist trainees took place in Germany from January to July 2017. This study was in cooperated within a DCE on job preferences of surgical technologist trainees (Saunders et al., 2018). We used two different target groups, Surgical Technologist trainees and Anaesthesia Technologist trainees, but provided a similar questionnaire. Due to the heterogeneity of both groups as well as the fact that Anaesthesia Technologist is a rather new

is still developing in Germany and not many training centres offer this training at present. Only approximately 250 training positions are available at present<sup>15</sup>. We included trainees from all training levels (1<sup>st</sup>-3<sup>rd</sup> year) and provided paper-based surveys as well as an online survey. However, training centres preferred to allocate paper-based surveys due to data security. We used the software DISE in order to develop the survey.(Schlereth and Skiera 2012). In the first place, we provided the respondents with a brief introduction to the survey in order to inform them about the sequence of the survey. The survey contained of three parts in total, whereby the first part included questions about the sociodemographic background of the respondents. The second part contained of the discrete choice experiment with fourteen choice alternatives. Initially, we asked the respondents to imagine themselves a time back before applying for the training. Afterwards, respondents were asked to pick their optimal choice out of two alternatives fourteen times. The final third part of the questionnaire provided some training specific questions. The average time to answer the whole survey took approximately fifteen to twenty minutes.

For the development of our survey, we needed to define the attributes and attributes levels in the first place. In order to do so we referred to the procedure of Helter and Boehler (2016). Hence, we determined relevant attributes and attributes levels based on literature search as well as during discussion with experts of the nursing field. The next step included focus group interviews which took place in two different school in different federal states in Germany. During the focus group interviews a list of ten possible attributes were discussed regarding comprehension and regarding the importance reflecting real world issues. Afterwards, the list of attributes was reduced to seven attributes, which were identified as most relevant to the target group. We performed a pre-test of our survey whereby we identified some comprehensible issues regarding the wording. After editing the survey, we ran a successful second pre-test. Our survey included seven attributes. The first attribute was classified as “officially certified profession” with two levels (yes/no). Since the profession of the anaesthesia technologist is not officially certified some disadvantages for this profession group exists. For instance, the access to further education such as university studies is generally limited to profession groups with an official certification. Besides, some uncertainties exist if the individual experience unemployment as the employment agency may grant the individual with the status “unskilled worker” which can affect the social payments. Hence, we included this attribute to figure out the importance of this attribute to the respondents. The second attribute was “shift types”, hence linked to working hours. This attribute consisted of three levels (free weekends/ three shift operation/ on-call duty). Previous literature stated the relevance of schedule flexibility (Tausig and Fenwick 2001) and a higher intention to leave the nursing profession due to dissatisfaction with the working schedule (Dall'Ora et al. 2015). Besides, evidence suggested the link between negative health outcomes of the individual and extensive shift work (Harrington 2001; Dall'Ora et al. 2015). Work-life balance is a key factor in our modern society; to understand the preferences regarding working hours, especially in a health care setting is crucial to retain staff. The third attribute was “autonomy” with two levels (low responsibilities/distinct

---

profession with yet a small total population of Anaesthesia Technologist trainees in Germany compared to Surgical Technologists we treat them separately.

<sup>15</sup> Compared to 1342 surgical technologist trainee places.

responsibilities). Previous studies showed that low autonomy can cause a higher intention to leave the current position due to dissatisfaction (Han et al. 2015). Besides, during the focus group interviews respondents stated their extent affection towards positions with distinct responsibilities. Relating to Scott et al. (2015), we decided to provide a more openly worded attribute to obtain the respondents flexibility in interpretation of the levels. The fourth attribute was “work environment”. We interpreted work environment as the relationship between the respondent, the physicians and other health care worker within a hospital. We know that a troubled relationship between nurses and physicians can contribute to a stressful work environment and a higher intention to leave the profession (Heinen et al. 2013; Rosenstein 2002; Greenfield 1999). During the focus group interviews, the nursing profession was associated with a hierarchical relationship between nurse and physician. The attribute consisted of three levels (friendly and open relationship/ respectful and professional relationship/ impersonal and formal relationship). Attribute number five was stated as “work content”. We interpreted work content as positions consisted of mainly nursing activities and positions with minor nursing activities. We did not identify another study, which incorporated work content as we did. The aim was to estimate if someone is also willing to fulfil nursing tasks, hence, if someone is also willing to switch a strictly specialised position such an anaesthesia technologist towards a more versatile position such as nursing. The sixth attribute was “workload” with three levels (low/middle/high), again rather of a more general nature to retain the respondents freedom of interpretation. This is necessary as the workload could depend on the hospital provider (small, rural hospital versus large, intercity hospital). Workload is also associated with high stress level and low job satisfaction (Lo et al. 2018; Ishihara et al. 2014). Finally yet importantly, attribute was “earnings”. We provided three levels based on the current average wage gross (2,500€) as well as a level with 2,900€ gross and 3,300€ gross, aligned with experts to provide a real world scenario.

Our survey contained of 14 choice sets in the DCE. We decided to opt for 14 choice sets as the literature stated that respondents are mentally capable of answering even a higher number of choice set without any problems (Bech et al. 2011). Results of our pre-test suggested that 14 choice sets are an adequate number of choices for our target group. We created a D-optimal (2·3·2·3·2·3·3) fractional factorial design by deploying the approach suggested in Street and Burgess (2007). These designs are characterised by a high degree of efficiency (98% d-efficiency in our study) as well as they are adaptable for a versatile ranch of research tasks. Each choice set contained of two possible positions and the respondents were asked to choose which of the two positions they prefer to work in.

### *2.3 Analysis*

For the analysis, we used the wiely applied hierarchical Bayes approach provided by Train (2009) to estimate the preferences in Matlab. The estimation was based on the random utility theory (Thurstone 1927). Detailed information regarding the model used in this study are published elsewhere (Saunders et al. 2018a).

### 3. Results

#### 3.1 Respondent characteristics

Fifty-seven anaesthesia technologist trainees completed the survey. This covers approximately 23% of the total anaesthesia technician trainee population (n=250). 97% of the respondents used the paper-based survey and only 3% participated online<sup>16</sup>. Hence, we do not report online-based results as an independent group. We recorded 63% female respondents. This result supports the clear drift of a female work force in health care (WHO 2008; OECD 2017). Nevertheless, compared to the population of health care worker in Germany where 24.2% are men and 75.8% are female, the amount of men taking part in the anaesthesia training is relatively high (Destatis 2018). Respondent's average age was calculated as 21.3 years (female) and 23.5 years (male). For further sociodemographic characteristics, see table 8.

Table 8: Respondents characteristics

	<i>Survey respondents</i>	<i>Percentage share<sup>17</sup></i>
<i>Number of trainees</i>	57	Total population 250 <sup>18</sup> (23%)
<b><i>Personal resp. characteristics</i></b>		
<i>Female</i>	36	63.2%
<i>Male</i>	21	36.8%
<i>Average age female</i>	21.3 years	
<i>Average age male</i>	23.5 years	
<b><i>Educational background</i></b>		
<i>Secondary modern school qualification</i>	2	3.5%
<i>High-school diploma</i>	20	35%
<i>vocational baccalaureate diploma</i>	12	21%
<i>A level</i>	23	40.4%
<i>University studies</i>	0	0%
<b><i>Years of training</i></b>		
<i>1<sup>st</sup> year of training</i>	29	50.1%
<i>2<sup>nd</sup> year of training</i>	20	35%
<i>3<sup>rd</sup> year of training</i>	8	14%
<b><i>Current workplace</i></b>		
<i>University hospital</i>	14	24.6%
<i>Private hospital</i>	15	26.3%
<i>Public hospital</i>	14	24.6%
<i>Ecclesiastical hospital</i>	10	5.7%
<i>Not sure</i>	4	7%

<sup>16</sup> Solely some training-centre host email accounts for their trainees. Besides, using private e-mail accounts to send the surveys is not allowed due to data security.

<sup>17</sup> Numbers were rounded.

<sup>18</sup> German Government, 2014.

### *3.2 DCE results - Parameters and importance weights*

The internal and predictive validity (first choice hit rates) were calculated to examine the benevolence of our estimation. Therefore, we removed two choice sets from our estimation in order to calculate the internal validity<sup>19</sup>. The predictive validity was calculated by using the same percentage for the two choice sets, which we did not consider for our estimation. The internal first choice rate is 99.71% and the predictive first choice hit rate is 79.82%. Every first choice hit rate greatly exceeded the 50% threshold of a random choice. For the detailed results of the averages over respondents' parameter estimates for each attribute level as well as the associated importance weights for each attribute, see table 9. The parameters are all of the expected sign.

Earnings with an average important weight of 34% seemed to be the most important attribute to the surgical technologist trainees. Of second most importance, with 21%, the work environment appeared to be of great importance to the respondents, with a friendly and open relationship between physicians and other health care workers is preferred over an impersonal and formal relationship, which is associated with a utility loss. In third place of the attribute ranking was work content at 13%. This encompassed caring activities, which tend to lead to disutility. However, the total share of 13% within the third place compared to the first place with 34% and second place with 21% demonstrated a massive drop of the respondent's importance towards the other attributes. Autonomy with 9.4% as well as workload with 7.8% seemed to be of similar importance, whereby distinct responsibilities are preferred as well as moderate workload (middle). An official recognised profession was the least important attribute to the respondents with an average important weight of 4.4%.

---

<sup>19</sup> This is about the percentage of choice sets, whereby the picked alternative is characterised by the utmost deterministic utility as per the individual's respondents parameter estimates.



Table 9: HB estimation

<i>Attribute</i>	<i>Level</i>	<i>Parameters (standard deviation across household- specific posteriors)</i>	<i>Importance Weights (IW)</i>
<i>Official recognised profession</i>	- Yes	0.175 (0.539)	4.4%
	- No	-0.175 (0.538)	
<i>Shift types</i>	- No weekend shifts	0.429 (0.344)	9.2%
	- Three-shift operation	-0.298 (0.263)	
	- On-call duty	-0.130 (0.270)	
<i>Autonomy</i>	- Low responsibilities	-0.372 (0.510)	9.4%
	- Distinct responsibilities	0.372 (0.510)	
<i>Work environment</i>	- friendly and open relationship between physicians and other health care workers	0.706 (0.560)	21%
	- respectful and very professional relationship between physicians and other health care workers	0.259 (0.404)	
	- impersonal and formally relationship between physicians and other health care workers	-0.965 (0.901)	
<i>Work content</i>	- none to very low caring activities	0.536 (0.778)	13%
	- mostly caring activities	-0.536 (0.778)	
<i>Earnings (=price factor, per 1,000€)</i>	- 2,500€	2.668 (2.101)	34%
	- 2,900€		
	- 3,300€		
<i>Workload</i>	- low	0.172 (0.326)	7.8%
	- middle	0.223 (0.201)	
	- high	-0.396 (0.353)	

N=57

Even though, we are aware of the small data set due to the fact we observed a young profession with limited numbers of training spaces, we provide results through splitting the data set into gender, training level and previous work experience in other fields than anaesthesia or the health care sector at all. Again, due to the small number of observations the statistical significance is limited though the results can demonstrate quite a trend for these groups.

To observe potential gender effects, we separated the data set into “female” (n=36) and “male” (n=21) and reran the analysis. Again, earnings was the most important attribute to both groups, females (IW 34.7%) and men (IW 33.4%), and did hardly differ to the whole data set with an average important weight of 35%. Nevertheless, it is notable that men valued earnings lesser than females. The second important attribute was again, likewise to the whole data set, work environment (IW 21%) for females (IW 20.4%), for men (IW 22.3%). The importance of work environment, especially experiencing a disutility for an informal relationship with the physicians as well as gaining utility through a friendly relationship with the physician was of greater importance for men. Another difference in the importance of attributes between both gender groups was work content. Men seemed to suffer from a slightly greater loss in utility when a position involves caring activities compared to female. Caring activities and nursing are often linked to females, however both gender group tend to face a similar loss of utility when the position involves caring activities. The relevance of the remaining attributes were relatively

similar for both gender groups compared to the whole data set. Detailed results can be found in table 10.

Table 10: HB estimation gender

Attribute	Level	Parameters	Important	Parameters	Important
		(standard deviation across household-specific posteriors) Female	weights	(standard deviation across household-specific posteriors) Male	weights
Official recognised profession	- Yes	0.151 (0.565)	3.9%	0.217 (0.488)	5.3%
	- No	-0.151(0.565)		-0.217(0.488)	
Shift types	- No weekend shifts	0.437 (0.355)	9.4%	0.415 (0.325)	8.8%
	- Three-shift operation	-0.296 (0.289)		-0.302 (0.212)	
	- On-call duty	-0.141 (0.271)		-0.112 (0.267)	
Autonomy	- Low responsibilities	-0.419 (0.520)	10.7%	-0.291 (0.482)	7.2%
	- Distinct responsibilities	0.419 (0.520)		0.291 (0.482)	
Work environment	- friendly and open relationship between physicians and other health care workers	0.673 (0.566)	20.4%	0.763 (0.545)	22.3%
	- respectful and very professional relationship between physicians and other health care workers	0.246 (0.397)		0.282 (0.415)	
	- impersonal and formally relationship between physicians and other health care workers	-0.919 (0.892)		-1.045 (0.911)	
Work content	- none to very low caring activities	0.516 (0.816)	13.2%	0.571 (0.705)	14.1%
	- mostly caring activities	-0.516 (0.816)		-0.571 (0.705)	
Earnings (=price factor, per 1,000€)	- 2,500€	2.652 (2.042)	34.7%	2.697 (2.212)	33.4%
	- 2,900€				
	- 3,300€				
Workload	- low	0.159 (0.299)	7.4%	0.195 (0.366)	8.5%
	- middle	0.209 (0.193)		0.247 0.212)	
	- high	-0.368 (0.340)		-0.442 (0.371)	

We divided the data set in absolute beginner (1<sup>st</sup> year; n=28) and advanced trainees (2<sup>nd</sup>-3<sup>rd</sup> year; n=29). Relevant differences appeared within work content. The beginner group suffered a much higher utility loss from an informal relationship with the physician than the advanced group of trainees. The important weights support these differences (IW 1<sup>st</sup> year 23.7%; IW 2<sup>nd</sup> 3<sup>rd</sup> year 19%). The striving for autonomy within the beginner group was quite higher. The beginner group also valued an official certification of the profession to a greater degree as the advanced group. The absence of caring activities was preferred to a similar degree of both groups. However, earnings played the major role and were of similar importance for both groups, also compared to the whole data set. For detailed results, see table 11.

Table 11: HB estimation trainings year

<i>Attribute</i>	<i>Level</i>	<i>Parameters (standard deviation across household- specific posteriors) Year 1</i>	<i>Important weights</i>	<i>Parameters (standard deviation across household- specific posteriors) Year 2/3</i>	<i>Important weights</i>
<i>Official recognised profession</i>	- Yes	0.236 (0.632)	5.9%	0.113 (0.413)	2.9%
	- No	-0.236(0.632)		-0.113 (0.413)	
<i>Shift types</i>	- No weekend shifts	0.396 (0.360)	6.2%	0.463 (0.325)	9.9%
	- Three-shift operation	-0.300 (0.303)		-0.297 (0.215)	
	- On-call duty	-0.096 (0.262)		-0.166 (0.272)	
<i>Autonomy</i>	- Low responsibilities	-0.313(0.410)	7.8%	-0.433 (0.591)	11.3%
	- Distinct responsibilities	0.313 (0.410)		0.433 (0.591)	
<i>Work environment</i>	- friendly and open relationship between physicians and other health care workers	0.768 (0.607)	23.3%	0.642 (0.499)	19%
	- respectful and very professional relationship between physicians and other health care workers	0.351 (0.434)		0.164 (0.347)	
	- impersonal and formally relationship between physicians and other health care workers	-1.119 (0.974)		-0.806 (0.788)	
<i>Work content</i>	- none to very low caring activities	0.541 (0.776)	13.6%	0.531 (0.780)	13.9%
	- mostly caring activities	-0.541 (0.776)		-0.531 (0.780)	
<i>Earnings (=price factor, per 1,000€)</i>	- 2,500€	2.393 (1.952)	33.9%	2.954 (2.220)	35.4%
	- 2,900€				
	- 3,300€				
<i>Workload</i>	- low	0.160 (0.295)	8.5%	0.185 (0.354)	7.2%
	- middle	0.260 (0.208)		0.184 (0.185)	
	- high	-0.421 (0.316)		-0.370 (0.386)	

Some of the respondents already obtained an apprenticeship as well as some respondents were interested in other trainings than the anaesthesia technologist training was. Therefore, we divided the data set into two groups: respondents with relevant work experience and interest in to work in different sectors (n=25) and respondents without any prior work experience (n=32). Earning was again the most important attribute for both groups, however respondents with work experience, valued earnings to a slightly higher extend (IW 34.4%) than the respondents without work experience (IW 33.9%). We found major differences between both groups for work environment. The group with work experience valued work environment to a much lesser extent than the group without any experiences. Besides, experienced respondents suffered a smaller loss of utility from an informal relationship with the physician. Work content (position with caring activities) had a negative impact to respondents without work experience compared to the respondents with work experience, as they do not suffer great utility loss from a position with caring activities involved. An on-call duty regime was less preferred for both groups; however, respondents without any experiences suffered a greater utility loss. Workload was nearly equally valued in both groups, whereby the official recognition of the profession was less valued of respondents without any work experience. For detailed results, see table 12.

Table 12: HB estimation work experience

<i>Attribute</i>	<i>Level</i>	<i>Parameters (standard deviation across household- specific posteriors) Respondents with work experience before starting the training</i>	<i>Important weights</i>	<i>Parameters (standard deviation across household- specific posteriors) Respondents without work experience before starting the training</i>	<i>Important weights</i>
<i>Official recognised profession</i>	- Yes	0.267 (0.512)	6.8%	0.099 (0.549)	2.4%
	- No	-0.267 (0.512)		-0.099 (0.549)	
<i>Shift types</i>	- No weekend shifts	0.404 (0.300)	9.2%	0.405 (0.376)	9.2%
	- Three-shift operation	-0.319 (0.250)		-0.281 (0.273)	
	- On-call duty	-0.085 (0.293)		-0.169 (0.242)	
<i>Autonomy</i>	- Low responsibilities	-0.447 (0.597)	11.4%	-0.309 (0.413)	7.7%
	- Distinct responsibilities	0.447 (0.597)		0.309 (0.413)	
<i>Work environment</i>	- friendly and open relationship between physicians and other health care workers	0.530 (0.494)	15.7%	0.854 (0.569)	25.7%
	- respectful and very professional relationship between physicians and other health care workers	0.170 (0.334)		0.334 (0.441)	
	- impersonal and formally relationship between physicians and other health care workers	-0.700 (0.785)		-1.188 (0.932)	
<i>Work content</i>	- none to very low caring activities	0.552 (0.649)	14.1%	0.532 (0.871)	13.1%
	- mostly caring activities	-0.552 (0.649)		-0.532 (0.871)	
<i>Earnings (=price factor, per 1,000€)</i>	- 2,500€	2.880 (1.881)	34.4%	2.491 (2.263)	33.9%
	- 2,900€				
	- 3,300€				
<i>Workload</i>	- low	0.191 (0.382)	8.1%	0.157 (0.269)	7.5%
	- middle	0.224 (0.200)		0.222 (0.202)	
	- high	-0.415 (0.422)		-0.379 (0.283)	

The trend of these results demonstrated slight differences of preferences within the gender group, which leads to the conclusion that a gender effect is not existent. Nevertheless, quite relevant differences were present within the respondents group with relevant work experiences compared to the group without work experience.

We found that pecuniary characteristics were utmost important to the respondents. Nevertheless, we do not know if trade-offs between pecuniary characteristics and non-pecuniary characteristics exists. However, hospital manager need to understand if there is a way to monetary compensate for job attributes which are of less favour to the employee. To obtain this knowledge we set up a counterfactual simulation by using the results of the DCE. We created a scenario whereby the anaesthesia technologist has a choice between two job offers: One hospital advertises the utmost favourable attribute levels but in combination with a lower salary of 2,500€ per month. The other hospital provides a fewer favourable job characteristic in one of the existing attributes. Our goal was to examine the change in probability of choosing the hospital with the less favourable working conditions under the assumption that the hospital

does not monetarily compensate the unattractiveness of the position by rising wages ( $\Delta Pr$ ). Detailed information about the model are published elsewhere (Saunders et al. 2018a).

Table 13: Compensation rates

<i>Attribute</i>	<i>Level</i>	<i>Change in probability <math>\Delta Pr</math></i>	<i>Compensations in salary <math>\Delta s</math></i>
Official recognised profession	No	6.39%	110.77€
Shift types	Three-shift operation	16.37%	272.87€
	On-call duty	12.77%	210.28€
Autonomy	Distinct responsibilities	14.11%	248.43€
Work environment	-Respectful and very professional relationship between physicians and other health care workers	10.62%	165.17€
	-Impersonal and formally relationship between physicians and other health care workers	27.30%	649.90€
Work content	Mostly caring activities	17.04%	382.07€
Workload	Middle	1.21%	19.14€
	High	12.50%	213.01€

*Baseline: non official certified profession, no weekend shifts, distinct responsibilities, friendly and open relationship between physicians and other health care workers, low workload, 2,500€gross salary*

The largest monetary compensation rate is linked to an impersonal and formally relationship between physicians and other health care worker. Even though, it is hardly possible to put a price tag on a rather unobservable factor such as work environment, in our study classified as the relationship between the staff, the large compensation sum of 649.90€ suggested however the extend importance of this attribute to the target group. A position containing of caring activities need to be compensated by 383.07€. This is an increase in salary of approximately 16% based on the baseline salary of 2,500€ gross. This high pay rise seems unrealistic for hospitals to fulfil as a pay rise of approximately 2% reflects the real world. Accepting a three-shift operation needs to be compensated by 272.87€ compared to accepting an on-call duty regime by 210.28€. A higher workload paid off with 213.01€, whereby a moderate (middle) workload seems rather irrelevant relating to the low compensation rate. The low compensation rate of 110.77€ for accepting a job without an official certification indicates the missing importance towards this attribute.

## 4. Discussion

Evidence from literature showed that the preferences of existing professions in the health care sector reflect more non-pecuniary characteristics such as an appropriate work environment and job satisfaction than focus on wages (Scott et al. 2015; Heyes 2005; Di Tommaso et al. 2009; Blaauw et al. 2010). However, since the labour shortage in health care, we are witnessing constant changes on the labour market. New professions are introduced to support or even to replace current occupations. Therefore, especially hospital manager and policy maker need to get an adequate understanding of the preferences of these new occupation groups in order to develop appropriate recruitment strategies as well as to tackle labour shortage. In our study, we investigated the preferences of the very young profession of anaesthesia technologist trainees to recognize their choice behaviour whilst choosing a job.

We found earnings as the most important attribute to the respondents. No relevant subgroup differences could be found. Even though, it is known, that health care professions do not value money to a greater extent compared to work conditions and job satisfaction, previous research showed the increasing importance of earnings (Zeytinoglu et al. 2006; Lum et al. 1998; Morris and McGuire 2002; Shields and Ward M. 2001; Hanel et al. 2014; Elliott et al. 2007). Hanel et al. (2014) stated that labour supply elasticity is higher than previous research suggested, thus increasing wages is a more promising tool to rise labour supply than expected before. Our results support this argumentation as the respondent's preferences demonstrated a high interest in earnings, which seemed one of the main driver whilst choosing a job. A previous study of job preferences of surgical technologist found similar results regarding the importance of earnings (Saunders et al. 2018a).

However, Kankaanranta and Rissanen (2009) and Di Tommaso et al. (2009) suggested that wages solely would not increase labour supply sufficiently. This suggestion supports our finding that work environment had a strong impact through all respondents. Work environment in our study is characterised as the relationship between the anaesthesia technologist trainee, the physicians and other health care worker. The respondents suffered a great utility loss from a formal and impersonal relationship between the physicians and other health care worker. A massive compensation rate of 649.90€ per month for accepting a rather impersonal atmosphere highlighted our findings. Especially new trainees within their first year of training and respondents without any prior work experience suffered a utility loss more largely compared to the other subgroups. These findings indicate the need of extra support for young professionals within their first years. Literature already draws the link between a good work environment and job motivation (Moynihan and Pandey 2016; Tracey et al. 1995; Raziq and Maulabakhsh 2015). In the literature, the work environment of nurses is widely discussed. Work place violence including bullying, oral abuse or physical violence from all groups including patients, relatives or other health care workers tends to get more problematic (Jackson et al. 2002; Henderson 2003; Kwok et al. 2006; Hesketh et al. 2003). To focus on the relationship between health care staff, bullying is a big issue (Hutchinson et al. 2006). In a NHS trust 44% of nurses reported about experiences with bullying (Quine 2001); in another study 27.3% of the nurses reported workplace bullying in the last six month (Johnson and Rea 2009). Even though, a poor relationship between the nurse and the physician is a driver for a nurse to leave the job and/or

the profession (Heinen et al. 2013). In his research Greenfield (1999) previously stated that two-third of the nurses had been abused by physicians every two-three months. This massively contributes to a stressful work environment of nurse (Greenfield 1999; Rosenstein 2002; Heinen et al. 2013). Besides, the cliché of the unskilled doctors handmaiden still exists (Ó Lúanaigh 2017). Hence, our results demonstrate a strong need of the respondents to work in appropriate environment. This findings support hospital manager especially to invest in long term strategies to keep motivated staff and to prevent premature leaving due to miscommunication or inappropriate behaviour between the staff.

We believe to be the first DCE study included the attribute work content in association with caring activities. All respondents suffered a quite small utility loss when a position involves caring activities. In comparison, the study of job preferences of surgical technologist found a strict refusal towards caring activities associated with a very high compensation rate of 1,145€ additional payment per month (salary increase of approximately 49%) (Saunders et. al 2018a) compared to an additional payment of 382.07€ per month for anaesthesia technologists. However, being an Anaesthesia technologist means having more contact to the patient than a surgical technologist does but less contact to the patient than a nurse. An anaesthesia technologist for instance needs to care for the patient within the post-anaesthesia care unit. Hence, the rather balanced attitude towards caring activities seems convincing.

The attributes shift types, autonomy and workload were of similar importance. However, respondents with prior work experience demonstrated slightly more importance towards shift types as well as autonomy. This might derive from prior work experiences they already endured. Free weekends were preferred which undermine the value of a work-life balance and control over the work schedule which is linked to more quality of life (Greenhaus et al. 2003; Tausig and Fenwick 2001). To accept a three-shift operation a compensation rate of 272.87€ was calculated and for accepting an on-call duty regime an extra payment of 210.28€ was estimated. Previous research linked extensive working hours to higher rates of burnout, thus to an decrease in job satisfaction and a higher intention to leave the profession (Dall'Ora et al. 2015; Kankaanranta and Rissanen 2008; Stimpfel et al. 2012; Heinen et al. 2013). Obviously, hospital manager cannot offer free weekends to all health care staff, however should develop a more flexible working schedule regime to enhance job satisfaction.

The respondents value autonomy to a moderate extent. We found the highest importance towards autonomy for respondents with work experience, which might be related due to this prior work experience and a clear picture of the own professional role. Our results of striving for autonomy matches with the study of Scott et al. (2015) who found the striving autonomy is based on dissatisfaction with the hospital management. Homburg et al. (2013) discussed a higher intention to leave the job and eventually the profession due to an increasing dissatisfaction with the management. It can be explained by the need of a good working environment such as having a responsible job as well as being trusted by other staff and the management can indeed support a good work environment due to being feel valued. Han et al. (2015) found nurses who quit their job experienced less autonomy and poor support from their peers. An indicator for hospital manager to offer responsibilities aligned with the performance on the job.

Since the profession of the Anaesthesia Technologist is very young, this profession is not yet official certified by the government. Without this certification, one can face some disadvantages when it comes to unemployment for any reasons as treated as an unskilled worker. Besides, further education like university studies for instance can get difficult as access is often limited to profession with an official certification. Besides, females value the official certification to a lower extent than men do as well as respondents. The importance of this attribute is also higher for respondents with work experiences, which can be related due to a more experienced and matured personality. However, the importance of an official certification seems the least important to the respondent. This finding matches again with the job preferences of a Surgical Technologist as they face the same problem but do not feel the importance either (Saunders et al. 2018a). An explanation might be the excellent labour market situation where unemployment is unexpected as well as the relatively young age of the respondents, without thinking about future needs.

Briefly, our study presented the job preferences of a very young occupational group. The results highlighted the great importance of earnings within this target group. This finding informs policy-makers but also hospital manager of the possibility to attract and to keep staff through an appropriate payment scheme. However, as previous literature already stated, earnings do not top everything else. Working environment evidently has also a great impact on the respondents. A key information for hospital manager and policy maker is to set up an appropriate payment scheme in combination with an adequate consideration of non-monetary characteristics. In this regard, the Herzberg's dual factor theory of job motivation distinguished between the hygiene factor (e.g. payment) and motivational factors (e.g. responsibilities) which are both needed to stay motivated within the job (House and Wigdor 1967). Hence, our findings set a clear trend to hospital manager to develop tailored recruitment as well as retention strategies for the still growing and young profession of Anaesthesia Technologist.

Further research is needed to observe for instance the potential change in preferences of graduated Anaesthesia Technologist. This study is also limited to some extent due to the small sample size, which however is due to the existing small number of training positions. Further research should be indicated within a growing population. Nevertheless, our study demonstrates as a pilot, a clear trend within this profession.



## **Summary**

This dissertation coped with the preferences of newly developed specialised health care professions in Germany. The government does not officially certify both professions. Due to this missing certification, this profession are not considered within annual public statistical elicitation of profession. Hence, we are first in collecting data of this new profession groups. Besides, we believe it to be the first DCE's in the field of specialised health care professions. Our results provide therefore academic value but furthermore, provide valuable insights for policy maker and hospital manager about the importance of specialised professions. The results showed that those specialised professions attract people who are willing to work within the health care system but under constrained conditions. Our studies contribute to develop appropriate framework conditions in order to enhance the further development of specialised health care professions. Besides, our studies rejected somehow the classic picture of only nurses and physicians working for a better health care supply.

## References

- Aiken, Linda H. (2002): Hospital Nurse Staffing and Patient Mortality, Nurse Burnout, and Job Dissatisfaction. In: JAMA 288 (1), S. 1987. DOI: 10.1001/jama.288.16.1987.
- American Society of Anesthesia Technologists and Technicians (2018): The Growing Profession of Anesthesia Technology. <http://www.asatt.org/?start=5>.
- Auger, P., Devinney, T., & Louviere, J. (2007): Best: Worst Scaling Methodology to Investigate Consumer Ethical Beliefs across Countries. In: Journal of Business Ethics (70 (3)), S. 299–326.
- Bech, Mikkael; Kjaer, Trine; Lauridsen, Jørgen (2011): Does the number of choice sets matter? Results from a web survey applying a discrete choice experiment. In: Health economics 20 (3), S. 273–286. DOI: 10.1002/hec.1587.
- Blaauw, D.; Erasmus, E.; Pagaiya, N.; Tangcharoensathien, V.; Mullei, K.; Mudhune, S. et al. (2010): Policy interventions that attract nurses to rural areas: a multicountry discrete choice experiment. In: Bull World Health Organ (88), S. 350–356. DOI: 10.2471/BLT.09.072918.
- Blum, K.; Löffert, S.; Offermanns, M.; Steffen, P. (2016): Krankenhaus Barometer. Umfrage 2016. Hg. v. Deutsches Krankenhausinstitut e.V. Düsseldorf. [https://www.dki.de/sites/default/files/downloads/2016\\_12\\_19\\_kh\\_barometer\\_final.pdf](https://www.dki.de/sites/default/files/downloads/2016_12_19_kh_barometer_final.pdf).
- Boxall, Peter; Purcell, John (2011): Strategy and Human Resource Management. 3rd ed. s.l.: Palgrave Macmillan Ltd (Management, Work and Organisations).
- Brikend A. (2011): JOB SATISFACTION: A LITERATURE REVIEW. In: MANAGEMENT RESEARCH AND PRACTICE (VOL. 3 ISSUE 4), S. 77–86.
- Buchan, James; Aiken, Linda (2008): Solving nursing shortages. A common priority. In: Journal of Clinical Nursing 17 (24), S. 3262–3268. DOI: 10.1111/j.1365-2702.2008.02636.x.
- Buchan, James; Dovlo, Delanyo (2004): International Recruitment of Health Workers to the UK: A Report for DFID. Hg. v. DFID Health Systems Resource Centre. <http://equinetafrica.org/sites/default/files/uploads/documents/BUChres310108.pdf>.
- Burisch, Matthias (Hg.) (2006): Definitivische Eingrenzung // Das Burnout-Syndrom. Theorie der inneren Erschöpfung. 3. überarbeitete Auflage. Berlin, Heidelberg: Springer Medizin Verlag Heidelberg.
- Burmeister, Elizabeth A.; Kalisch, Beatrice J.; Xie, Boqin; Doumit, Myrna A. A.; Lee, Eunjo; Ferraresion, Annamaria et al. (2018): Determinants of nurse absenteeism and intent to leave. An international study. In: Journal of nursing management. DOI: 10.1111/jonm.12659.
- Business Dictionary (2018): Definition work environment. Hg. v. Business Dictionary. Online verfügbar unter <http://www.businessdictionary.com/definition/work-environment.html>.
- Canadian Nurse Association (2018): Tested solution for eliminating Canada's registered nurse shortage. Hg. v. Canadian Nurse Association. [https://cna-aicc.ca/~media/cna/page-content/pdf-en/rn\\_highlights\\_e.pdf](https://cna-aicc.ca/~media/cna/page-content/pdf-en/rn_highlights_e.pdf).
- Chandukala, Sandeep R.; Kim, Jaehwan; Otter, Thomas; Rossi, Peter E.; Allenby, Greg M. (2007): Choice Models in Marketing. Economic Assumptions, Challenges and Trends. In: FNT in Marketing 2 (2), S. 97–184. DOI: 10.1561/1700000008.

- Clark, Michael D.; Determann, Domino; Petrou, Stavros; Moro, Domenico; Bekker-Grob, Esther W. de (2014): Discrete choice experiments in health economics. A review of the literature. In: *PharmacoEconomics* 32 (9), S. 883–902. DOI: 10.1007/s40273-014-0170-x.
- Dall'Ora, Chiara; Griffiths, Peter; Ball, Jane; Simon, Michael; Aiken, Linda H. (2015): Association of 12 h shifts and nurses' job satisfaction, burnout and intention to leave. Findings from a cross-sectional study of 12 European countries. In: *BMJ open* 5 (9), e008331. DOI: 10.1136/bmjopen-2015-008331.
- Delucas, A. Christine (2014): Foreign nurse recruitment. Global risk. In: *Nursing ethics* 21 (1), S. 76–85. DOI: 10.1177/0969733013486798.
- Destatis (2018).  
<https://www.destatis.de/DE/ZahlenFakten/GesellschaftStaat/Gesundheit/Gesundheitspersonal/Gesundheitspersonal.html>.
- Deutsche Krankenhausgesellschaft (2011): DKG-Empfehlung zur Ausbildung und Prüfung von Operationstechnischen und Anästhesietechnischen Assistentinnen/Assistenten.  
<http://www.dkgev.de/media/file/10213.DKG-Ausbildungsempfehlung-ATA-OTA.pdf>.
- Deutscher Berufsverband Operationstechnischer Assistentinnen und Assistenten (Hg.) (2017): Berufsentstehung OTA. <http://www.dbota.de/beruf/geschichte/>.
- Deutscher Bundestag (Hg.) (2016): Heilberufe in Deutschland.  
<https://www.bundestag.de/blob/418610/198af9fae0d559572b69be74e301d0b9/wd-9-100-15-pdf-data.pdf>.
- Di Tommaso, M. L.; Strøm, S.; Saether, E. M. (2009): Nurses wanted Is the job too harsh or is the wage too low? In: *Journal of health economics* 28 (3), S. 748–757. DOI: 10.1016/j.jhealeco.2009.01.003.
- Eberth, Barbara; Elliott, Robert F.; Skåtun, Diane (2016): Pay or conditions? The role of workplace characteristics in nurses' labor supply. In: *The European journal of health economics : HEPAC : health economics in prevention and care* 17 (6), S. 771–785. DOI: 10.1007/s10198-015-0733-6.
- Elliott, Robert F.; Ma, Ada H. Y.; Scott, Anthony; Bell, David; Roberts, Elizabeth (2007): Geographically differentiated pay in the labour market for nurses. In: *Journal of health economics* 26 (1), S. 190–212. DOI: 10.1016/j.jhealeco.2006.05.002.
- Emeghebo, Lorraine (2012): The image of nursing as perceived by nurses. In: *Nurse education today* 32 (6), e49-53. DOI: 10.1016/j.nedt.2011.10.015.
- Federal Employment Agency (2018): Blickpunkt Arbeitsmarkt – Fachkräfteengpassanalyse. Hg. v. Statistik/Arbeitsmarktberichterstattung Bundesagentur für Arbeit. Nürnberg.  
<https://statistik.arbeitsagentur.de/Statischer-Content/Arbeitsmarktberichte/Fachkraeftebedarf-Stellen/Fachkraefte/BA-FK-Engpassanalyse-2018-06.pdf>.
- Finkelman, Anita Ward; Kenner, Carole (2013): *Professional Nursing Concepts. Competencies for quality leadership*. 2nd ed. Burlington, MA: Jones & Bartlett Learning.
- Fletcher, Karen (2007): Image. Changing how women nurses think about themselves. Literature review. In: *Journal of advanced nursing* 58 (3), S. 207–215. DOI: 10.1111/j.1365-2648.2007.04285.x.

- Flinkman, Mervi; Leino-Kilpi, Helena; Salanterä, Sanna (2010): Nurses' intention to leave the profession. Integrative review. In: *Journal of advanced nursing* 66 (7), S. 1422–1434. DOI: 10.1111/j.1365-2648.2010.05322.x.
- Flinkman, Mervi; Salanterä, Sanna (2015): Early career experiences and perceptions - a qualitative exploration of the turnover of young registered nurses and intention to leave the nursing profession in Finland. In: *Journal of nursing management* 23 (8), S. 1050–1057. DOI: 10.1111/jonm.12251.
- Florence Nightingale (1859): *Notes on Nursing*: Enhanced Media Publishing.
- Florence Nightingale (1871): *Una and the lion*: Cambridge Riverside Press.
- Greenfield, L. J. (1999): Doctors and nurses. A troubled partnership. In: *Annals of surgery* 230 (3), S. 279–288.
- Greenhaus, Jeffrey H.; Collins, Karen M.; Shaw, Jason D. (2003): The relation between work–family balance and quality of life. In: *Journal of Vocational Behavior* 63 (3), S. 510–531. DOI: 10.1016/S0001-8791(02)00042-8.
- Hammer, R. M.; Tufts, M. A. (1985): Nursing's self-image--nursing education's responsibility. In: *The Journal of nursing education* 24 (7), S. 280–283.
- Han, Kihye; Trinkoff, Alison M.; Gurses, Ayse P. (2015a): Work-related factors, job satisfaction and intent to leave the current job among United States nurses. In: *Journal of Clinical Nursing* 24 (21-22), S. 3224–3232. DOI: 10.1111/jocn.12987.
- Hanel, Barbara; Kalb, Guyonne; Scott, Anthony (2014): Nurses' labour supply elasticities. The importance of accounting for extensive margins. In: *Journal of health economics* 33, S. 94–112. DOI: 10.1016/j.jhealeco.2013.11.001.
- Harrington, J. M. (2001b): Health effects of shift work and extended hours of work. In: *Occupational and Environmental Medicine* (58), S. 68–72. DOI: 10.1136/oem.58.1.68.
- Hayek, Friedrich A. von (1944): *Der Weg zur Knechtschaft*: Lau Verlag & Handel KG (24. Februar 2017).
- Heinen, Maud M.; van Achterberg, Theo; Schwendimann, René; Zander, Britta; Matthews, Anne; Kózka, Maria et al. (2013c): Nurses' intention to leave their profession. A cross sectional observational study in 10 European countries. In: *International journal of nursing studies* 50 (2), S. 174–184. DOI: 10.1016/j.ijnurstu.2012.09.019.
- Helter, Timea Mariann; Boehler, Christian Ernst Heinrich (2016): Developing attributes for discrete choice experiments in health. A systematic literature review and case study of alcohol misuse interventions. In: *Journal of substance use* 21 (6), S. 662–668. DOI: 10.3109/14659891.2015.1118563.
- Henderson, Angela D. (2003): Nurses and workplace violence. Nurses' experiences of verbal and physical abuse at work. In: *Nursing leadership* (Toronto, Ont.) 16 (4), S. 82–98.
- Hesketh, Kathryn L.; Duncan, Susan M.; Estabrooks, Carole A.; Reimer, Marlene A.; Giovannetti, Phyllis; Hyndman, Kathryn; Acorn, Sonia (2003): Workplace violence in Alberta and British Columbia hospitals. In: *Health Policy* 63 (3), S. 311–321. DOI: 10.1016/S0168-8510(02)00142-2.

- Heyes, Anthony (2005): The economics of vocation or 'why is a badly paid nurse a good nurse'? In: *Journal of health economics* 24 (3), S. 561–569. DOI: 10.1016/j.jhealeco.2004.09.002.
- Homburg, Vincent; van der Heijden, Beatrice; Valkenburg, Lukas (2013): Why do nurses change jobs? An empirical study on determinants of specific nurses' post-exit destinations. In: *Journal of nursing management* 21 (6), S. 817–826. DOI: 10.1111/jonm.12142.
- HOUSE, ROBERT J.; WIGDOR, LAWRENCE A. (1967): HERZBERG'S DUAL-FACTOR THEORY OF JOB SATISFACTION AND MOTIVATION. A REVIEW OF THE EVIDENCE AND A CRITICISM. In: *Personnel Psychology* 20 (4), S. 369–390. DOI: 10.1111/j.1744-6570.1967.tb02440.x.
- Hutchinson, Marie; Vickers, Margaret; Jackson, Debra; Wilkes, Lesley (2006): Workplace bullying in nursing. Towards a more critical organisational perspective. In: *Nursing inquiry* 13 (2), S. 118–126. DOI: 10.1111/j.1440-1800.2006.00314.x.
- Ishihara, Itsuko; Ishibashi, Yukie; Takahashi, Kiyomi; Nakashima, Mitsuyo (2014): Effect of organizational factors and work environments on newly graduated nurses' intention to leave. In: *Japan journal of nursing science : JJNS* 11 (3), S. 200–210. DOI: 10.1111/jjns.12021.
- Jackson, D.; Clare, J.; Mannix, J. (2002): Who would want to be a nurse? Violence in the workplace - a factor in recruitment and retention. In: *Journal of nursing management* 10 (1), S. 13–20. DOI: 10.1046/j.0966-0429.2001.00262.x.
- Johnson, Susan L.; Rea, Ruth E. (2009): Workplace bullying. Concerns for nurse leaders. In: *The Journal of nursing administration* 39 (2), S. 84–90. DOI: 10.1097/NNA.0b013e318195a5fc.
- Kankaanranta, T.; Rissanen, P. (2008): Nurses' intentions to leave nursing in Finland. In: *The European journal of health economics : HEPAC : health economics in prevention and care* 9 (4), S. 333–342. DOI: 10.1007/s10198-007-0080-3.
- Kankaanranta, T.; Rissanen, P. (2009): The labor supply of registered nurses in Finland. The effect of wages and working conditions. In: *The European journal of health economics : HEPAC : health economics in prevention and care* 10 (2), S. 167–178. DOI: 10.1007/s10198-008-0116-3.
- Kovner, Christine T.; Brewer, Carol S.; Fatehi, Farida; Jun, Jin (2014): What does nurse turnover rate mean and what is the rate? In: *Policy, politics & nursing practice* 15 (3-4), S. 64–71. DOI: 10.1177/1527154414547953.
- Krausz, Moshe; Koslowsky, Meni; Shalom, Nirra; Elyakim, Nirra (1995): Predictors of intentions to leave the ward, the hospital, and the nursing profession. A longitudinal study. In: *J. Organiz. Behav.* 16 (3), S. 277–288. DOI: 10.1002/job.4030160308.
- Kwok, R. P. W.; Law, Y. K.; Li, K. E.; Ng, Y. C.; Cheung, M. H.; Fung, V. K. P. et al. (2006): Prevalence of workplace violence against nurses in Hong Kong. In: *Hong Kong medical journal = Xianggang yi xue za zhi* 12 (1), S. 6–9.
- Lancaster K.J. (1966). In: *The Journal of Political Economy* (2), S. 132–157.
- Lee, Julie Anne; Soutar, Geoffrey; Louviere, Jordan (2008): The best-worst scaling approach. An alternative to Schwartz's Values Survey. In: *Journal of personality assessment* 90 (4), S. 335–347. DOI: 10.1080/00223890802107925.

- Lee, Julie Anne; Soutar, Geoffrey N.; Louviere, Jordan (2007): Measuring values using best-worst scaling. The LOV example. In: *Psychol. Mark.* 24 (12), S. 1043–1058. DOI: 10.1002/mar.20197.
- Leineweber, Constanze; Chungkham, Holendro Singh; Lindqvist, Rikard; Westerlund, Hugo; Runesdotter, Sara; Smeds Alenius, Lisa; Tishelman, Carol (2016): Nurses' practice environment and satisfaction with schedule flexibility is related to intention to leave due to dissatisfaction. A multi-country, multilevel study. In: *International journal of nursing studies* 58, S. 47–58. DOI: 10.1016/j.ijnurstu.2016.02.003.
- Lindqvist, Rikard; Smeds Alenius, Lisa; Griffiths, Peter; Runesdotter, Sara; Tishelman, Carol (2015): Structural characteristics of hospitals and nurse-reported care quality, work environment, burnout and leaving intentions. In: *Journal of nursing management* 23 (2), S. 263–274. DOI: 10.1111/jonm.12123.
- Lindqvist, Rikard; Smeds Alenius, Lisa; Runesdotter, Sara; Ensio, Anneli; Jylhä, Virpi; Kinnunen, Juha et al. (2014): Organization of nursing care in three Nordic countries. Relationships between nurses' workload, level of involvement in direct patient care, job satisfaction, and intention to leave. In: *BMC nursing* 13, S. 27. DOI: 10.1186/1472-6955-13-27.
- Lo, Wen-Yen; Chien, Li-Yin; Hwang, Fang-Ming; Huang, Nicole; Chiou, Shu-Ti (2018): From job stress to intention to leave among hospital nurses. A structural equation modelling approach. In: *Journal of advanced nursing* 74 (3), S. 677–688. DOI: 10.1111/jan.13481.
- Louviere, JJ.; Hensher, DA.; Swait, JD. (2000): *Stated choice methods: analysis and applications*: Cambridge University Press.
- Louviere, Jordan; Lings, Ian; Islam, Towhidul; Gudergan, Siegfried; Flynn, Terry (2013): An introduction to the application of (case 1) best–worst scaling in marketing research. In: *International Journal of Research in Marketing* 30 (3), S. 292–303. DOI: 10.1016/j.ijresmar.2012.10.002.
- Lum, Lillie; Kervin, John; Clark, Kathleen; Reid, Frank; Sirola, Wendy (1998): Explaining nursing turnover intent. Job satisfaction, pay satisfaction, or organizational commitment? In: *J. Organiz. Behav.* 19 (3), S. 305–320. DOI: 10.1002/(SICI)1099-1379(199805)19:3%3C305::AID-JOB843%3E3.0.CO;2-N.
- Manojlovich, Milisa (2005): Linking the Practice Environment to Nurses' Job Satisfaction Through Nurse-Physician Communication. In: *J Nursing Scholarship* 37 (4), S. 367–373. DOI: 10.1111/j.1547-5069.2005.00063.x.
- Maslach, C.; Schaufeli, W. B.; Leiter, M. P. (2001): Job burnout. In: *Annual review of psychology* 52, S. 397–422. DOI: 10.1146/annurev.psych.52.1.397.
- McFadden, Daniel (Hg.) (1974): *Conditional Logit Analysis of Qualitative Choice Behavior*. New York.
- McHugh, Matthew D.; Ma, Chenjuan (2014): Wage, work environment, and staffing. Effects on nurse outcomes. In: *Policy, politics & nursing practice* 15 (3-4), S. 72–80. DOI: 10.1177/1527154414546868.

- Merkle, F.; Ritsema, T. S.; Bauer, S.; Kuilman, L. (2011): The physician assistant. Shifting the Paradigm of European medical practice? In: HSR proceedings in intensive care & cardiovascular anesthesia 3 (4), S. 255–262.
- Moloney, Willoughby; Boxall, Peter; Parsons, Matthew; Cheung, Gordon (2018): Factors predicting Registered Nurses' intentions to leave their organization and profession. A job demands-resources framework. In: Journal of advanced nursing 74 (4), S. 864–875. DOI: 10.1111/jan.13497.
- Morell, K. (2005): Towards a typology of nursing turnover: the role of shocks in nurses' decisions to leave. In: Journal of Advanced Nursing (49), S. 315–322.
- Morris, S.; McGuire, A. (2002a): The private net present value and private internal rate of return to becoming a nurse in Great Britain. In: Applied Economics (17), S. 2189–2200.
- Morris, Stephen; McGuire, Alistair (2002b): The private net present value and private internal rate of return to becoming a nurse in Great Britain. In: Applied Economics 34 (17), S. 2189–2200. DOI: 10.1080/00036840210139328.
- Morris-Thompson, Trish; Shepherd, Janet; Plata, Robin; Di Marks-Maran (2011): Diversity, fulfilment and privilege. The image of nursing. In: Journal of nursing management 19 (5), S. 683–692. DOI: 10.1111/j.1365-2834.2011.01268.x.
- Moynihan, Donald P.; Pandey, Sanjay K. (2016): Finding Workable Levers Over Work Motivation. In: Administration & Society 39 (7), S. 803–832. DOI: 10.1177/0095399707305546.
- Nantsupawat, A.; Kunaviktikul, W.; Nantsupawat, R.; Wichaikhum, O-A; Thienthong, H.; Poghosyan, L. (2017): Effects of nurse work environment on job dissatisfaction, burnout, intention to leave. In: International nursing review 64 (1), S. 91–98. DOI: 10.1111/inr.12342.
- NHS (2018). Online verfügbar unter <https://www.healthcareers.nhs.uk/eXplore-roles%20>.
- Nordin, Jennifah; Yusuf, Nur Afisha; Sadikin, Sarehan; Desa, Zalina Mohd (2017): Job Satisfaction among educators staff in public universities. Case study of UiTM Samarahan Sarawak. In: Int. j. adv. appl. sci 4 (3), S. 73–78. DOI: 10.21833/ijaas.2017.03.012.
- Ó Lúanaigh, Pádraig (2017): Nurses and Nursing. The Person and the Profession. Milton: Taylor and Francis.
- OECD (2017). Online verfügbar unter <http://www.oecd.org/gender/data/women-make-up-most-of-the-health-sector-workers-but-they-are-under-represented-in-high-skilled-jobs.htm>.
- Oliveira, Daiana Rangel de; Griep, Rosane Härter; Portela, Luciana Fernandes; Rotenberg, Lucia (2017): Intention to leave profession, psychosocial environment and self-rated health among registered nurses from large hospitals in Brazil. A cross-sectional study. In: BMC health services research 17 (1), S. 21. DOI: 10.1186/s12913-016-1949-6.
- Perry, Lin; Xu, Xiaoyue; Duffield, Christine; Gallagher, Robyn; Nicholls, Rachel; Sibbritt, David (2017): Health, workforce characteristics, quality of life and intention to leave. The 'Fit for the Future' survey of Australian nurses and midwives. In: Journal of advanced nursing 73 (11), S. 2745–2756. DOI: 10.1111/jan.13347.
- Phillips, V. L. (1995b): Nurses' labor supply: Participation, hours of work, and discontinuities in the supply function. In: Journal of health economics 14, S. 567–582.

Quine, L. (2001): Workplace bullying in nurses. In: *Journal of health psychology* 6 (1), S. 73–84. DOI: 10.1177/135910530100600106.

Rafferty, Anne Marie; Clarke, Sean P.; Coles, James; Ball, Jane; James, Philip; McKee, Martin; Aiken, Linda H. (2007): Outcomes of variation in hospital nurse staffing in English hospitals. Cross-sectional analysis of survey data and discharge records. In: *International journal of nursing studies* 44 (2), S. 175–182. DOI: 10.1016/j.ijnurstu.2006.08.003.

Raziq, Abdul; Maulabakhsh, Raheela (2015): Impact of Working Environment on Job Satisfaction. In: *Procedia Economics and Finance* 23, S. 717–725. DOI: 10.1016/S2212-5671(15)00524-9.

RN4CAST (2018). Online verfügbar unter <http://www.rn4cast.eu/>.

Rosenstein, A. (2002a): Nurse-Physician Relationships: Impact on Nurse Satisfaction and Retention. In: *The American Journal of Nursing* 102 (6), S. 26–34.

Royal College of Nursing (2018): Overall increase in nurses and midwives masks 'severe workforce instability'. RCN responds to NMC figures showing the number of UK nurses and midwives registering for the first time is falling. Online verfügbar unter <https://www.rcn.org.uk/news-and-events/news/overall-increase-in-nurses-and-midwives-masks-severe-workforce-instability>.

Rudman, Ann; Gustavsson, Petter; Hultell, Daniel (2014): A prospective study of nurses' intentions to leave the profession during their first five years of practice in Sweden. In: *International journal of nursing studies* 51 (4), S. 612–624. DOI: 10.1016/j.ijnurstu.2013.09.012.

Ryan, Mandy; Amaya-Amaya, Mabel; Gerard, Karen (2007): *Using Discrete Choice Experiments to Value Health and Health Care*. Dordrecht: Springer (The Economics of Non-Market Goods and Resources, 11).

Sabanciogullari, Selma; Dogan, Selma (2015): Relationship between job satisfaction, professional identity and intention to leave the profession among nurses in Turkey. In: *Journal of nursing management* 23 (8), S. 1076–1085. DOI: 10.1111/jonm.12256.

Saunders K., Hagist C., McGuire A., Schlereth C. (2018a): Nursing without caring. A discrete choice experiment with surgical technologist trainees in Germany. Submitted at WHU Economics working paper series assigned number 19/01, presented at the German Conference on Health Economics 2018; presented at the European Conference on Health Economics 2018

Saunders K., Hagist C., McGuire A., Schlereth C. (2018): Preferences of a new health care profession. A pilot study with anaesthesia technologist trainees in Germany. Submitted at WHU Economics working paper series assigned number 19/02, presented at the German Conference on Health Economics 2019

Saunders K., Hagist C., McGuire A. (2018): A systematic review of the literature on a nurse's intention to leave the profession. Unpublished working paper

Scherrmann, Ulrich (Hg.) (2015): „Burnout“. Begriff – Definition – Terminologie und Diagnose. Berlin-Heidelberg: Springer.

Schlereth, Christian; Skiera, Bernd (2012): DISE. Dynamic Intelligent Survey Engine, S. 225–243. DOI: 10.1007/978-3-8349-3722-3\_11.



- Schlereth, Christian; Skiera, Bernd (2017): Two New Features in Discrete Choice Experiments to Improve Willingness-to-Pay Estimation That Result in SDR and SADR. Separated (Adaptive) Dual Response. In: *Management Science* 63 (3), S. 829–842. DOI: 10.1287/mnsc.2015.2367.
- Scott, Anthony; Witt, Julia; Duffield, Christine; Kalb, Guyonne (2015a): What do nurses and midwives value about their jobs? Results from a discrete choice experiment. In: *Journal of health services research & policy* 20 (1), S. 31–38. DOI: 10.1177/1355819614554924.
- Scott, Anthony; Witt, Julia; Duffield, Christine; Kalb, Guyonne (2015b): What do nurses and midwives value about their jobs? Results from a discrete choice experiment. In: *Journal of health services research & policy* 20 (1), S. 31–38. DOI: 10.1177/1355819614554924.
- Seago, Jean Ann; Spetz, Joanne; Alvarado, Andrew; Keane, Dennis; et al. (2006): The Nursing Shortage: Is It Really About Image? In: *Journal of Healthcare Management* Bd. 51, Aug. 2, S. 96–108.
- Shields, M.; Ward M. (2001a): Improving nurse retention in the National Health Service in England: the impact of job satisfaction on intentions to quit. In: *Journal of health economics*, S. 677–701.
- Shields, M.; Ward M. (2001b): Improving nurse retention in the National Health Service in England: the impact of job satisfaction on intentions to quit. In: *Journal of health economics*, S. 677–701.
- Shields, Michael A.; Ward, Melanie (2001): Improving nurse retention in the National Health Service in England. The impact of job satisfaction on intentions to quit. In: *Journal of health economics* 20 (5), S. 677–701. DOI: 10.1016/S0167-6296(01)00092-3.
- Simon, P.; Tackenberg, H-M; Hasselhorn, A.; Kümmerling, A.; Büscher & B.H. Müller (2005): Auswertung der ersten Befragung der NEXT Studie in Deutschland.
- Staehele, Wolfgang H. (1989): Mitteilungen aus der Arbeitsmarkt- und Berufsforschung. *Human Resource Management und Unternehmungsstrategie*. 22. Jg./1989. IAB. Online verfügbar unter [http://doku.iab.de/mittab/1989/1989\\_3\\_MittAB\\_Staehele.pdf](http://doku.iab.de/mittab/1989/1989_3_MittAB_Staehele.pdf).
- Stansfeld, S.; Candy, B. (2006): Psychosocial work environment and mental health—a meta-analytic review. In: *Journal of Work, Environment & Health* (32), S. 443–462. <http://www.jstor.org/stable/40967597>.
- Stimpfel, Amy Witkoski; Sloane, Douglas M.; Aiken, Linda H. (2012): The longer the shifts for hospital nurses, the higher the levels of burnout and patient dissatisfaction. In: *Health affairs (Project Hope)* 31 (11), S. 2501–2509. DOI: 10.1377/hlthaff.2011.1377.
- Street, Deborah J.; Burgess, Leonie (2007): *The construction of optimal stated choice experiments. Theory and methods*. Hoboken, NJ: Wiley-Interscience (Wiley series in probability and statistics).
- Swait, Joffre; Andrews, Rick L. (2003): Enriching Scanner Panel Models with Choice Experiments. In: *Marketing Science* 22 (4), S. 442–460. DOI: 10.1287/mksc.22.4.442.24910.
- Tausig, Mark; Fenwick, Rudy (2001a): Unbinding Time: Alternate Work Schedules and Work-Life Balance. In: *Journal of Family and Economic Issues* 22 (2), S. 101–119. DOI: 10.1023/A:1016626028720.

- Tausig, Mark; Fenwick, Rudy (2001b): Unbinding Time: Alternate Work Schedules and Work-Life Balance. In: *Journal of Family and Economic Issues* 22 (2), S. 101–119. DOI: 10.1023/A:1016626028720.
- Thurstone, L. L. (1927): A law of comparative judgment. In: *Psychological Review* 34 (4), S. 273–286. DOI: 10.1037/h0070288.
- Tipping, Jane (2018): What is an Anesthesia Assistant. Hg. v. Canadian Anesthesiologists' Society. <https://www.cas.ca/English/Anesthesia-Assistant>.
- Tracey, J. Bruce, Tannenbaum, Scott I., Kavanagh, Michael J. (1995): Applying trained skills on the job: The importance of the work environment. In: *Journal of Applied Psychology*, (Vol 80), S. 239–252.
- Train, Kenneth (2009): *Discrete Choice Methods with Simulation*. 2. Aufl.: Cambridge University Press.
- Tumulty, G.; Jernigan, I. E.; Kohut, G. F. (1994): The impact of perceived work environment on job satisfaction of hospital staff nurses. In: *Applied Nursing Research* 7 (2), S. 84–90.
- U.S. National Library of Medicine (2015): Changing the face of medicine. [https://cfmedicine.nlm.nih.gov/physicians/biography\\_35.html](https://cfmedicine.nlm.nih.gov/physicians/biography_35.html).
- WHO (Hg.) (2008): Gender and health workforce statistics. [http://www.who.int/hrh/statistics/spotlight\\_2.pdf](http://www.who.int/hrh/statistics/spotlight_2.pdf).
- Yang, Huiyun; Lv, Jingwen; Zhou, Xi; Liu, Huitong; Mi, Baibing (2017): Validation of work pressure and associated factors influencing hospital nurse turnover. A cross-sectional investigation in Shaanxi Province, China. In: *BMC health services research* 17 (1), S. 112. DOI: 10.1186/s12913-017-2056-z.
- Yoo, Hong Il; Doiron, Denise (2013): The use of alternative preference elicitation methods in complex discrete choice experiments. In: *Journal of health economics* 32 (6), S. 1166–1179. DOI: 10.1016/j.jhealeco.2013.09.009.
- Zeytinoglu, Isik Urla; Denton, Margaret; Davies, Sharon; Baumann, Andrea; Blythe, Jennifer; Boos, Linda (2006): Retaining nurses in their employing hospitals and in the profession. Effects of job preference, unpaid overtime, importance of earnings and stress. In: *Health Policy* 79 (1), S. 57–72. DOI: 10.1016/j.healthpol.2005.12.004.
- Zhang, Yuanyuan; Wu, Juemin; Fang, Zhiyin; Zhang, Yaqing; Wong, Frances Kam Yuet (2017): Newly graduated nurses' intention to leave in their first year of practice in Shanghai. A longitudinal study. In: *Nursing outlook* 65 (2), S. 202–211. DOI: 10.1016/j.outlook.2016.10.007.

# Appendix

Table 14: Results HB estimation female/male

<i>Attribute</i>	<i>Level</i>	<i>Parameters (standard deviation across household- specific posteriors) Female</i>	<i>Parameters (standard deviation across household- specific posteriors) Male</i>
<i>Official recognised profession</i>	- Yes	0.231 (0.184)	0.223 (0.195)
	- No	-0.231 (0.184)	-0.223 (0.195)
<i>Shift types</i>	- No weekend shifts	0.685(0.460)	0.663(0.444)
	- Three-shift operation	-0.439 (0.480)	-0.425 (0.453)
	- On-call duty	-0.246 (0.421)	-0.237 (0.404)
<i>Autonomy</i>	- Low responsibilities	-0.386 (0.420)	-0.402 (0.454)
	- Distinct responsibilities	0.386 (0.420)	0.402 (0.454)
<i>Work environment</i>	- friendly and open relationship between physicians and other health care workers	0.736 (0.377)	0.717 (0.392)
	- respectful and very professional relationship between physicians and other health care workers	0.248 (0.323)	0.251 (0.319)
	- impersonal and formally relationship between physicians and other health care workers	-0.985 (0.683)	-0.932 (0.690)
<i>Work content</i>	- none to very low caring activities	1.234 (1.021)	0.997 (1.031)
	- mostly caring activities	-1.234 (1.021)	-0.997 (1.031)
<i>Earnings (=price factor, per 1,000€)</i>	- 2,500€	1.959 (1.425)	2.253 (1.572)
	- 2,900€		
	- 3,300€		
<i>Workload</i>	- low	0.174 (0.232)	0.195 (0.236)
	- middle	0.046 (0.166)	0.056 (0.155)
	- high	-0.221 (0.301)	-0.252 (0.293)

Table 15: Results HB estimation age

<i>Attribute</i>	<i>Level</i>	<i>Parameters (standard deviation across household- specific posteriors) Age 16-20yrs</i>	<i>Parameters (standard deviation across household- specific posteriors) Age 21-24 yrs.</i>	<i>Parameters (standard deviation across household- specific posteriors) Age 25-29 yrs.</i>	<i>Parameters (standard deviation across household- specific posteriors) Age 30+ yrs.</i>
<i>Official recognised profession</i>	- Yes	0.222 (0.189)	0.236 (0.182)	0.231 (0.176)	0.216 (0.244)
	- No	-0.222 (0.189)	-0.236 (0.182)	-0.231 (0.176)	-0.216 (0.244)
<i>Shift types</i>	- No weekend shifts	0.612 (0.456)	0.721 (0.458)	0.696 (0.425)	0.706 (0.474)
	- Three-shift operation	-0.384 (0.435)	-0.453 (0.498)	-0.453 (0.473)	-0.577 (0.468)
	- On-call duty	-0.227 (0.428)	-0.267 (0.422)	-0.243 (0.358)	-0.129 (0.405)
<i>Autonomy</i>	- Low responsibilities	-0.402 (0.449)	-0.391 (0.430)	-0.351 (0.348)	-0.356 (0.370)
	- Distinct responsibilities	0.402 (0.449)	0.391 (0.430)	0.351 (0.348)	0.356 (0.370)
<i>Work environment</i>	- friendly and open relationship between physicians and other health care workers	0.763 (0.380)	0.722 (0.374)	0.723 (0.395)	0.656 (0.380)
	- respectful and very professional relationship between physicians and other health care workers	0.257 (0.329)	0.244 (0.320)	0.225 (0.320)	0.158 (0.300)
	- impersonal and formally relationship between physicians and other health care workers	-1.021 (0.691)	-0.967 (0.677)	-0.949 (0.696)	-0.814 (0.654)
<i>Work content</i>	- none to very low caring activities	1.146 (1.071)	1.209 (0.986)	1.290 (1.073)	1.107 (1.007)
	- mostly caring activities	-1.146 (1.071)	-1.209 (0.986)	-1.290 (1.073)	-1.107 (1.007)
<i>Earnings (=price factor, per 1,000€)</i>	- 2,500€	1.896 (1.433)	2.057 (1.451)	2.106 (1.494)	2.077 (1.538)
	- 2,900€				
	- 3,300€				
<i>Workload</i>	- low	0.168 (0.236)	0.186 (0.235)	0.180 (0.219)	0.159 (0.212)
	- middle	0.067 (0.165)	0.038 (0.160)	0.053 (0.166)	0.019 (0.174)
	- high	-0.235 (0.302)	-0.224 (0.300)	-0.223 (0.297)	-0.179 (0.293)

Table 16: Results HB estimation training year

Attribute	Level	Parameters	Parameters	Parameters
		(standard deviation across household-specific posteriors)	(standard deviation across household-specific posteriors)	(standard deviation across household-specific posteriors)
		Year 1	Year 2	Year 3
Official recognised profession	- Yes	0.227 (0.196)	0.229 (0.177)	0.234 (0.182)
	- No	-0.227 (0.196)	-0.229 (0.177)	-0.234 (0.182)
Shift types	- No weekend shifts	0.637 (0.464)	0.694 (0.452)	0.722 (0.450)
	- Three-shift operation	-0.395 (0.453)	-0.456 (0.481)	-0.464 (0.493)
	- On-call duty	-0.241 (0.428)	-0.237 (0.417)	-0.258 (0.407)
Autonomy	- Low responsibilities	-0.346 (0.427)	-0.414 (0.426)	-0.351 (0.421)
	- Distinct responsibilities	0.346 (0.427)	0.414 (0.426)	0.351 (0.421)
Work environment	- friendly and open relationship between physicians and other health care workers	0.727 (0.394)	0.722 (0.368)	0.696 (0.370)
	- respectful and very professional relationship between physicians and other health care workers	0.231 (0.336)	0.281 (0.309)	0.214 (0.317)
	- impersonal and formally relationship between physicians and other health care workers	-0.958 (0.711)	-1.054 (0.659)	-0.911 (0.670)
Work content	- none to very low caring activities	1.189 (1.061)	1.216 (1.035)	1.170 (0.073)
	- mostly caring activities	-1.189 (1.061)	-1.216 (1.035)	-1.170 (0.973)
Earnings (=price factor, per 1,000€)	- 2,500€	1.973 (1.498)	1.922 (1.356)	2.151 (1.499)
Workload	- 2,900€			
	- 3,300€			
	- low	0.165 (0.231)	0.197 (0.224)	0.174 (0.243)
	- middle	0.064 (0.165)	0.039 (0.166)	0.039 (0.159)
	- high	-0.229 (0.301)	-0.237 (0.299)	-0.213 (0.301)

Table 17: Results HB estimation work experience

<i>Attribute</i>	<i>Level</i>	<i>Parameters (standard deviation across household- specific posteriors) Respondents with work experience before starting the training</i>	<i>Parameters (standard deviation across household- specific posteriors) Respondents without work experience before starting the training</i>
<i>Official recognised profession</i>	- Yes	0.219 (0.190)	0.235 (0.183)
	- No	-0.219 (0.190)	-0.235 (0.183)
<i>Shift types</i>	- No weekend shifts	0.679 (0.484)	0.683(0.443)
	- Three-shift operation	-0.442 (0.464)	-0.433 (0.482)
	- On-call duty	-0.236 (0.400)	-0.249 (0.428)
<i>Autonomy</i>	- Low responsibilities	-0.374 (0.384)	-0.397 (0.447)
	- Distinct responsibilities	0.374 (0.384)	0.397 (0.447)
<i>Work environment</i>	- friendly and open relationship between physicians and other health care workers	0.715 (0.373)	0.742 (0.383)
	- respectful and very professional relationship between physicians and other health care workers	0.227 (0.329)	0.251 (0.319)
	- impersonal and formally relationship between physicians and other health care workers	-0.943 (0.682)	-0.933 (0.685)
<i>Work content</i>	- none to very low caring activities	1.176 (1.076)	1.201 (0.999)
	- mostly caring activities	-1.176 (1.076)	-1.201 (0.999)
<i>Earnings (=price factor, per 1,000€)</i>	- 2,500€	2.101 (1.499)	1.962 (1.431)
	- 2,900€		
	- 3,300€		
<i>Workload</i>	- low	0.165 (0.238)	0.185 (0.230)
	- middle	0.048 (0.165)	0.048 (0.163)
	- high	-0.214 (0.292)	-0.234 (0.304)

Table 18: Results HB estimation hospital provider

<i>Attribute</i>	<i>Level</i>	<i>Parameters (standard deviation across household- specific posteriors) Public Hospital</i>	<i>Parameters (standard deviation across household- specific posteriors) Ecclesiastical hospital.</i>	<i>Parameters (standard deviation across household- specific posteriors) Private Hospital</i>	<i>Parameters (standard deviation across household- specific posteriors) University Hospital.</i>	<i>Parameters (standard deviation across household- specific posteriors) Not sure which hospital provider</i>
<i>Official recognised profession</i>	- Yes	0.220 (0.196)	0.245 (0.176)	0.238 (0.177)	0.226 (0.188)	0.198 (0.199)
	- No	-0.220 (0.196)	-0.245 (0.176)	-0.238 (0.177)	-0.226 (0.188)	-0.198 (0.199)
<i>Shift types</i>	- No weekend shifts	0.669 (0.472)	0.718 (0.458)	0.635 (0.420)	0.717 (0.429)	0.626 (0.527)
	- Three-shift operation	-0.456 (0.512)	-0.481 (0.501)	-0.375 (0.418)	-0.416 (0.407)	-0.424 (0.525)
	- On-call duty	-0.213 (0.439)	-0.237 (0.415)	-0.260 (0.393)	-0.300 (0.368)	-0.202 (0.497)
<i>Autonomy</i>	- Low responsibilities	-0.374 (0.405)	-0.415 (0.437)	-0.335 (0.380)	-0.433 (0.442)	-0.370 (0.413)
	- Distinct responsibilities	0.374 (0.405)	0.415 (0.437)	0.335 (0.418)	0.433 (0.442)	0.370 (0.413)
<i>Work environment</i>	- friendly and open relationship between physicians and other health care workers	0.708 (0.365)	0.700 (0.385)	0.758 (0.380)	0.782 (0.394)	0.738 (0.351)
	- respectful and very professional relationship between physicians and other health care workers	0.217 (0.309)	0.219 (0.318)	0.252 (0.318)	0.294 (0.336)	0.250 (0.339)
	- impersonal and formally relationship between physicians and other health care workers	-0.925 (0.658)	-0.920 (0.686)	-1.010 (0.680)	-1.077 (0.710)	-0.989 (0.668)
<i>Work content</i>	- none to very low caring activities	1.224 (1.010)	1.139 (1.002)	1.170 (0.973)	1.081 (0.964)	1.126 (1.053)
	- mostly caring activities	-1.224 (1.010)	-1.139 (1.002)	-1.170(0.973)	-1.081 (0.964)	-1.126 (1.053)
<i>Earnings (=price factor, per 1,000€)</i>	- 2,500€	1.927 (1.501)	2.136 (1.523)	1.864 (1.344)	2.199 (1.439)	1.761 (1.314)
	- 2,900€					
	- 3,300€					
<i>Workload</i>	- low	0.181 (0.247)	0.165 (0.218)	0.187 (0.239)	0.201 (0.223)	0.145 (0.240)
	- middle	0.046 (0.167)	0.024 (0.163)	0.067 (0.153)	0.057 (0.154)	0.068 (0.189)
	- high	-0.227 (0.310)	-0.190 (0.287)	-0.255 (0.297)	-0.259 (0.293)	-0.214 (0.319)

Table 19: Selected research on nurse's labour supply

<i>Author (Year)</i>	<i>Topic</i>	<i>Type of data</i>	<i>Sample size</i>	<i>Country</i>	<i>Findings</i>
Phillips (1995b)	To measure the labour market participation elasticities with regard to wage rate, non-labour income, cost raised through work for nurses.	Quantitative secondary data from the Women and Employment Survey	5,588	UK	Respondents were highly responsive to wage changes.
Shields und Ward M. (2001a)	The impact of job satisfaction and the intention to leave nursing.	Quantitative secondary data from the national survey of NHS nursing staff	9,625	UK	Absolute pay, good work environment is positively linked to job satisfaction. Dissatisfaction is associated with the intention to quit based on e.g., increased workload, pay, poor career possibilities.
Heyes (2005)	The impact of wages and vocation for the nurse's profession.	N/A	N/A	UK	A nurse with a poor wage has a likely higher vocation towards the job, thus is over-performing. A pay rise might attract people with less vocation, thus under-performing.
Elliott et al. (2007)	To estimate the relative competitiveness of nurse's wages and its potential differences across local labour markets in Britain.	Quantitative secondary data from the Quarterly Labour Force Survey	64,525	UK	Wage differentials between nurses' jobs and other sectors exists and has a significant impact on the attractiveness of a nurses' job and retaining strategies for the NHS.
Kankaanranta und Rissanen (2008)	To estimate the labour supply of RN in Finland and the effect of wages and working conditions.	Quantitative primary data (survey)	3,407	Finland	Wage elasticity is rather small, however a significant effect was found regarding working hours applied. Wage increase solely cannot increase labour supply. Non-monetary characteristics need to be taken into account.
Di Tommaso et al. (2009)	To identify the importance of wages for nurses in order to increase labour supply with respect to the nurses shortage in Norway.	Quantitative secondary data	35,411	Norway	A generic wage increase cannot solve the nurse's shortage in Norway. The importance of non-monetary characteristics is highlighted.
Yoo und Doiron (2013)	To compare preferences on nursing jobs determined by profile and multi-profile case DCE.	Stated preferences DCE	526	Australia	Multi-profile case showed stronger preferences for monetary gains.
Hanel et al. (2014)	To identify if an increase in wages has an impact on the supply side (nurses).	Quantitative secondary pooled data	696	Australia	Labour supply elasticity tend to be higher than previous research stated. An increase in wages in order to increase labour supply is thus more promising than previous research shown.
Saunders et al. (2018)	To identify the job preferences of a Surgical Technologist trainee.	Stated preferences DCE	1,064	Germany	Earnings plays the major role whilst choosing a job followed by a decrease in utility if the job contains caring activities and a too formal relationship between the trainee and physicians and other health care worker. Compensation rates in order to accept poor attributes are too high.