

**Faculté de psychologie et des sciences
de l'éducation**

Breaking down the literature on avoiding surgeon burnout

An integrative review focused on increasing
surgeon well-being.

Auteur : SIMON Johanna
Promoteurs : Pr. GOURDIN Maximilien, Pr. JANNE Pascal
Année académique 2020-2021
Master en sciences psychologiques à finalité spécialisé

Breaking down the literature on avoiding surgeon burnout

A narrative review focused on increasing surgeon well-being.

Promoteurs : Pr. GOURDIN Maximilien, Pr. JANNE Pascal
Année académique 2020-2021

Mémoire présenté en vue de l'obtention du grade de Master en Sciences
Psychologiques par Johanna Simon.

Acknowledgments

Conducting this master thesis was a fulfilling yet challenging task. Therefore, I wish to express my sincerest gratitude to the people that supported me during the redaction of this work.

I wish to thank...

Pr. Pascal Janne – my supervisor – for without him, this thesis would not have been possible. He provided me with the information and direction I needed to accomplish this work. His feedbacks and expertise have helped me a lot during this long process that was, at times, difficult. Being always available, his guidance, support and encouraging word were of great value.

Pr. Maximilien Gourdin, for providing me with the opportunity of writing this thesis. I am especially grateful to him for giving me the chance of witnessing a day in the operating theatre.

Pr. Philippe Eucher, for accepting to have me witness several of his interventions in the operating room of the Clinique Universitaire UCL Mont-Godinne, which was a fascinating and memorable experience.

Dr. Sam Scolati – my biggest supporter – for the patience and generosity he demonstrated during this time. From pitching ideas to proofreading, he deserves my endless appreciation for the hours he invested in me – god knows time is a rare commodity for physicians these days!

My friends and family, for their encouragements and never stopping to believe in me, even when I doubted myself.

And finally, **my readers**, for the time and effort they will put into reading and evaluating my work.

Le plagiat

Je déclare sur l'honneur que ce mémoire a été écrit de ma plume, sans avoir sollicité d'aide extérieure illicite, qu'il n'est pas la reprise d'un travail présenté dans une autre institution pour évaluation, et qu'il n'a jamais été publié, en tout ou en partie. Toutes les informations (idées, phrases, graphes, cartes, tableaux,...) empruntées ou faisant référence à des sources primaires ou secondaires sont référencées adéquatement selon la méthode universitaire en vigueur. Je déclare avoir pris connaissance et adhérer au Code de déontologie pour les étudiants en matière d'emprunts, de citations et d'exploitation de sources diverses et savoir que le plagiat constitue une faute grave sanctionnée par l'Université catholique de Louvain.

Table of contents

1	Introduction	1
2	The surgeon and his environment.....	3
2.1	The surgeon.....	3
2.2	General precisions	3
2.3	The surgical personality – a distinct profile?	4
2.4	The particularity of women in surgery.....	5
2.5	Being a surgeon – the other side of the coin.	6
2.5.1	Depression.....	7
2.5.2	Suicide.....	7
2.5.3	Substance abuse.....	7
2.6	Conclusion.....	8
3	Surgery as a career choice.....	9
3.1	Introduction	9
3.2	Methods.....	9
3.3	What are the deterrents for choosing surgery as a career choice?.....	13
3.4	What makes surgery an attractive career choice?.....	14
3.5	Conclusion.....	16
4	Stress and burnout.....	17
4.1	Introduction	17
4.2	Methods.....	18
4.3	The burnout syndrome	21
4.3.1	The burnout syndrome: Past and present	21
4.3.2	Maslach’s three dimensions burnout applied to healthcare	21
4.3.3	Measurements of burnout.....	22

4.4	Prevalence of burnout among surgeons	23
4.5	Aetiology of stress/burnout among surgeons	24
4.5.1	Acute stress	24
4.5.2	Personal factors correlated to increased burnout.....	25
4.5.3	Institutional factors correlated to stress and burnout	29
4.6	The impact of surgeon stress/burnout.....	31
4.6.1	The impact of stress on surgical performance.....	32
4.6.2	The impact of surgeon burnout on healthcare.....	32
4.6.3	Long-term consequences of surgeon burnout	33
4.7	Conclusion.....	34
5	Protective factors against adverse mental health outcomes	37
5.1	Introduction	37
5.2	Methods.....	38
5.3	Individual strategies/factors promoting surgeon well-being.....	41
5.3.1	Emotional	41
5.3.2	Spiritual.....	44
5.3.3	Physical	44
5.4	Institutional strategies promoting surgeon well-being.....	45
5.4.1	General.....	45
5.4.2	Physical	47
5.4.3	Emotional	47
5.4.4	Cultural	48
5.5	Conclusion.....	48
6	General conclusion	51
7	Bibliography	54

1 Introduction

Surgeons are highly trained individuals that are required to perform risky medical procedures, remain focused for extended periods of time, and take quick decisions with far-reaching consequences, often under various constraints such as time pressure, team issues, or material shortcomings. For those who chose a career path in surgery, the day-to-day life is long, strenuous, and often unpredictable. They come in early, work relentlessly, often without taking a break for eating or resting, and are the last ones to leave in the evening. Their extensive caseload forces them to work 60 weekly hours or more, while handling on-call nightshifts, often at the cost of their own well-being.

The training of surgeons is long, strenuous, and ultimately leads to the development of a multitude of technical and non-technical skills. Unfortunately, while they are extensively taught about surgery, they fail to learn how to live as surgeons (Campbell, Sonnad, Eckhauser, Campbell, & Greenfield, 2001) . Their personal relationships suffer from the lifestyle they lead, and so do their mental and physical health. Indeed, there is abundant literature available to testify to the psychological ill-health of surgeons, which covers, inter alia, depression, anxiety, substance abuse and suicide (Balch, Freischlag, & Shanafelt, 2009).

Health practitioners, due to the nature of their work, belong to the category of professionals that are especially prone to occupational burnout (Maslach & Jackson, 1982). Surgeons, even more so if they are female, manifest alarmingly high rates of this syndrome, with most surveys identifying rates of around 40% of surgeons with symptoms of occupational burnout (Balch et al., 2009).

The burden of surgeon work-related burnout and other mental illnesses is high in social, human, and economic terms. It leads to a wide array of adverse consequences that vary from a decreased quality of patient care to increased medical errors and physician turnover, only to name a few. The quality of life of surgeons being way below population norms (Balch et al., 2009), medical students are reluctant to engage in surgical careers which contributes to the well-documented surgeon shortfalls (Bland & Isaacs, 2002; Sheldon, 2011; Van Way, 2010).

Surgeons are strained and their situation is worsening over time (Shanafelt et al., 2015). Therefore, it is crucial that surgeon well-being be addressed and that strategies to promote mental health for these health care professionals be implemented in order for the health care system to continue providing the best possible care for the patients. Hence, the aim of this work is to break down the literature on surgeon burnout, starting with the reluctance of students to pursue this career, the contributing factors of burnout and its consequences, to potential solutions to increase surgeon well-being on a multidimensional level. It answers three questions: 1.How does surgeon burnout arise? 2.What are the consequences of it? 3.How can surgeon well-being be improved?

To answer these questions, this paper proceeds by breaking down the literature on the three following subjects. The first subject, *surgery as a career choice*, provides context for comprehending the following chapters and introduces some key elements, such as work-home balance. The second subject, *surgeon burnout*, offers an in-depth comprehension of the intensifying crisis that surgeons are facing, and the third subject, *increasing surgeon well-being*, focuses on investigating the possible personal and institutional factors that could contribute to increasing surgeon wellness, all while discussing the gender specific problematics. For every one of these subjects, the literature will be systematically reviewed, resulting in an essay that offers an extensive comprehension of the surgical lifestyle, its issues, and possible paths of resolution.

It is, to the authors knowledge, the only essay of this kind, that offers a thorough, multi-faceted understanding of the worsening mental health of surgeons by reviewing the three above-mentioned subjects (medical education, burnout syndrome and increasing surgeon wellness). The results could, for instance, be presented to medical schools, hospital administrations or individual surgeons in order to increase their awareness of the problematic and to provide them with a pallet of possible solutions.

Disclaimer: Throughout this thesis, gender-specific terms are used by convention. They should be understood as referring to both genders, unless otherwise specified. Gender-specific differences are discussed within a dichotomic man/woman framework, not as a lack of awareness of non-binary identities, but to adequately represent the current state of the scientific literature on surgeon psychology.

2 The surgeon and his environment

The aim of this chapter is to provide the reader with information that is relevant for the comprehension of the ulterior chapters. It defines some key elements, such as *surgeon*, *surgery*, and *operating room* and provides information on other matters such as gender-bias in surgery, in order for the non-initiated reader to be able to read and understand the problematics exposed throughout this work.

2.1 The surgeon

There are several ways to define the terms *surgery* and *surgeon*. The Oxford Dictionary defined surgery as: “The branch of medical practice that treats injuries, diseases, and deformities by the physical removal, repair, or readjustment of organs and tissues, often involving cutting into the body” (Oxford University Press [OUP], 2020). The same dictionary defines *surgeon* as a “physician qualified to practice said surgery” (OUP, 2020). Throughout this paper, the term surgeon will refer to all medical practitioners who spend a significant amount of time inside the OR.

The different surgical subspecialties of medicine include but are not limited to: vascular, trauma, orthopaedic, thoracic, cardiac, plastic, transplant, neuro and general surgery, surgical oncology, urology, otolaryngology, pediatric surgery and obstetrics gynecology.

2.2 General precisions

While the nomenclature seems to vary between countries and cultures, this paper will refer to specialized medical practitioners who have accomplished their training in surgery

as *senior/attending surgeons* or *faculty* members. Physicians who have yet to conclude their specialization training will be referred to as *trainees, assistants, or residents*.

“OR” is the abbreviation for *operating room* or *operating theatre* which refers to “a room in a hospital specially equipped for surgical operations” (OUP, 2020). The equipment in these rooms varies, depending on the type of surgery being done. There is usually an operating table of which the height and angle can be adjusted, breathing machines and several monitors to keep track of the patient’s vitals and one or more stainless steel tables with sterilized instruments that will be used by the surgeon during the intervention (Johns Hopkins Medicine, n.d.).

When operating, the surgeon does not work alone but is assisted by an *operating team* (“*scrub team*”) usually consisting of various professions and disciplines. There are always at least four people: The attending surgeon, an anaesthesiologist, a scrub nurse, and an anaesthetist nurse. The attending surgeon may be assisted by one or more surgery residents. An assistant nurse and medical students doing their surgery rotations (internships) might also be present (Ramadanov, 2021; Rydenfält, 2014).

2.3 The surgical personality – a distinct profile?

The personality of surgeons has been a subject of fascination in the scientific literature since the eighteenth-hundreds. Many studies, of cross-sectional or longitudinal nature, have attempted to describe and compare it with the general population (Whitaker, 2018) or with the personality of internists (Drosdeck et al., 2015; Warschkow et al., 2010), and have tracked its evolution over time (Preece & Cope, 2016). There is, however, as Grossman (2018) notes, a lot of contradicting evidence in the literature, indicating that the surgical personality is a myth rather than a reality.

Nonetheless, there seems to be an existing, mostly negatively connotated stereotype of the surgical personality, as anecdotal reports (K. Hughes, 2015; Vuong, 2010) and assessments (Warschkow et al., 2010) suggest. Surgeons are often described with adjectives that are traditionally ascribed to men : aggressive, courageous, hostile, impersonal, obnoxious, practical, poor communicators, calm and collected but capable of taking split-second decisions with far-reaching consequences (Cassell, 1997; Chopra,

2017; Vuong, 2010; Warschkow et al., 2010). K. Hughes (2015) very provocatively describes the surgeon stereotypes as

[Referring to men] With testosterone-infused swagger, confident and brash, charismatic, commanding. Arrogant. Volatile, even bullying, and abusive. Aggressive. Cuts first, asks questions later, because to cut is to cure, and the best cure is cold, hard steel. [Referring to women] Cold, impersonal, moody. Micromanaging shrew, castrating harpy bitch. (Hughes, 2015, para. 8)

Furthermore, there seems to be a discrepancy between the self- and hetero-evaluations of surgeon personality traits (Warschkow et al., 2010) which could indicate a lack of self-awareness among surgeons. This also makes one wonder about the validity of the above-mentioned studies on surgeon personality, that often use self-reports to measure personality traits.

In a blog post, Vuong (2010) makes the interesting point that maybe, the negative connotated stereotype of the surgical personality comes from the fact that they are overworked, and therefore have a tendency to be short-tempered and hostile. In another article, “*Why are surgeons assholes?*”, Paulas (2015) argues that the reputation of surgeons stems from the fact that, back in the days, surgery was an old boys’ club, and that this mentality is being passed on to the next generations. He states that younger surgeons do not perpetrate as many disruptive behaviours as the old ranks and concludes that the best option is to “wait out” that the old generation and its mentalities die out. This paper does not further investigate these hypotheses, however, these questions are surely worth keeping in mind and investigating in ulterior research.

2.4 The particularity of women in surgery

Surgery is and remains a male-dominated field (Cassell, 1997; Miller, 2019). If response rates to a survey with almost 8000 participants are presumed to reflect the reality of the field, there could be as little as 8% of female surgeons in the USA (Balch et al., 2009). According to the Deutsches Ärzteblatt and the Atlas de la Démographie Médicale en France, 18% of practicing surgeons in Germany (Wünsch, 2017) and, 31,1% of surgeons in France (Conseil National de l'ordre des Médecins[CNOM], 2020) are women. The CNOM (2020) also indicates that the proportion of women in surgery is increasing over

the years but, as Bercot (2015) observed, the repartition of women in the surgical specialties is very heterogenic, with women being primarily involved in more “feminine” fields such as pediatric surgery or obstetrics gynecology. This is an example of *horizontal occupational gender segregation*, a phenomenon where the distribution of men and women, at the same hierarchal position, is uneven (International Labour Organization [ILO], 2019).

The history of women in surgery begins with Dr. James Barry, the “beardless” surgeon”, who practiced for forty years as a surgeon in the nineteenth century. As he died, the autopsy revealed that he was, in fact, Dr. Miranda Steward, a woman that had been impersonating a man for the sake of being able to practice medicine (Wirtzfeld, 2009). This sets the tune for a very long history of women fighting to establish a reputation in surgery. To this day, there is a persistent *gender-bias* (defined as the tendency to prefer one gender over another (ILO, 2019)), and hostility towards women practicing these medical specialties (Ali & McVay, 2016; Miller, 2019; Wirtzfeld, 2009).

Female surgeons, despite having the same education, are perceived as less competent than their male peers (Ashton-James, Tybur, Grieser, & Costa, 2019). In the eye-opening paper *#MeToo in Surgery: Narratives by Women Surgeons*, the interested reader will find anecdotal reports of women that experienced significative gender-bias, sexism, hostility and even violence in the operating room and the hospital environment (Miller, 2019).

Because there is substantial evidence of inequalities at the workplace for female surgeons, this paper will, beside its main purposes, highlight gender specific differences between men and women regarding the choice of surgery as a career, burnout causes and consequences and possible ways of overcoming them.

2.5 Being a surgeon – the other side of the coin.

The surgeon is often described as an all-mighty, heroic, god-like figure, that comes in with a scalpel and saves the day. He is confident, wealthy and intelligent (Chopra, 2017). The field of surgery is, in the public opinion, associated with prestige, skill and power (Bercot & Mathieu-Fritz, 2007; Seelandt, Kaderli, Tschan, & Businger, 2014). However,

as hinted to previously, being a surgeon comes at a great cost, in form of a great number of adverse psychological (and physical) health correlates.

2.5.1 Depression

Depression is not a rare occurrence among health practitioners. A meta-analysis of 31 cross-sectional surveys found an average rate of 28.8% of clinician residents with depressive symptoms. Another survey of over 6000 Australian physicians found that 10.3% screened positive for major depressive disorder (Wurm et al., 2016). Surgeons seem to be especially affected, with rates exceeding 30% according to an American survey of almost 8000 participants (T. Shanafelt et al., 2009). Surgery residents were found to have a twofold higher rate of moderate to severe depression symptoms than age-matched peers in the general population (Lebares et al., 2018)..

2.5.2 Suicide

Suicide and suicide ideation (SI), are also a concern for surgeons, and physicians in general. Schernhammer and Colditz (2004) found that suicide was more common among physicians of both genders than in the general population. A recent meta-analysis suggests that women physicians and certain clinical specialties (anesthesiology, general surgery, psychiatry) were at higher risk (Dutheil et al., 2019). Regarding SI among surgeons, Shanafelt et al. (2011) found that 6,3% reported SI in the past 12 months, of which, only about a fourth sought psychological support. Another survey found that 11% of surgical residents in the USA report SI, which is three times higher compared to the general population (Lebares et al., 2018).

2.5.3 Substance abuse

Substance (mainly alcohol) abuse among physicians is a recurring theme in the literature, and surgeons may be at higher risk (Balch et al., 2009). In a survey of 7192 American surgeons, 15,4% screened positive for alcohol abuse or dependence, with women being at higher risk than men (Oreskovich, 2012). This rate is doubled among(in?) surgery residents, of which 33% screened positive (Lebares et al., 2018). A survey of Fijian surgeons found that >30% had a problematic use of alcohol and 47% consumed Kava, a popular local drink known for its sedative properties (Patel, Huggard, & van Toledo, 2017). Oreskovich (2012) notes that, while the rates of alcohol abuse and dependence do

not differ significantly from the general population, they might be more consequential in surgeons as they can compromise patient safety and quality of care. Finally, surgeons might be at particularly high risk of abusing prescription medication because of their easy access to it (Sudan & Seymour, 2016), as physicians do exhibit higher rates of prescription benzodiazepine and opiate misuse than the general population (P. H. Hughes et al., 1992).

2.6 Conclusion

On the surface, the individuals practicing surgery seem to belong to a specific personality type. There is, however, no robust evidence that testifies to the existence of a “surgical personality”. Aside from this, surgeons do seem to face common battles: Women in surgery fight to be included and accepted but face significant gender bias, while surgeons in general manifest many symptoms of distress in the form of adverse psychological consequences. It may come as no surprise that these negative aspects of the profession influence career choice in medical students, which is what chapter 2 is all about.

3 Surgery as a career choice

3.1 Introduction

If given the choice, almost three fourth of surgeons would become a surgeon again. However, only half of them would recommend a career in surgery to their children, and the majority (63,6%) of them believe that their work schedule does not leave sufficient time to lead a balanced life (Balch & Shanafelt, 2010). The previous chapter already brought to light that surgery is facing a crisis, with women being underrepresented and surgeons appearing to face mental health issues. This chapter includes an assessment of the reason why aspiring physicians chose this career path, the various factors that impact their career decision and the surgeon's perception of the deterring and promoting aspects of their career.

Several studies have attempted to identify the appealing or discouraging factors for choosing to pursue a career in surgery. Very often, the researcher's interest was motivated by the fact that surgeons are becoming scarcer and that there is an ongoing tendency for medical students to specialize in fields that involve are more "lifestyle-based" such as anaesthesiology or radiology (Bland & Isaacs, 2002). This chapter is divided in two: The first part is dedicated to the factors that promote the surgical career, while the second part focusses on the deterrent factors. Additionally, this chapter will provide the reader with some insight as to why the surgical subspecialties are often avoided by women. All in all, 10 scientific papers on this subject were retained and read.

3.2 Methods

For this chapter, an advanced PubMed and Embase search was conducted in December of 2020. The databases were searched for combinations of the following keywords: career, attitude(s), factor(s), and surgeon/surgical/surgery, with the intent of finding scientific papers (studies, articles and reviews) that identify factors that make the surgical career attractive and/or discouraging. Regarding the literature review of this and the next chapters, following language and date restrictions were imposed: Papers that appeared before 2005 as well as papers published in a language different from English, French, or German were excluded.

Embase :

surg*:ti AND career:ti AND factors:ti AND [2005-2021]/py
attitude*:ti AND surg*:ti AND career:ti AND [2005-2021]/py

The database search identified 57 results of which all the titles were read. 28 reports were excluded right away as their title did not match this chapter's subject. The abstracts were then analysed, resulting in the exclusion of 13 more records for not addressing the research question. Most of the time, reports were discarded because they investigated intrinsic characteristics of medical students (age, ethnicity, exposure to surgery during pre-clinical years) rather than characteristics of the profession in itself. Of the remaining 16 reports, only 10 full texts were accessible online, resulting in the further exclusion of 6 titles. The remaining 10 reports were printed and read in full. The flow of articles is represented in **Figure 1**.

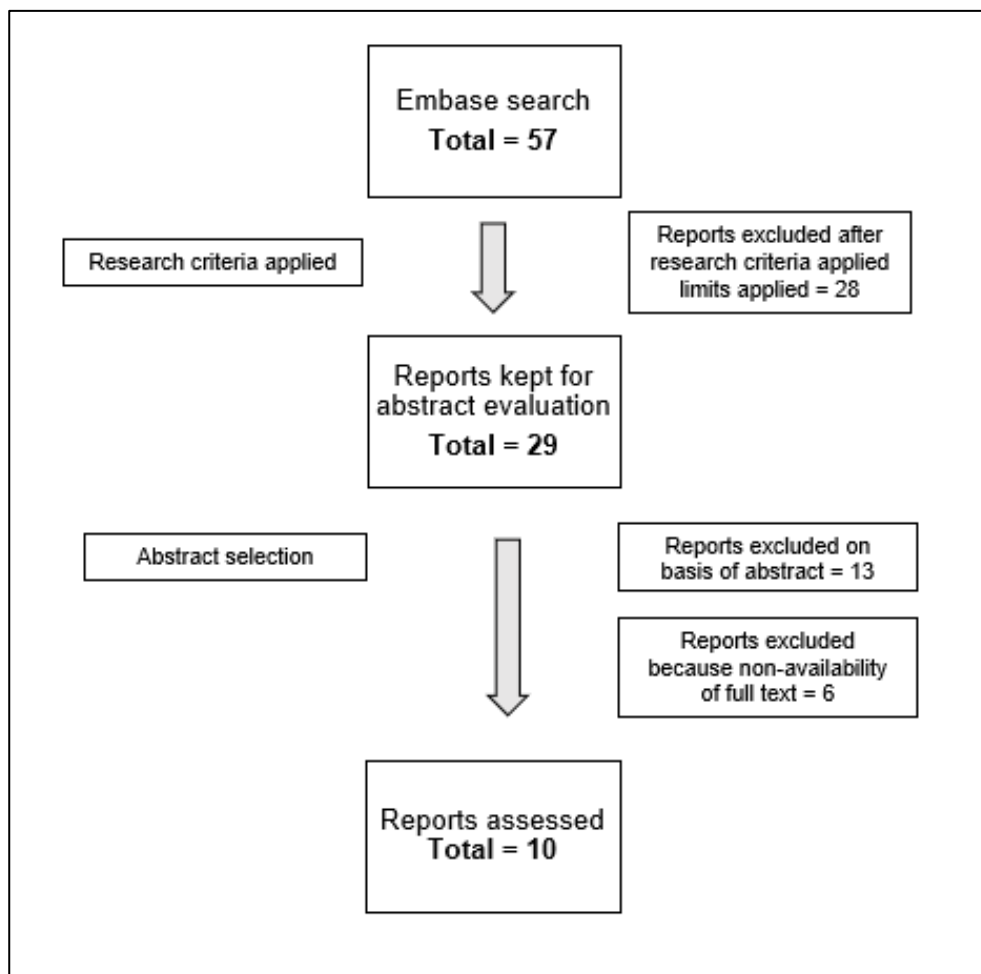


Figure 1. Flow diagram of articles on surgery as a career choice.

PubMed :

```
((factors[Title]) AND (career[Title])) AND (surg*[Title]) AND (("2005"[Date - Publication] : "2021"[Date - Publication]))  
(attitude*[Title]) AND (surg*[Title]) AND (career[Title]) AND (("2005"[Date - Publication] : "2021"[Date - Publication]))
```

The database search identified 46 articles. 23 were excluded because their title mismatched this chapter's field of interest. The remaining articles were duplicates of the Embase search and thus excluded.

In the end, 10 full texts were retained and screened with the purpose of providing scientific data for this chapter, a list of which can be found in **Table 1**. Also, the cross-references were checked, resulting in the inclusion of additional references that fit the purposes of the chapter. However, it is important to note that the information presented here includes sources beyond the systematic review that was performed: The literature reviews of each chapter work together to mutually enrich and complete each other. All in all, this results in an integrative review that provides a thorough understanding of the problematic, its causes and potential resolutions.

Table 1. Studies included in literature review on surgery as a career choice.

Author(s)	Title	Country	Description
Chegini and Chegini (2015)	Attitudes towards a career in surgery amongst students and trainees	England	Survey, 52 medical student and resident respondents
Corless et al. (2020)	The future of general surgery in Ireland: factors influencing career decisions of medical students	Ireland	Online survey, 307 medical student respondents
Ganschow (2012)	Attitude of medical students towards a surgical career - A global phenomenon?	/	Systematic review of 21 reports
Glynn and Kerin (2010)	Factors influencing medical students and junior doctors in choosing a career in surgery	Ireland	Paper and online survey, 204 medical student and resident respondents
Kahn, Pillay, Veller, Panieri, and Westcott (2006)	General surgery in crisis - Factors that impact on a career in general surgery	South- Africa	Online survey, 245 medical student respondents
Peel, Schlachta, and Alkhamesi (2018)	A systematic review of the factors affecting choice of surgery as a career	/	Systematic review of 120 reports, no date restriction
Scott, Matejcek, Gowans, Wright, and Brenneis (2008)	Choosing a career in surgery: Factors that influence Canadian medical students' interest in pursuing a surgical career	Canada	Survey, 2168 medical student respondents
Seelandt, Kaderli, Tschan, and Businger (2014)	The surgeon's perspective: Promoting and discouraging factors for choosing a career in surgery as perceived by surgeons	Switzerland	Open ended questionnaire, 492 senior surgeons
Sutton, Mason, Vimalachandran, and McNally (2014)	Attitudes, motivators, and barriers to a career in surgery: A national study of uk undergraduate medical students	England, Wales	Online survey, 482 medical student respondents
Yu, Jain, Chakraborty, Wilson, and Hill (2012)	Factors influencing intentions of female medical students to pursue a surgical career	/	Systematic review of 70 reports published after 1990

3.3 What are the deterrents for choosing surgery as a career choice?

The literature was analysed to find potential discouraging factors for choosing surgery as a career. This subchapter aims to list and analyse those factors. As previously mentioned, a very low proportion of women chose to engage in surgical careers, therefore, in order to further understand this phenomenon, particular attention was given to factors that are perceived as a deterrent by women.

Many publications highlight the fact that there is increasing evidence of a decline in interest in surgical careers among medical students (for example: (Corless et al., 2020; Lawal & Afolabi, 2013; Peel, Schlachta, & Alkhamesi, 2018)). Many authors, fearing that it might come to a severe shortage of surgeons in the future, have tried to understand this trend and explored the barriers for choosing a career in surgery.

The primary reasons medical students and residents refrain from choosing a career in surgery is the perceived difficulty to attain a satisfactory **work-life balance**. This was discussed in all 10 research papers included in this search. According to a survey by Chegini and Chegini (2015), only 7% of medical students believe their work-life **priorities** would match those of a successful surgeon. A recent study by Corless et al. (2020) found that many medical students initially interested in a surgical career were dissuaded during the course of medical school, citing poor work-life balance (47%) as their primary reason for changing their mind. This is understandable, since work-life balance is among the most important decision factors when choosing a medical specialty (Sutton, Mason, Vimalachandran, & McNally, 2014). In a meta-analysis by Yu, Jain, Chakraborty, Wilson, and Hill (2012) it is stated that the perceived poor work-life balance of surgeons is particularly discouraging for women, as they believe that **surgery is incompatible with pregnancy, having and raising children**. The lack of possibility for a maternity leave or part-time residency positions are also of concern.

While the difficulty to attain a satisfactory work-life balance was the most heavily studied in the literature (Peel et al., 2018), there is also mention of other discouraging aspects of the surgical lifestyle. Indeed, in comparison to other specialties such as family or internal medicine, surgeons generally have a less “controllable” lifestyle due to **nights on-call, irregular working hours** and an **extensive workload** (Seelandt et al., 2014). The **length of training** and **lifestyle during training** is also a concern (Glynn & Kerin, 2010; A. J.

Scott & Kahn, 2017) with some extreme cases of South African general surgery residents working up to 100 hours per week (Kahn, Pillay, Veller, Panieri, & Westcott, 2006). The high work volumes, long working hours as well as the fact that human lives depend on the surgeon's skills undoubtedly contribute to the profession being qualified as **stressful**, which dissuades many medical graduates from entering this profession (Glynn & Kerin, 2010; Kahn et al., 2006; Lawal & Afolabi, 2013).

Aside from lifestyle issues, there are also gender specific disincentives for choosing a career in surgery. Indeed, there are few female surgeons which causes a **lack of same-sex role-models** for women during surgery internships. A significant number of women tend to **feel out of place** during surgery rotations. Furthermore, 68%-96% of female medical students stated that they experienced **gender bias** during surgical internships, including **sexual harassment** and **discrimination**, which afterwards influenced their career choice. These were most often instigated by surgeons and residents, but also by staff and patients (Peel et al., 2018; Yu et al., 2012).

As has already been mentioned in subchapter 2.4, the proportion of women in surgery is particularly low. This is particularly concerning given that the proportion of women in medical schools is increasing (about 50%-60% of female students in many countries (Yu et al., 2012)) and that the general population is aging (Eurostat, 2019), hence increasing the need for surgical interventions. The increasing proportion of women in medical schools in addition to the decreasing popularity of surgical subspecialties among medical students of both genders could eventually lead to a surgeon shortage crisis, which is why the profession needs to be made more attractive to students. Work time regulations, positive role-models and incorporating surgical exposure during pre-clinical years are often cited as possible course of actions to remediate this issue.

3.4 What makes surgery an attractive career choice?

The scientific literature focusses less on the promoting factors for choosing surgery as a career than it does on the discouraging factors. The authors often tried to highlight the reasons why medical students refrain from choosing a career in surgery in order to help prevent a surgeon shortfall in the future, which could be the reason why there is less

emphasis on the positive aspects of the profession. This division will attempt to list the promoting factors for choosing surgery as a career.

A consistent finding in the literature is, that the ability to **witness the improvement of the patients' health** after a surgical intervention is rewarding and considered to be an attractive part of the profession (Kahn et al., 2006; A. J. Scott & Kahn, 2017; Yu et al., 2012). “**Hands-on work**” or the use of **manual skills** was also found to be a recurrent incentive for choosing to pursue a career in surgery, as identified by 4 publications (Kahn et al., 2006; A. J. Scott & Kahn, 2017; Seelandt et al., 2014; Yu et al., 2012). All in all, the profession is described as **intellectually challenging, meaningful, and demanding**. It offers the possibility of **task variety, teamwork, bright career prospects**, and the **conjoint use of several technical and non-technical skills** (Seelandt et al., 2014). It is also an attractive career choice for individuals seeking a **hospital oriented medical specialty** (Yu et al., 2012).

Another incentive for choosing a career in surgery is the anticipated **income and status**. The profession is qualified as **highly prestigious** (Seelandt et al., 2014) and many surgeons believe they benefit from a high social status (Kahn et al., 2006). Many publications highlight the fact that students aiming to pursue a career in surgery are often motivated by prestige, income and future career prospects (Glynn & Kerin, 2010; Mushtaq & Tahir, 2014; I. M. Scott, Matejcek, Gowans, Wright, & Brenneis, 2008; Yu et al., 2012).

There are numerous positive aspects in regard to task and contextual factors of the surgical profession, with many surgeons qualifying their profession as being their **calling** (Kahn et al., 2006; Seelandt et al., 2014). Despite the fact that the literature highlights the high attrition rates of surgical residents and the reluctance of (female) medical students to engage in surgical careers, this trend has not been observed in every country. For instance, Ganschow (2012) found that surgical subspecialties are more popular in countries with a lower Human Development Index than in western countries. In order to promote the attractiveness of the profession, numerous authors emphasize the beneficial role of having positive role-models during surgery rotations and residency (for example: (Peel et al., 2018)), which could increase the interest of pursuing a surgical career.

3.5 Conclusion

There is a lot of literature on factors that could influence medical students in pursuing a career in surgery. While this search only identified 10 reports that fit the aim of this chapter, many more publications could have been included if the key words and/or inclusion criteria would have been different.

There seems to be a genuine concern in the medical literature as to why the interest in the surgical profession is decreasing, and numerous potential barriers have been identified. Although, it has been established for decades that the surgical lifestyle is an issue, and that surgery is a female-unfriendly field, this research identified little to no evidence that genuine efforts to remedy these issues are being made in the field. The conclusion is that awareness needs to be risen concerning these issues in medical schools and university clinics, and of their role in promoting surgery as a valid career choice for medical students of both genders.

4 Stress and burnout

4.1 Introduction

The previous chapters have established that surgery is a demanding occupation that often does not leave enough time to lead a balanced life, which is one of the primary reasons why students, especially females, refrain from pursuing this career. It is characterized by irregular work hours and a high-pressure environment, that is known to have detrimental effects on surgeon's (physical and) mental health, as indicated by high rates of depression, suicide ideation and substance abuse among surgeons.

When browsing the scientific databases for publications on surgeon psychology, one notices that there is an overwhelming number of publications on surgeon stress and burnout. As with many publications on the surgical profession, the authors express concern about potential surgeon shortfalls, and attempt to come up with ideas to improve surgeon well-being. This chapter addresses the specificities of surgeon burnout, because in order to find strategies to increase the surgeons' wellness, one must have a thorough understanding of what ails them. Among others, this chapter discusses lifestyle issues, acute stress inside the OR, and gender differences.

It is divided in four parts:

The first part explains the term *burnout*, its history, definition, and assessment tools. The second part addresses the prevalence of the burnout syndrome among the surgical population. The third part assesses the aetiology of stress and burnout (the *causes*), while the last part presents the impact (the *consequences*) of it.

The subject of stress and burnout among surgeons is very well-researched. It is closely linked to the adverse psychological outcomes mentioned in chapter 1, and to the reasons that discourage medical students from pursuing a career in surgery, mentioned in chapter 2. Therefore, it is crucial that this subject is addressed, as interventions that target this issue could have a positive influence on many of the other battles that surgeons are facing.

4.2 Methods

A PubMed search for combinations of the keywords *surgeon/surgery/surgical*, *stress* and *burnout*, was conducted in January of 2021. The same exclusion criteria as in chapter 2 were applied, but because of the overwhelming amount of literature available on this subject, additional exclusion criteria were introduced. Research papers focussing on specific surgical subspecialties were excluded in favour of papers including multiple surgical domains, and papers focusing solely on stress or burnout in surgery residents were also excluded as this was not considered to be the primary focus of this review. The scientific literature was included, either if it identified causes or consequences of burnout, or of stress in the OR

The aim was to provide the reader with a more general overview of the stressors of the profession. Since the PubMed search issued an abundant amount of content for this chapter, an additional Embase search was not deemed necessary. The flow of articles is represented in **Figure 2** while an overview of the articles identified by this search can be found in **Table 2**.

PubMed search:

((((surg*[Title]) AND (burnout[Title] OR stress[Title]))) NOT (residen* [Title] OR incontinence[Title] OR urin*[Title] OR cancer[Title] OR nurse*[Title])) AND ("2005"[Date - Publication] : "2021"[Date - Publication]))

This search identified 1.152 search results of which 1.079 were excluded firsthand, as they did not fit the inclusion criteria or the topic of this chapter. The abstracts of the remaining 73 publications were read, resulting in 34 additional exclusions. These exclusions were based on various reasons with most being that the papers were of editorial nature or because they were off topic. Left were 39 research papers, of which 20 were read in full as they were deemed to best fit the interest of this chapter.

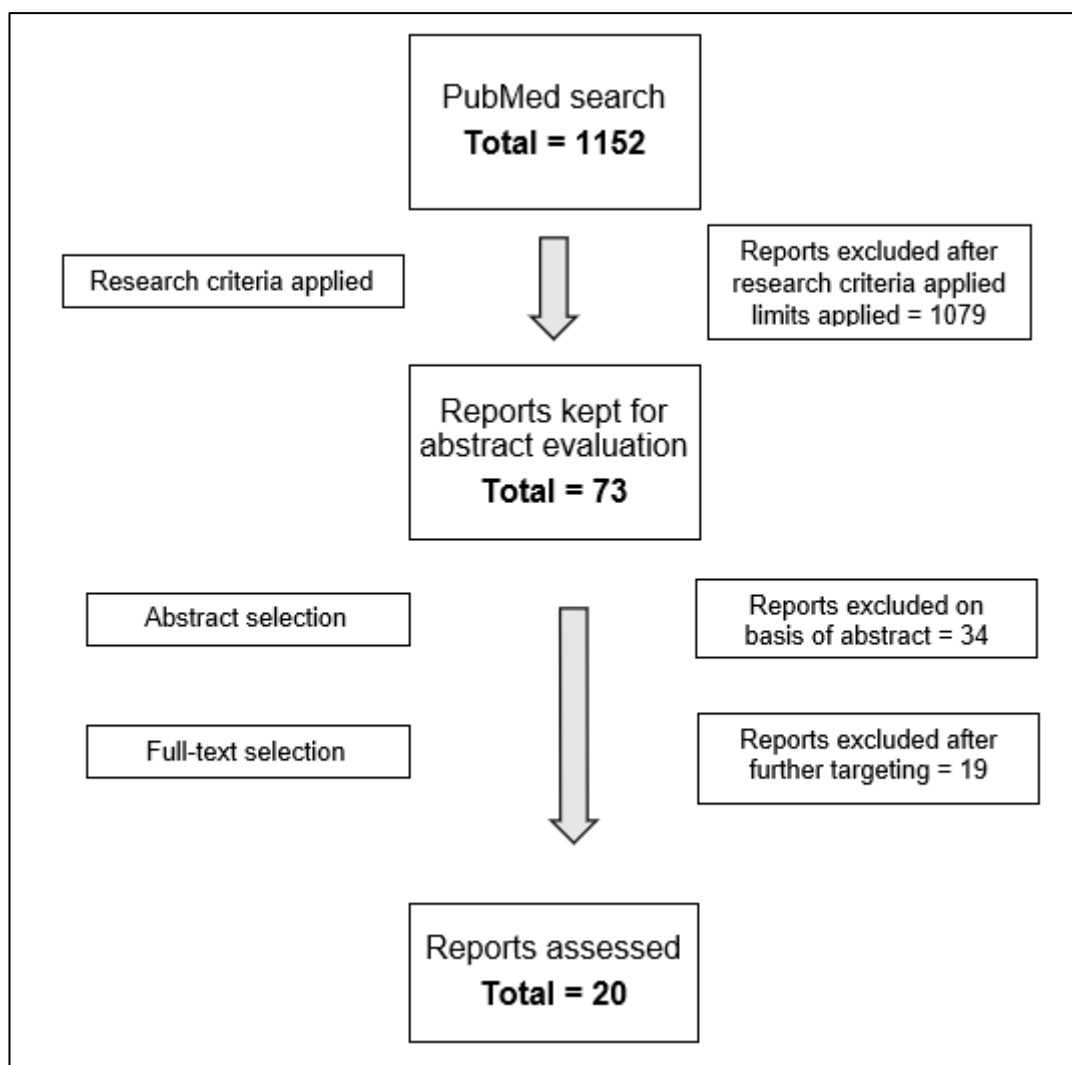


Figure 2. Flow diagram of reports on stress and burnout in surgery.

Table 2. Studies included in literature review on stress and burnout in surgery.

Author(s)	Title
Anton, Montero, Howley, Brown, and Stefanidis (2015)	What stress coping strategies are surgeons relying upon during surgery?
Arora et al. (2010)	The impact of stress on surgical performance: a systematic review of the literature
Balch and Shanafelt (2010)	Combating stress and burnout in surgical practice: a review
Balch et al. (2009)	Stress and burnout among surgeons: understanding and managing the syndrome and avoiding the adverse consequences
Bartholomew et al. (2018)	Meta-Analysis of Surgeon Burnout Syndrome and Specialty Differences
Dimou, Eckelbarger, and Riall (2016)	Surgeon Burnout: A Systematic Review
Doherty (2019)	How Do We Prevent Burnout in Surgery?
Dyrbye et al. (2011)	Relationship between work-home conflicts and burnout among American surgeons: a comparison by sex
Galaiya, Kinross, and Arulampalam (2020)	Factors associated with burnout syndrome in surgeons: a systematic review
Jones et al. (2015)	Assessing surgeon stress when operating using heart rate variability and the State Trait Anxiety Inventory: will surgery be the death of us?
Klein, Frie, Blum, Siegrist, and dem Knesebeck (2010)	Berufliche Gratifikationskrisen, Job Strain und Burnout bei chirurgisch tätigen Krankenhausärzten
Lu, Columbus, Fields, Melnitchouk, and Cho (2020)	Gender Differences in Surgeon Burnout and Barriers to Career Satisfaction: A Qualitative Exploration
Lu et al. (2020)	Gender Differences in Surgeon Burnout and Barriers to Career Satisfaction: A Qualitative Exploration
McQueen, Mobilio, and Moulton (2020)	Fractured in surgery: Understanding stress as a holistic and subjective surgeon experience
Patel et al. (2017)	Occupational Stress and Burnout among Surgeons in Fiji
Senturk and Melnitchouk (2019)	Surgeon Burnout: Defining, Identifying, and Addressing the New Reality
T. D. Shanafelt et al. (2009)	Burnout and career satisfaction among American surgeons
Shanafelt et al. (2010)	Burnout and medical errors among American surgeons
Shanafelt et al. (2012)	Avoiding burnout: the personal health habits and wellness practices of US surgeons
Wetzel et al. (2006)	The effects of stress on surgical performance

4.3 The burnout syndrome

4.3.1 The burnout syndrome: Past and present

It seems worthwhile to mention that the concept of burnout is not new, which is a common misconception since burnout awareness has risen in the past years, both in the scientific and public opinion. The significant increase in publications on this subject could be perceived as an indicator of an increased social interest in mental health. However, it has already been thematized in as early as 1974 (Freudenberger, 1974; Ginsburg, 1974). Christina Maslach followed up in 1976 with the tri-dimensional model of burnout (Maslach, 1976) that is widely known and accepted today. This model will be explained in chapter 6.4.2. This author is also co-creator of the Maslach Burnout Inventory – MBI (Maslach & Jackson, 1981), a tool to assess the experienced burnout which is often described as the gold standard measure of burnout.

Finally, it is also necessary to mention that the burnout syndrome is still disputed in the scientific community. While there are numerous publications on the subject of burnout, it has not been established as a mental health condition by the most common nosographies i.e. the DSM-V and ICD-10 (American Psychological Association, 2013; World Health Organization, 2004). Heinemann and Voigt (2017) argue that the recognition of the burnout syndrome as a medical condition could be the medicalisation of a normal phenomenon, being occupational stress. The interested reader will find an interesting but critical approach to the history of the burnout syndrome in their literature review (Heinemann & Voigt, 2017).

4.3.2 Maslach's three dimensions burnout applied to healthcare

Christina Maslach is one of the pioneers when it comes to burnout research. She dedicated over forty years of her career to this subject, boasting over a hundred publications on this subject and still teaching at the University of California, Berkeley, at age 75.

In a 1982 paper on burnout among health care workers, she very well sums up that

most healthcare careers involve a great deal of contact with people – patients, patient's families or friends, and other medical personnel. Often, this interpersonal contact is emotionally charged, with feelings of tension, anxiety, embarrassment, fear, or even hostility underlying the verbal exchange. This source of chronic emotional stress can lead

to the development of *burnout* – a syndrome of emotional exhaustion, depersonalization, and reduced personal accomplishment. (Maslach & Jackson, 1982, p.228)

This tri-dimensional model can be applied to many different professions. The aim of this subchapter is to understand how this can be applied to the surgical profession.

Maslach's first dimension of burnout, **emotional exhaustion (EE)**, refers to the fact that the surgeon might feel emotionally depleted, as if their emotional resources were drained and they didn't have anything left to give to their patients (Maslach & Jackson, 1981). The dimension of **depersonalization (DP)**, also referred to as cynicism, encompasses detachment from the job (Senturk & Melnitchouk, 2019) and negative feelings and attitudes towards the patients (Maslach & Jackson, 1982). The last dimension is the decreased sense of **personal accomplishment (PA)**, which is a sense of ineffectiveness at work and to have a negative self-perception, especially in regard of one's work with patients (Maslach & Jackson, 1981).

Balch and Shanafelt (2010) add that feeling emotionally drained and treating patients and treating colleagues and patients like objects rather than human beings are common symptoms of burnout among healthcare workers. Physical fatigue, poor judgement and guilt are also commonly cited symptoms.

4.3.3 Measurements of burnout

There are several assessment tools for measuring occupational burnout.

The most commonly used and validated tool is the Maslach Burnout Inventory (MBI) (Maslach & Jackson, 1996; Maslach, Jackson, & Leiter, 1997), a 22-item self-administered questionnaire divided in 3 independent subscales. Most surveys cited in this chapter utilize some version of this questionnaire, an abbreviated form or select items from it, in order to assess surgeon burnout. There is a lack of consensus in the literature regarding cut-off points and categorization of low/medium/high burnout which makes generalisations difficult.

Other questionnaires such as the Oldenburg Burnout Inventory or the Copenhagen Burnout Inventory are also popular tools to assess the experienced burnout syndrome,

however, the MBI remains the most widely used (Demerouti, 2008; Kristensen, Borritz, Villadsen, & Christensen, 2005).

4.4 Prevalence of burnout among surgeons

There are many difficulties when trying to determine the prevalence of burnout among surgeons. As mentioned previously, there is some debate on the definition of burnout. For instance, some authors deemed surgeons “burnt-out” when they reached high scores on the three subscales of the MBI, while others defined burnout as having a high score on at least one of the subscales, hence finding a much greater prevalence of burnout among surgeons. Furthermore, the available research shows heterogeneity when it comes to the assessment tools for occupational burnout. All in all, these issues make generalizations impossible, which is why all the following numbers are to be read with precaution before drawing any conclusions.

First of all, when investigating surgeon burnout, there is no going around “The American College of Surgeons Burnout Survey” by T. D. Shanafelt et al. (2009) which is, to this day, the biggest study on this subject with 7905 American surgeon respondents. The authors considered individuals with high scores of DP and/or EE as exhibiting at least one symptom of occupational burnout. Their results indicate that 39,6% of surgeons were burnt-out. These authors also investigated potential links between burnout comorbidities such as depression and demographic indications such as gender. Those results will be exposed in subsequent chapters.

Similar findings as those from T. D. Shanafelt et al. (2009) were found across the literature. Burnout ranges varying from 22,2% of surgery residents (Arghavan Salles et al., 2019) to 85,1% of reconstructive surgeons in China (Zheng, Shao, & Zhou, 2018) were identified in a recent meta-analysis by Galaiya, Kinross, and Arulampalam (2020). A German study found rates as high as 48,7% (Klein, Frie, Blum, Siegrist, & dem Knesebeck, 2010). Rates of 47,6% among Australian surgeons (Benson, Truskett, & Findlay, 2007) and 32% among UK colorectal and vascular surgeons have also been mentioned by Balch et al. (2009). A survey realized in 2011 and revisited in 2014 found that burnout (and depression) rates were increasing over time (Shanafelt et al., 2015) which testifies to the urgency of addressing this matter.

Some researchers assessed differentiated levels of burnout. A meta-analysis by Bartholomew et al. (2018) found rates of 3% and 34% for burnout among surgeons when using strict and less strict criteria respectively, strict criteria meaning that the individuals had to manifest high scores on the three subscales of the MBI. Another study ranked Fijian surgeons in categories of low (27,8%), medium (63,9%) and high (8,3%) levels of burnout, depending on their scores.

Regardless of the assessment tool or definition used, there seems to be an overall consensus in the literature that the burnout rates among surgeons are alarmingly high and, as stated previously, that these individuals seem to be particularly at risk for developing adverse psychological outcomes. These high numbers prove that it should be a priority to try to find strategies to improve surgeon well-being, especially since these numbers tend to be increasing rather than decreasing over the years. The following chapters will be dedicated to finding out possible reasons *why* these rates are so high and *how* it affects the physicians.

4.5 Aetiology of stress/burnout among surgeons

4.5.1 Acute stress

As previously presented, there are numerous statistical correlates to burnout among surgeons. Most of these correlates, however, are related to lifestyle issues. For instance, extensive workloads, long working hours and nights on-call have been identified as correlating to burnout. This subchapter will address the acute stressors of the profession, as they are also potential contributors to burnout. Indeed, surgeons are required to perform high stakes operations on a regular basis, and chronic exposure to job stressors has been linked to burnout (Maslach, Schaufeli, & Leiter, 2001). In this context, stress is defined as the *flight-or-flight* response, a nonspecific arousal, to environmental demands and stressors (Selye, 1973, 1976).

Surgeons have very high responsibilities and need to stay focused during extended periods of time. In the literature, their performances have been compared to those of pilots (Kao & Thomas, 2008; J Bryan Sexton, Thomas, & Helmreich, 2000). The surgical interventions are considerable sources of stress. Both objective and subjective research methods have identified an increase in stress levels during operative procedures (Jones et

al., 2015). The literature has identified several stressors such as laparoscopic surgery (=minimally invasive surgery using trochars), complex procedures, bleeding, potential distractions, problems with the equipment and time pressure (Arora et al., 2010).

Surgeon stress has been described as multifaceted, encompassing emotional, physiological, sociocultural and cognitive facets (McQueen, Mobilio, & Moulton, 2020). There is also mention of a *culture of bravado* (Galaiya et al., 2020) or *culture of silence* (McQueen et al., 2020) which refers to the unwritten code among surgeons, that valorises being tough and not complaining, thus preventing them from seeking help when confronted to psychological turmoil, which puts an additional strain on them.

While some level of arousal may be important to increase focus and performance (Sandi, 2013; Yerkes & Dodson, 1908), high levels of stress are detrimental both short- and long-term. Indeed, it can lead to impaired thinking and performance and ultimately burnout, when chronically exposed to (Jones et al., 2015; Maslach et al., 2001). Nevertheless, while the acute stressors are to be considered as a part of a holistic approach to surgeon burnout, they are an unavoidable part of the profession. Therefore, the focus of the institutions in question should be on the stressors that are avoidable, such as workload, workflow efficiency etc. (+stress management techniques etc.).

4.5.2 Personal factors correlated to increased burnout

While it has already been addressed that surgery in itself is a stressful occupation, this chapter will attempt to summarize the personal factors such as demographic details of the physician that are correlated to higher levels of burnout. The ultimate goal is to present evidence of factors that could be contributing to burnout, as this may help surgeons identify if they are at risk of developing adverse psychological outcomes such as occupational burnout. However, this task is hindered by the fact that, while research has established numerous correlations between personal and professional variables and burnout rates, the direction of these links as well as the underlying mechanisms remain unclear. In other words, it is often difficult to determine if something is the cause or the consequence of burnout.

According to Balch et al. (2009), referring to surgeon burnout

One of the tragic paradoxes of burnout is that those most susceptible appear to be the most dedicated, conscientious, responsible, and motivated. Individuals with these traits are often idealistic and have perfectionist qualities that may lead them to submerge themselves in their work and devote themselves until there is nothing left to give. Thus, commitment to patients, attention to detail, and recognizing the responsibility associated with patient's trust – the very traits that define a good surgeon – also place surgeons with these qualities at greater risk for burnout. (Balch et al., 2009, p. 374)

As per the “American College of Surgeons (ACS) Survey”, young age, being a woman, **working more nights on-call**, having experienced a **work-home conflict in the past three weeks** and working in a setting where the revenue is based on billing/productivity are factors linked to increased burnout rates. (In addition, having children between the ages of 5 and 21 years was also linked to increased burnout rates, while the fact of having children in general was linked with a decreased rate of burnout.) **Hours worked per week** did correlate with higher burnout rates after controlling for confounding variables (Patel et al., 2017), which is understandable, as a third of surgeons stated working 60-69 hours per week (32,6%), and 17,1% stating they worked 80 hours or more (Dyrbye et al., 2011; T. Shanafelt et al., 2009). Hours worked per week were associated with higher burnout rates in the majority of papers (Balch et al., 2009; Bartholomew et al., 2018; Dimou, Eckelbarger, & Riall, 2016; Dyrbye et al., 2011; Galaiya et al., 2020; Pulcrano, Evans, & Sosin, 2016; Senturk & Melnitchouk, 2019). The **lack of control over work life** was also mentioned as a contributing factor (Lu, Columbus, Fields, Melnitchouk, & Cho, 2020). Finally, a recent meta-analysis suggests that limiting the hours worked per week would reduce burnout (Galaiya et al., 2020).

Regarding gender-specific differences, the literature yielded mixed results. The ACS survey indicated that fewer men than women manifested burnout symptoms with 39% and 43.3% respectively (Dyrbye et al., 2011). A meta-analysis by Pulcrano et al. (2016) that assessed reports published between 1980 to 2015, found 6 reports with similar results, however, one report found male sex to correlate with higher burnout, and 9 articles could not find any evidence that could suggest a link between sex and occupational burnout. While women reported more work-home conflicts than their male counterparts, the other factors contributing to burnout were remarkably similar (Dyrbye et al., 2011). A recent qualitative study by Lu et al. (2020) suggests that **gender bias** contributes to burnout

among women, while A. Salles, Milam, Cohen, and Mueller (2018) found **perceived gender judgement** to increase both men's and women's burnout rates. The statements of gender bias are in line with what was already exposed in regards of sexism in the surgical work field, with female surgeons stating that it is often assumed that they are incompetent. According to a systematic review by Dimou et al. (2016), difficulties maintaining a work-life balance is the biggest contributing factor to burnout. This is also one of the reasons why many medical students are reticent to engage in a surgical career, as stated in a previous chapter.

Marital status was also a point of divergence, with several studies finding negative correlations between **marriage** and burnout syndrome, while other studies found that the effect of the relationship status on burnout rates depended on other factors such as the profession of the spouse. For instance, a **spouse working outside of the home as a healthcare professional** was found to increase burnout rates (T. Shanafelt et al., 2009) whereas having a partner that was **supportive** and the fact of **spending more time with a spouse** was linked to decreased burnout rates (Galaiya et al., 2020).

High burnout rates have been linked to a phenomenon called the “**second victim syndrome**” (SVS). This refers to the trauma experienced by surgeons who face medical errors and poor patient outcomes (Lu et al., 2020; Senturk & Melnitchouk, 2019). Physicians manifesting SVS syndrome might feel personally responsible for unforeseeable adverse patient outcomes and question their own skills or question their career choice. SVS has been identified as both a cause and consequence of occupational burnout (Heiss & Clifton, 2019; Marmon & Heiss, 2015).

Researchers were also interested in finding out if there were potential correlations between burnout rates and field of specialty. Indeed, the tasks, patient interactions and time spent in the OR vary a lot between surgical specialties. T. Shanafelt et al. (2009) found that otolaryngologists (ENT), urology, trauma, vascular and general surgery were linked to higher rates of burnout. Similar results were found by Dimou et al. (2016), with trauma surgeons having the highest and paediatric surgeons having the lowest burnout rates. A meta-analysis by Bartholomew et al. (2018) found different results with ENT surgeons having the lowest rates of burnout while general, neuro, transplant and oncology surgeons having high rates across all three dimensions of the MBI.

In addition, being a resident rather than an attending was associated with higher burnout rates by many authors (for instance: Galaiya et al. (2020)). Age has been identified as playing a role as well, with younger surgeons having higher burnout rates (Dimou et al., 2016; Galaiya et al., 2020; T. Shanafelt et al., 2009)

Researchers have tried to come up with explanatory factors for the high burnout rates among surgeons. In regards to this, the “delayed gratification” theory seems to be widely accepted as a potential contributing factors to burnout. Balch et al. (2009) explain that many medical students and residents form maladaptive coping strategies during their learning/training period, where they put their personal lives “on hold”, thinking that the situation will improve once a certain phase or event has passed. This might contribute to them developing a “delayed gratification” mentality, which will go on as they progress in their careers. Many believe they will have to wait until retirement to be able to have fulfilling personal lives. In fact, the vast majority of surgeons seem to believe that it is impossible to simultaneously lead a fulfilling personal and professional life (64%) (T. Shanafelt et al., 2009). An overview of the factors that likely contribute to the development of occupational burnout among surgeons can be found in **Table 4**.

Table 3. Overview of contributing causes to burnout

Contributing causes to surgeon burnout (Balch et al., 2009)
Length of training and delayed gratification
Limited control over the provision of medical services
Long working hours, high work loads
Difficulties with keeping up a work-life balance
Feeling isolated, not having sufficient time to connect with peers
Financial issues
Grief or guilt about patients with negative outcomes
Insufficient time or funds dedicated to research
Inefficient or hostile work environment
Unrealistic goals

4.5.3 Institutional factors correlated to stress and burnout

While many personal factors have been found to correlate with higher burnout rates, this subchapter will address which institutional factors present an increased risk for developing occupational burnout.

Regarding teaching and academic work, surgeons being able to engage in **research** and in **academic work** have been found to have decreased burnout rates. The ability to **teach residents** was also cited as an enjoyable aspect of the job (Galaiya et al., 2020; Lu et al., 2020).

A **lack of autonomy and control** over one's schedule was linked to more burnout in a qualitative study by Lu et al. (2020), resulting in surgeons reporting they could not plan any activities because they felt they had protected free time. This lack of control over their work life was linked to feelings of powerlessness, frustration, despair, and anxiety. **Excessive administrative** duties as well as **no protected time** specifically dedicated to accomplishing them was also identified as a work environment factor linked to burnout (Galaiya et al., 2020).

Hierarchy support was also stated to decrease burnout, as was **administrative transparency** and an effective **workflow**. **Support from colleagues** was also pictured as a factor decreasing burnout, with surgeons describing teamwork, collegiality, as opposed to poor working relationships, as positive aspects of the profession. (Galaiya et al., 2020; Lu et al., 2020).

The **workload** and **hours worked** per week have previously been identified with higher burnout rates, which is why this chapter will not go into further detail on this subject. However, it seems worthwhile to mention that regulated work reductions such as limiting the hours worked per week to a given maximum has been found to induce a decrease in burnout rates (Galaiya et al., 2020).

Regarding income and compensation models, **lower income** has been linked to higher burnout rates, as has debt load (Galaiya et al., 2020). Also, having an incentive-based salary based on productivity, as opposed to a stable income, was shown to increase burnout (T. D. Shanafelt et al., 2009).

Table 3. summarizes the factors that manifest positive or negative correlations with burnout.

Table 4. Overview of correlates of burnout among surgeons

Factors associated with an increased burnout rate.	Factors associated with a decreased burnout rate.
Fields of specialty: Trauma, vascular and general surgery, ENT and urology	Increased revenue (Pulcrano et al., 2016).
Having experienced a work-home conflict in the past 3 weeks, resolving the most recent work-home conflict in favour of work, difficulties maintaining a work-life balance	Grit and perseverance (Dimou et al., 2016).
Hours worked per week.	Enjoyment of patient care (Lu et al., 2020)
Lack of autonomy, high volume of administrative tasks/low administrative support, high caseload, legal issues.	Support from colleagues and supporting work environment (Galaiya et al., 2020; Lu et al., 2020).
Depression, suicidal ideation, substance abuse or misuse.	Having children.
Desire to leave, low career satisfaction, poor relationships with peers.	Health, being physically active and having hobbies.
Second victim syndrome (Heiss & Clifton, 2019).	Personality factors like openness, extraversion, agreeableness and conscientiousness (Galaiya et al., 2020).
Perceived gender-judgement	Academic work, research or teaching (Galaiya et al., 2020)
	High career satisfaction (T. Shanafelt et al., 2009)

4.6 The impact of surgeon stress/burnout

After having presented the factors that can cause or contribute to burnout, this subchapter will present the consequences of burnout. Three main issues will be tackled: the impact of stress on surgical performance, the impact of surgeon burnout on healthcare, and finally, the consequences of burnout for the surgeon's health and well-being. This will underline the importance of handling these issues, as it poses a threat to the physicians, their patients and health care on a more global level.

Several of the sub-mentioned papers find links between burnout and diverse adverse outcomes in physicians of non-surgical specialties. Those results were still included because, to the authors knowledge, no study explored those links in surgical specialties and, there is a chance that what applies to internist burnout could also to some extent be applied to surgeon burnout. It is also worthwhile to note that with many of the sub-mentioned consequences of burnout, the direction of the link is not always crystal clear and could sometimes be bi-directional.

4.6.1 The impact of stress on surgical performance

Stress is known to affect performance in the military (Wallenius, Larsson, & Johansson, 2004), aviation (J. B. Sexton & Helmreich, 2000; J Bryan Sexton et al., 2000), and sports (Hammermeister & Burton, 2001), which is why stress management techniques have been implemented in those disciplines. In line with the *code amongst surgeon* and general mentalities that are ascribed to them, it comes as no surprise that stress management training and coping techniques seem undervalued by surgeons. Often, it is also not acknowledged or taught during medical training. Unfortunately, stress does impact surgical performance negatively. This sub-chapter will focus on the short-term effect of stress while the subsequent sub-chapters will handle the long-term effects of burnout.

Although moderate levels of arousal can be necessary to complete a challenging task (Sandi, 2013), when the demands exceed one's resources, it can **impair performance** (Lazarus, 1985). Indeed, high levels of stress have been found to be **detrimental to both technical and non-technical skills** during surgery in a literature review by Arora et al. (2010). For instance, stress has been linked to **poorer dexterity** and **increased incidence of errors** (Moorthy, Munz, Dosis, Bann, & Darzi, 2003) and to **impaired judgment** and **communication** (Wetzel et al., 2006). Another study found that low experienced stress in combination to high work experience were more beneficial surgical performance during simulations (Wetzel et al., 2010), unfortunately, those factors are not very malleable.

The literature has identified many stressors, including but not limited to: Emergency cases, surgical complications, advanced tasks, equipment problems, teamwork problems, distractions, and other personal factors such as tiredness or physical discomforts (Arora et al., 2010; Wetzel et al., 2006).

4.6.2 The impact of surgeon burnout on healthcare

Not only does surgeon burnout affect the physician, but it also affects the patients and, on a more global scale, the healthcare system as well.

In fact, Shanafelt et al. (2010) found significative positive correlations between physician burnout and **medical errors**. The authors demonstrated that it can also adversely affect **quality of care** and **patient safety**. Other research papers indicated that there were links

between burnout and suboptimal patient care as well as perceived medical errors in internist residents (Shanafelt, Bradley, Wipf, & Back, 2002; West et al., 2006). Burnout correlates with **malpractice litigations** and **poor patient satisfaction** scores are also mentioned in this context (Senturk & Melnitchouk, 2019). In addition, the increased risk of malpractice litigations can become costly for the healthcare institutions (Balch et al., 2009).

There is evidence of a negative correlation between **satisfaction with career choice** and **satisfaction with specialty choice** with burnout in the ACS survey (Balch & Shanafelt, 2010). Grunfeld et al. (2000) found a correlation between burnout and the **intention to leave practice** among oncologists. A longitudinal multi-specialty study by the Mayo Clinic found that burnout adversely affects physician **professional efforts**. If surgeons are generally inclined towards changing practice or taking an early retirement, and if their productivity declines, this could pose an additional strain on healthcare services, as surgeon shortfalls already plague many hospitals.

On a more global scale, surgeon burnout is a costly phenomenon for healthcare services. The literature mentions that physician turnover comes with great costs (Senturk & Melnitchouk, 2019) and that malpractice suits are expensive as well (Balch et al., 2009). The decline of professional productivity can also be seen as a financial and systemic burden.

4.6.3 Long-term consequences of surgeon burnout

Regarding the long-term effects, there is abundant literature on the detrimental effects of chronic stress on health, life expectancy, mortality and morbidity. Numerous studies link chronic exposure to stress to cardiovascular diseases (Brotman, Golden, & Wittstein, 2007; Kivimäki & Kawachi, 2015; Steptoe & Kivimäki, 2012). Links to obesity and metabolic syndrome as well as autoimmune disorders such as type 2 diabetes mellitus have also been identified (Stefanaki, Pervanidou, Boschiero, & Chrousos, 2018). This subchapter will, however, focus on the specific effects of burnout on surgeons and other physicians of non-surgical specialties.

In an American study, burnout has been associated with **suicide ideation** (SI) in medical students (Dyrbye et al., 2008) and Balch and Shanafelt (2010) found correlations between

SI and each subscale of the MBI. 6,3% of surgeons manifested SI in the ACS survey, the results showed that SI among surgical specialties was up to two times more present than in the average population. Most of the surgeons (60,1%) with SI stated that they did not seek psychological support because of the fear that it might damage their career (Shanafelt et al., 2011).

Regarding the consequence of burnout on health habits, Senturk and Melnitchouk (2019) found evidence that **poor diet** and a **lack of regular physical activity** and **substance abuse** could follow burnout.

Work-home conflicts can not only be a contributing factor, but is also likely to be a consequence of burnout (Senturk & Melnitchouk, 2019). Furthermore, burnout is also likely to contribute to **divorce** and **broken relationships** (Balch et al., 2009). One relatively old study found that surgeons display the second highest rate of **divorce** after 30 years, with a rate of 33%, while psychiatrists occupy the pole position with divorce rates of 50% (Rollman, Mead, Wang, & Klag, 1997).

Regarding other psychiatric morbidities, there seems to be a strong link between burnout and **depression** rates among surgeons (Shanafelt et al., 2011). Divorce and broken relationships have also been cited in the literature (Balch et al., 2009; Balch & Shanafelt, 2010).

4.7 Conclusion

There are many reasons as to why surgery is a stressful occupation. High-stakes, complex surgical procedures paired with the massive workload, high responsibilities and a culture of gritting teeth and enduring whatever challenge comes next without complaining, characterize the day-to-day life of a surgeon. It comes to no surprise that this can lead some surgeons to their breaking points.

During a casual conversation with a vascular surgery resident, the author was told an anecdote about a fellow surgeon that, starting at a new hospital, was made fun of for asking where the canteen was. The reason was that, at that hospital, it was unusual for surgeons to do lunchbreaks, as their workload and schedule did not permit it. This says a lot about the surgical lifestyle which, understandably, adversely affects the physician's

well-being. With 60 or often more hours worked per week and nights on-call, the mental and psychological health of the surgeons suffer. Free protected time to see friends and family is sparse, as is time for hobbies and physical activity. Maintaining the recommended 7-9 hours of sleep per night (Centers for Disease Control and Prevention [CDC], 2017) and a balanced healthy diet (World Health Organization, 2020) seem like an utopic task.

The cost of surgeon burnout is important both on individual and more global scale, which justifies the interest it has aroused in the literature, and the present attempt of presenting viable solutions to the issue. An interesting point raised in the literature is the burden of medical errors on society. Indeed, medical errors are the third leading cause of death in the United states, exceeding the fatalities of workplace injuries, road accidents or breast cancer, yet receives very little attention (Institute of Medicine Committee on Quality of Health Care in America, 2000). Medical errors can contribute to SVS and are both cause and consequences of burnout, therefore, adapting a no-blame culture as it is already present in other professions could be valuable to increase surgeon's well-being.

The cost of being a surgeon is even greater for women. Indeed, in dual-career heterosexual households, women still do about twice as many household tasks (Cerrato & Cifre, 2018) than men. Female surgeons are no exception to these inequalities: They are more likely to experience work-home conflicts, more likely to feel like child-raising slowed down their career, more likely to be the primary caregiver of their children and less likely to let their career take priority over their spouse's career. Also, female surgeons are more likely to be in dual career households (83,1%) than male surgeons (21,9%), which could also explain the increased job strain of women in surgery (Dyrbye et al., 2011). While physicians already have difficulties maintaining an adequate work-life balance, this is especially tough for female surgeons who accumulate the extensive work, household, and child rearing responsibilities. It should come as no surprise that the female surgeon's burnout and depression rates surpass those of their male counterparts. While many of the issues could potentially be helped by e.g., hospitals providing round-the-clock childcare services for physicians and worktime restrictions, there remains the issue of the persistent gender-bias in society that affects women of all working classes.

All in all, increasing evidence suggests that burnout is a pressing issue affecting many physicians and especially those of surgical specialties, with rates close to 40%. Burnout is also linked to numerous comorbidities. The personal and professional adverse outcomes associated with burnout are summarized in **Figure 3**.

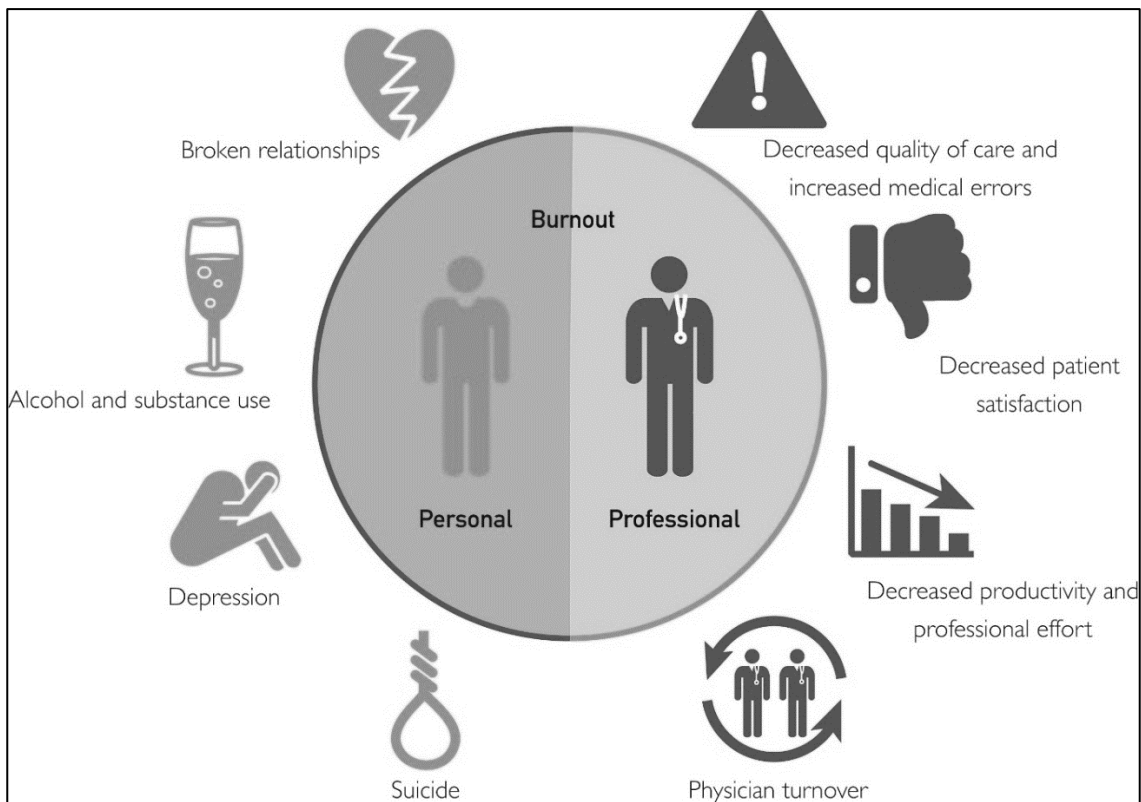


Figure 3. Professional and personal consequences of burnout (Reproduced from Shanafelt and Noseworthy (2017)).

5 Protective factors against adverse mental health outcomes

5.1 Introduction

As stated previously, surgeon well-being is low and decreasing. It is characterized by broken relationships and divorce, high rates of depression, substance abuse, burnout and even suicide. This causes consequences on personal, institutional and societal levels, increasing the problem of surgeon shortcomings, turnover and early retirement as well as decreasing patient satisfaction and health outcomes.

Increasing surgeon well-being should be a priority. Indeed, if surgeons had a better quality of life, their psychological and physical health would improve, thus potentially decreasing surgeon absenteeism, early retirement, and turnover. In addition, patient satisfaction and quality of care could also increase. In the long run, more students would potentially be inclined to engage in a surgical career, as the current surgical lifestyle is one of the biggest deterrents for medical students to engage in a surgical career.

This chapter will address protective factors and strategies to improve surgeon well-being. To structure the information, the chapter is split in two sub-chapters that address individual strategies and protective factors, that are in the surgeon's control and institutional strategies, that involve the hospitals and healthcare on a more global scale.

When working in surgery, several stressors such as daily work requirements or complications are simply unpredictable (Kern et al., 2019). Therefore, it is the aim of this chapter to focus on the factors that can be changed, either through augmenting surgeons' personal resources or decreasing their work demands. The subchapters about increasing physical well-being were purposely kept short, as the psychological factors are the main interest of this work, even though the author believes that psychological and physical health are deeply intertwined.

5.2 Methods

For this chapter, a systematic literature review was performed in May 2021 using following key words: *surgeon/surgical/surgery, coping, well-being, resilience, protective factors*. An overview of the search queries can be found in **Table 3**. The goal was to explore the literature to find responses to the question of how we could help surgeons cope with their lifestyle in order to avoid burnout and other adverse psychological outcomes.

Table 5. Overview of the database search queries.

PubMed
<code>(((((surg*[Title])) AND (well-being[Title] OR resilience[Title] OR protective factors[Title] OR coping[Title])) AND (("2005"[Date - Publication] : "2021"[Date - Publication]))) NOT (patient[Title]))</code>
EMBASE
<code>surg*:ti AND (resilience:ti OR 'protective factors':ti OR coping:ti OR 'well being':ti) NOT patient:ti AND [2005-2021]/py</code>

Firstly, the PubMed database was searched for evidence. This first search yielded 267 results of which all the titles were read, resulting in the first-hand exclusion of 221 titles. The abstracts of the remaining 46 scientific papers were read, resulting in the further exclusion of 26 papers. A representation of the flow of articles can be found in **Figure 4**.

An EMBASE search was performed with the aim of finding additional reports. This yielded 359 results, of which all the titles were read. Beside the duplicates of the PubMed search, only one report was kept for evaluation and discarded afterwards, as the full text was not available. The remaining 20 papers of were printed and read in full. On overview of the studies included in this search can be found in **Table 4**.

Table 6. Studies included in literature review on surgeon protective factors and well-being.

Author(s)	Title
A. Salles et al. (2017)	Perceived Value of a Program to Promote Surgical Resident Well-being
A. Salles, Milam, Cohen, and Mueller (2018)	The relationship between perceived gender judgment and well-being among surgical residents
Allespach, Sussman, Bolanos, Atri, and Schulman (2020)	Practice Longer and Stronger: Maximizing the Physical Well-Being of Surgical Residents with Targeted Ergonomics Training
Arghavan Salles et al. (2019)	Social Belonging as a Predictor of Surgical Resident Well-being and Attrition
Audu and Coleman (2019)	Prioritizing personal well-being during vascular surgery training
Bittner, Khan, Babu, and Hamed (2011)	Stress, burnout, and maladaptive coping: strategies for surgeon well-being
Dahlke, Quinn, Chung, and Bilimoria (2017)	Surgical Residents' Work Hours and Well-Being in Year 2 of the FIRST Trial
Kern et al. (2019)	Psychological stressors, resources and well-being of surgeons in Germany : A cross-sectional study
Kuerer and Holleman (2012)	The health and well-being of American surgery
Lases et al. (2016)	Evaluating Mind Fitness Training and Its Potential Effects on Surgical Residents' Well-Being: A Mixed Methods Pilot Study
Lebares et al. (2018)	Burnout and Stress Among US Surgery Residents: Psychological Distress and Resilience
Milam, Cohen, Mueller, and Salles (2019)	The Relationship Between Self-Efficacy and Well-Being Among Surgical Residents
Murden, Bailey, Mackenzie, Oeppen, and Brennan (2018)	The impact and effect of emotional resilience on performance: an overview for surgeons and other healthcare professionals
Price et al. (2020)	Are We Making an Impact? A Qualitative Program Assessment of the Resident Leadership, Well-being, and Resiliency Program for General Surgery Residents
Rialon et al. (2021)	Drivers of distress and well-being amongst pediatric surgeons
Robertson and Hill (2020)	Building resilience in the face of adversity: the STRONG surgeon
Shanafelt et al. (2014)	An interactive individualized intervention to promote behavioral change to increase personal well-being in US surgeons
Vickers and Vickers (2017)	Lessons Learned from Mentors and Heroes on Leadership and Surgical Resilience
Zaré et al. (2005)	Psychologic well-being of surgery residents after inception of the 80-hour workweek: a multi-institutional study
Zhang et al. (2021)	Development of a conceptual model for understanding the learning environment and surgical resident well-being

Most of the research papers were excluded because they did not respond to the research question. It is noteworthy, that several reports focusing on increasing surgeon well-being and reducing burnout in the wake of the ongoing Coronavirus Disease 2019 (COVID-19) pandemic, were excluded because this subject was beyond the aims of this paper. Nevertheless, the increased concern for surgeons and physician well-being in general during this era is an interesting observation.

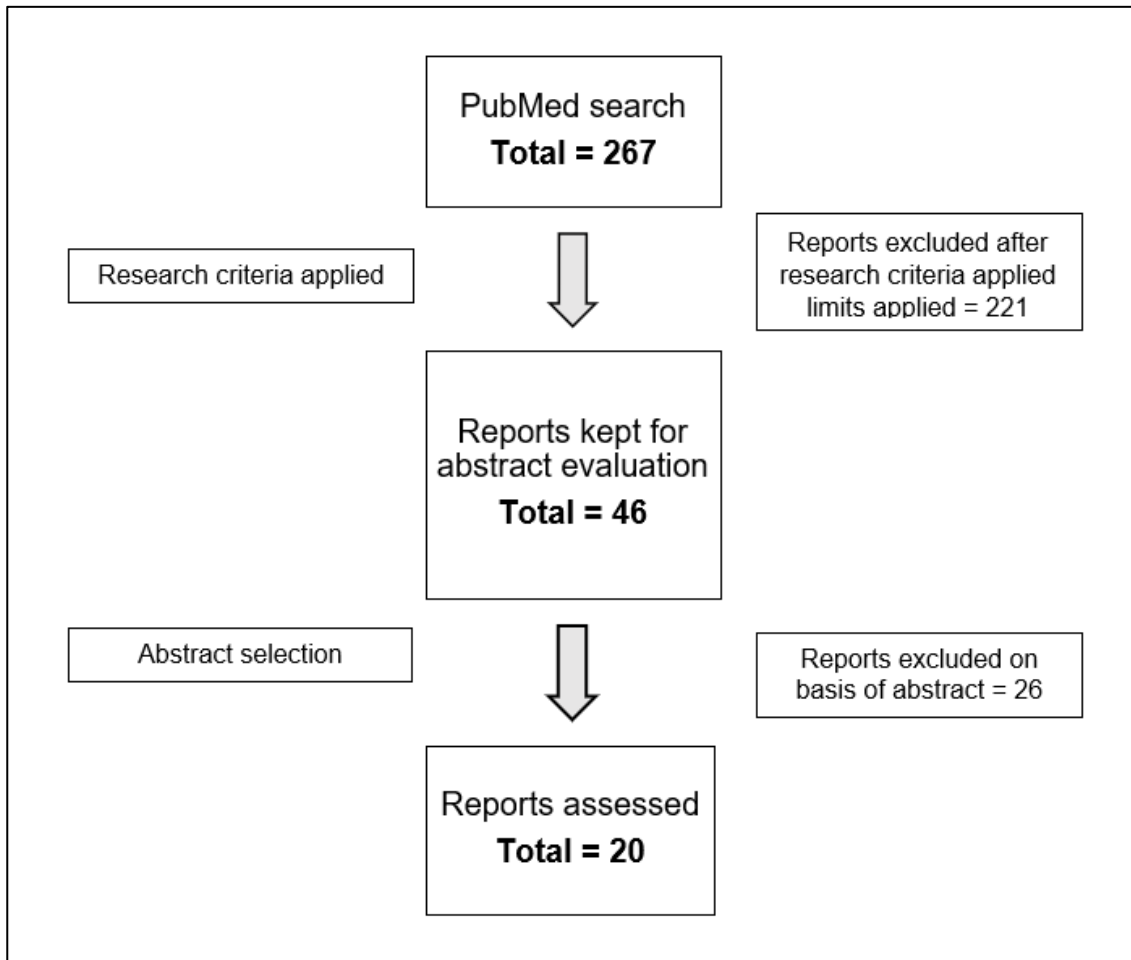


Figure 4. Flow of reports on surgeon well-being and protective-factors search.

As in the previous chapter's literature reviews, the cross-references were checked and included in the review as additional sources of information. Also, as already mentioned on a previous occasion, the individual chapters of this report work together and provide context, continuity, additional information, and assure thoroughness of the assessment of the subject. This is particularly true for this chapter. Indeed, while the other subjects addressed in this thesis have an extensive body of literature to support them, there are only few reports on interventions to decrease adverse consequences and increase well-

being among surgeons which is why a lot of the evidence presented in this chapter comes from sources outside of the literature review.

5.3 Individual strategies/factors promoting surgeon well-being

It is evident that medicine, especially surgery, is a very demanding profession. While stress management is an inclusive part of other high-stakes fields of work such as military, aviation and professional sports, and supervision is actively encouraged among psychological health care professionals, formal stress management training and psychological support or coaching is rarely explicitly offered to physicians. Indeed, the ability to manage high workloads, adverse consequences, high responsibilities, and other pressures is often taken for granted.

The aim of this division is to cite the individual strategies and factors from which surgeons could benefit. It focusses on factors that are in the surgeon's control and that they can develop, whereas the elements that are out of their control (i.e. the institution's responsibility) are covered in subchapter 5.4. Resiliency is addressed in more detail, as it seems to be a promising factor when it comes to preventing and reducing burnout.

While evidence-based research on individual strategies that promote surgeon well-being is available, this does not mean that surgeons will actively seek and autonomously apply these strategies. It would still be the institutions responsibility to make this information available and to provide the opportunity to apply those strategies. For instance, surgeons can practice mindfulness training on their own, but, as many do not know about the effectiveness of these techniques for surgeons, providing mindfulness courses during residency training, as an integral part of the surgical education, would probably yield much better results.

5.3.1 Emotional

Milam, Cohen, Mueller, and Salles (2019) found self-efficacy, a person's perception of their own competences, to be negatively correlated to burnout and positively correlated to general psychological well-being of surgical residents. Thus, they suggest implementing interventions focused on **increasing self-efficacy** as a possible way of decreasing surgeon burnout.

Personal relationships are also a key factor to increasing physician well-being. Surgeons should protect and nurture relationships in and outside of work (Audu & Coleman, 2019; Bittner, Khan, Babu, & Hamed, 2011). For residents, building a relationship to a mentor could also benefit their well-being (Audu & Coleman, 2019; Brandt, 2017). Also, Shanafelt et al. (2012) found that **protecting time away from work with loved ones** in addition to **talking about feelings** with them and **participating in leisure activities** are all related to an improved quality of life among surgeons.

Several authors recommend **self-monitoring** as a way of decreasing burnout. For physicians, this implies recognizing the triggers and symptoms of stress as well as burnout symptoms (Bittner et al., 2011; Murden, Bailey, Mackenzie, Oeppen, & Brennan, 2018). They should then react by using adaptive coping strategies such as taking time off to spend with family, talking with colleagues, using humour and setting aside quiet time, which have all been linked to decreased EE (Bittner et al., 2011).

There is evidence in the literature, that surgeons that display specific wellness promotion attitudes, have lower risks of burnout. For instance, surgeons that stress a **work-life balance** and those who **take vacations** have better outcomes than those who do not. Similarly, having **optimistic attitudes** is correlated with lower rates of occupational burnout, as is **focusing on what is important** to them (Shanafelt et al., 2012).

Finding meaning in work is often cited as a factor increasing well-being (Bittner et al., 2011; Murden et al., 2018; Shanafelt et al., 2012). This subject could easily be introduced during psychological counselling or experiential sessions for residents or attending surgeons. For instance, surgeons could be asked to reflect on this subject and identify areas of work that are personally meaningful to them (Bittner et al., 2011).

5.3.1.1 Resilience

The noun resilience is derived from the Latin verb “resilire” which means to rebound or spring back. In physics, it describes the amount of force that an object can be subjected to until it breaks. (Vickers & Vickers, 2017) For surgeons, it implies the ability to successfully recover from a negative experience (Masten, 2001).

Vickers and Vickers (2017) argue that resilience could be one of the most important traits for surgeons to hone. Trait resilience, as measured by the Block-Ego Resiliency Scale (ER89) (J. Block & Block, 2006; Jack Block & Kremen, 1996), was linked to decreased burnout and depression symptoms, lower stress and distress, and less SI and anxiety in surgeons (Lebares et al., 2018).

The good news is, that resilience is malleable and can thus be taught. Indeed, in their review, Audu and Coleman (2019) give a handful of examples where teaching hospitals have successfully included resiliency training to their programs.

Murden et al. (2018); Robertson and Hill (2020) emphasize **cultivating personal relationships** as a major facilitator for resilience. Indeed, relations both inside and outside of work play an important role, but the importance of **camaraderie and collegiality** is underlined by the authors.

Increasing **self-awareness** through mindfulness has been shown to improve resilience, as had **self-monitoring** through journaling and introspection (Murden et al., 2018). **Optimism and positivity** have also been cited by several authors (Murden et al., 2018; Robertson & Hill, 2020).

Cognitive flexibility and the fact of knowing that mistakes are part of the human nature, is also helpful in increasing resilience. In surgery however, rationalizing one's errors is notably difficult, as surgeons are inevitably judged by their outcomes (Murden et al., 2018). This is adequately illustrated by the statement of a surgeon during a qualitative interview: "You're only as good as your last complication" (McQueen et al., 2020).

An extensive but not exhaustive list of factors increasing resilience can be found in **Table 7**. The interested reader will be redirected to Robertson and Hill (2020) for a concise report on building resilience in surgeons.

Table 7. Factors associated with increased resiliency.

Factors linked to increased resilience
Sense of humor
Sense of purpose and meaning in life
Quality leisure time
Good team and team environment
Self-awareness
Self monitoring
Optimism and positivity
Cognitive flexibility

5.3.2 Spiritual

Lebares et al. (2018) found that **higher mindfulness** as measured by the Cognitive Affective mindfulness Scale-Revised (CAMS-R) (Feldman, Hayes, Kumar, Greeson, & Laurenceau, 2006) was linked to lower risks of experiencing stress and distress, and to decreased scores on all three MBI subscales. It was also linked to decreased rates of depressive symptoms, SI and anxiety. One report evaluated the efficacy of the Mind Fitness Training (MFT) program, based on the theory of mindful practice, and found promising results: Surgical residents perceived improvement in focusing skills and manifested higher specialty satisfaction scores, among other positive outcomes (Lases et al., 2016).

5.3.3 Physical

Many authors stress the importance for surgeons to look after their own **physical health** as injuries and diseases directly and indirectly contribute to absenteeism and early retirement. This implies obtaining **eight hours of sleep** a night if possible, catching up on sleep when necessary, eating good, **healthy food** and practicing regular **physical activity**(Bittner et al., 2011; Brandt, 2017; Shanafelt et al., 2012).

Taking care of one's health also means to have **regular check-ups** at the dentist and general practitioner, as well as having the age-appropriate screenings done (i.e. colonoscopy and mammography) (Brandt, 2017; Shanafelt et al., 2012). As bad posture in the OR often results in injuries and contributes to surgeon absenteeism, developing

strategies to work more ergonomically could contribute to the effort of increasing surgeon well-being (Allespach, Sussman, Bolanos, Atri, & Schulman, 2020).

5.4 Institutional strategies promoting surgeon well-being

5.4.1 General

As mentioned in chapter 3, medical students tend to refrain from pursuing surgical careers. This might contribute to surgeon shortages and increase the individual surgeon's workload. Therefore, **increasing awareness of the factors influencing the choice of surgery as a career** in medical schools and university clinics could be a first step in increasing future surgeon's well-being. Several reports have mentioned **increasing surgical exposure during pre-clinical years** and having **positive role models for women** as possible courses of action (Peel et al., 2018; Seelandt et al., 2014; Yu et al., 2012).

As the denomination *resident* suggest, the surgical trainees are expected to spend a significant amount of time in the hospital, which significantly contributes to their decreased psychological well-being and work satisfaction. As such, **resident work hour regulations** are shown to have some positive outcomes. Stamp et al. (2005); Zaré et al. (2005) surveyed surgical residents before and after the implementation of worktime restrictions and found that their quality of life had improved whilst not interfering with their training.

Furthermore, several authors argue that there should be opportunities for **maternity leaves, flexible child-care services and part time residencies** in the workplace, especially for female residents, as this not only affects their well-being but is also one important deterring factor for female medical students to engage in surgical careers (Bittner et al., 2011; Doherty, 2019; Lu et al., 2020; Peel et al., 2018).

Women in surgery are often victims of sexual harassment and gender bias, which causes medical students to refrain from engaging in surgical careers. Those who do chose to pursue this path nonetheless face many obstacles, resulting in high attrition rates. Their well-being is decreased due to their concern of being judged for their gender (A. Salles et al., 2018). They often fall victim to a “double-bind”, a social psychology paradigm where

a person receives contradictory information that prevents them from acting adequately. In this case, they are either disliked for exhibiting masculine traits (e.g., leadership skills) or perceived as incompetent when they exhibit feminine traits (e.g., gentle, nurturing) (A. Salles et al., 2018). Therefore, **enforcing policies to prevent sexual harassment and discrimination** both during training programs and in the workplace could be of value.

An important way of clinician's well-being could be to directly target burnout symptoms. Indeed, Choong (2013) suggests that institutional efforts rather than individual efforts are required to tackle this issue. As Christina Maslach said, "Burnout is not a problem of people but of the social environment in which they work" (Maslach & Leiter, 2017, p. 160). As such, **education about burnout and how to avoid it** should be a part of the medical curriculum (Brandt, 2017; Maslach & Leiter, 2017). Hospitals could help by providing **periodic burnout assessments** as well as **psychological support** to burnt-out surgeons (Brandt, 2017).

Research shows that **providing surgeons with an individual feedback regarding their mental health** could be a potential incentive for them to adapt healthier behaviours. Indeed, surgeons are particularly unaware of their mental state and tend to overestimate their well-being, but when given the opportunity to compare their well-being with social norms, they become more inclined to make changes to their behaviours (Shanafelt et al., 2014). This kind of assessment could probably benefit surgeons in various stages of their training.

Furthermore, as excessive workloads and administrative work has been linked to increased burnout rates, the health institutions should attempt to provide the surgeons with **administrative support** (Brandt, 2017). Surgeon's **compensation plans** are also to be kept in mind, as a compensation based only on billing has been linked to increased burnout rates. Indeed, a model where overtime is very well rewarded could lead to surgeons increasing their caseload, thus neglecting their well-being (Brandt, 2017). Further research needs to be made to find out what compensation model would be adequate in order to maximise surgeon well-being.

Researchers often underline the fact that there is not one single miracle recipe to increase surgeon well-being, and that different surgeons respond differently to different

interventions. In other words, what is helpful to one surgeon might not be helpful to another (Berman et al., 2021). Therefore, an intervention on an institutional level should be multifaceted. A successful example is the program created by the Stanford University School of Medicine created that targets different aspects of resident well-being. They implemented psychological counselling sessions, a refrigerator with healthy meals and snacks, a resident mentorship program, sponsored social events and a guide with information on local gyms, trails, restaurants, as well as general practitioners and dentists that work late and/or on weekends. This program was well-received by the residents and significantly improved their well-being (A. Salles et al., 2017).

5.4.2 Physical

Brandt (2017) published a paper dedicated to protective factors for surgeon's well-being. In regard to increasing their physical well-being, he suggests that surgeons should be offered an **24/7 access to healthy snacks** in their workroom as well as a room to **catch up on sleep**. Their schedules should also, if possible, be programmed as to enable a healthy lifestyle: The author suggests adapting their schedule to a **60-hour workweek** and **two weekly nights of on-call duty**, as well as **not having scheduled operations the day following a night on-call**. The report also encompasses various ideas to improve ergonomics and reduce health hazards inside the OR. Having an **on-site exercise facility** could also contribute to physician well-being.

5.4.3 Emotional

Institutions have the power to decrease the toll that medical errors, adverse events, and lawsuits have on surgeons by providing psychological and instrumental support, as many surgeons do not feel adequately supported during the aftermath. For instance, hospitals could make **psychological counselling** readily available or provide the opportunity of **formal activities/discussion** after significant patient harm or death. They could also provide surgeons with the **legal support** of a risk management team in case of lawsuits (Berman et al., 2021; Brandt, 2017).

Social belonging, a sense of connectivity or positive association with peers, has been found to correlate to surgeon well-being and to negatively correlate with resident attrition rates by Arghavan Salles et al. (2019). Therefore, these authors suggest maximizing

efforts to increase social belonging in residency programs. This finding goes hand in hand with the findings that teamwork and collegiality are important to avoid burnout (Galaiya et al., 2020; Lu et al., 2020).

5.4.4 Cultural

The “shame and blame” culture among healthcare professionals is often cited as a factor detrimental to surgeon well-being as it prevents them from seeking help or reporting errors when it is necessary. While other high-responsibility fields of work practice a no-blame policy, it is still very present in medicine where doctors are often judged by their patient outcomes (Berman et al., 2021; Murden et al., 2018). Hospitals should also adopt a **very strict position against the “shame and blame” culture** and encourage open and honest conversations between the involved parties. To go even further, they could provide education to **teach physicians how to support each other** more effectively, as they often mean well but lack the tools and awareness to do so (Berman et al., 2021).

Women in surgery are often the victim of sexual harassment and gender bias, which causes medical students to refrain from engaging in surgical careers. Those who do choose to pursue this path nonetheless face many obstacles, resulting in high attrition rates. Their well-being is decreased due to their concern of being judged for their gender (A. Salles et al., 2018). They often fall victim to a “double-bind”, a social psychology paradigm where a person receives contradictory information that prevents them from acting adequately. In this case, they are either disliked for exhibiting masculine traits (e.g. leadership skills) or perceived as incompetent when they exhibit feminine traits (A. Salles et al., 2018). Therefore, **enforcing policies to prevent sexual harassment and discrimination** both during training programs and in the workplace could be of value.

Audu and Coleman (2019) stress that hospitals should adopt a culture promoting physician mental health by promoting well-being programs and providing psychological support.

5.5 Conclusion

The implementation of specific programs aimed at increasing physician well-being is generally associated with positive outcomes. The University of Arizona-Tucson General Surgery Resident Leadership, Well-being, and Resiliency Program, aimed at improving

general surgery residents welfare through experiential and interactive monthly sessions is one successful example. These sessions targeted mental and physical health, as well as social well-being through following subjects: team building, communication, maintaining work-life balance, setting goals, increasing empathy, improved diet and exercise, targeted ergonomics lessons, stress-reduction techniques, and mindfulness/meditation. This program was associated with decreased emotional exhaustion (MBI) and stress levels and an increased satisfaction with several factors such as work-life balance and productivity in addition to being very well-received by the residents (Price et al., 2020; Riall et al., 2018). A summary of the factors cited in this chapter can be found in **Table 8**. In Balch and Shanafelt (2010) and Bittner et al. (2011), the interested reader will find other concise step-by-step guides that summarize the factors that increase surgeon wellness.

By taking care of their own physical and mental health, surgeons could set an example for their peers, patients, and other physicians as well as their trainees and future generations of surgeons to come. Of course, it is crucial that the institutions play along or even take the lead on tackling the issue of physician burnout, as they seem to proud to ask for help.

Table 8. Strategies to improve surgeon well-being (Berman et al., 2021; Bittner et al., 2011; Brandt, 2017; Murden et al., 2018)

Institutional strategies to improve surgeon well-being
- Prevent discrimination and sexual harassment - Preventing burnout through periodic assessment and counselling - (Providing mentorship programs) - Improve ergonomics in the OR - (Improve department leadership) - Provide support for administrative work - Educate physicians on how to increase their well-being - (Develop physician autonomy) - Reduce health hazards in the OR - Adapt work schedule - Work-hour regulations for residents - Provide on-site exercise facility - Provide healthy snacks and rooms to catch up on sleep - Provide support (psychological and/or legal) after medical errors, adverse patient outcomes or lawsuits - Allow “sabbaticals” - Implement a “zero-tolerance” policy for shaming and blaming - Education about burnout and how to avoid it
Personal strategies to improve surgeon well-being
- Work on increasing resilience - Increase self-efficacy - Prioritize own health (regular general practitioner and dentist visits) - Improve lifestyle through an adequate diet, sleep schedule and regular exercise - Seek professional help in case of substance abuse, suicidal ideation, depression or burnout symptoms - Protect and nurture relationships in and outside of work

6 General conclusion

This thesis exposes three main subjects, being the factors influencing surgery as a career, the burnout syndrome among surgeons and strategies on increasing surgeon well-being.

Surgery faces a recruitment crisis, partially because medical students tend to pursue careers with a more controllable lifestyle. These surgeon shortages are both a symptom of, and a reason for students refraining from engaging in surgical career paths. Indeed, as there is a lack of surgeons in the work field, their individual workload (and burnout risk) increases, resulting in a lifestyle that is discouraging most students from engaging in such a career, hence perpetuating this vicious circle. Therefore, tackling the surgical lifestyle, for instance by implementing work hour regulations, should become an institutional priority, in order to make surgery a more viable choice for students of all genders.

Especially women, whose proportion in medical schools are increasing, are reluctant to engage in surgical specialties. Not only are they afraid, that this path is incompatible with having and raising children, but they also perceive surgery as a female-unfriendly field where many women report having witnessed and experienced gender-based discrimination and even sexual harassment. Institutions should endeavour to promote the inclusion of women in the fields of surgery, starting with an effort to make the surgical lifestyle more manageable. Part-time work should be normalized, and the possibility for maternity leaves and flexible childcare services should be made available. Furthermore, awareness of gender bias and sexism should be risen in physicians of all training levels and surgical role-models need to be informed of the crucial role they play in influencing medical student's career choices.

Being a woman, as well as many other factors, is correlated to increased burnout, which afflicts about 40% of the surgical population. These aspects are represented in an extensive list exposed in chapter 4. One interesting finding in this chapter is, that to some extent, surgeons seem to be both the perpetrator and the victim of their current situation. Indeed, some clinicians take pride in the lifestyle they lead, perceiving overwork as a hallmark of dedication and work-home conflicts as part of their work identities (Seelandt et al., 2014). Surgical trainees quickly grasp that certain behaviours are unacceptable and

learn to display or “perform” traits such as toughness (Jin, Martimianakis, Kitto, & Moulton, 2012). This socialisation process and overall mentality are, of course, a barrier for seeking help when needed. Obviously, the “captain of the ship” (metaphor used by Kirby (2017)) will not show any signs of weakness in front of his crew, fearing that it might undermine his competence and authority. Therefore, surgeons might be reluctant to plead for better work conditions and seek help when confronted with symptoms of burnout and other issues. As an effort to not “blame the victim”, it is also noteworthy to mention that there seems to be a general stigma and fear of career repercussions for physicians seeking psychologic or psychiatric help, which certainly also adversely affects the surgeons intentions of seeking support (Brandt, 2017).

These above-mentioned findings indicate that the surgical mentality, or “code among surgeons” as it has been referred to in this thesis, should be actively questioned and fought. Indeed, being taught to be tough and strong might be counterproductive when it comes to seeking psychological support. Alike, the “shame and blame” culture, omnipresent in healthcare settings, further puts stigma on physicians when it comes to making and reporting errors, although this phenomenon is quite common. To counter these issues, multilevel institutional efforts could be enforced, as early as medical school, to destigmatize mental health care and seeking help for physicians. Indeed, they have comparatively high rates of burnout, SI and alcohol use disorders and, over the course of their careers, often encounter situations where they are responsible for patient death or significant harm, but often do not have a socially acceptable outlet for dealing with these issues.

Chapter 5 cites and summarizes a plethora of strategies that have been associated with positive outcomes when it comes to surgeon well-being and decreased burnout rates. A possible path of resolving the surgical burnout pandemic could be to implement programs that target several facets of well-being, such as presented in A. Salles et al. (2017). Such programs could be accommodated to the needs and means of the individual health care services and would include strategies to increase wellness on multiple levels, being cultural, physical, emotional, or other. For instance, female surgeons might feel safer in a work-environment that actively condemns sexual harassment, while their male peers would rather have their safety improved by interventions targeted at destigmatizing medical errors. Similarly, younger surgeons might be open for psychological counselling

or experiential groups, while the older, prototypical surgeon archetype would rather receive practical help, such as workload alleviations.

All in all, there seems to be an increasing interest in strategies to promote surgical well-being in order to decrease burnout and combat surgeon shortfalls. A noteworthy find was that the ongoing COVID-19 pandemic has generated a spike in reports focussing on techniques to improve well-being and reduce burnout in surgeons (for example: Balasubramanian, Paleri, Bennett, and Paleri (2020)). This suggests that, now where the safety of all depends on the performance of our healthcare systems, the well-being of physicians is now more important than ever. However, only the future will tell if this results in an improvement of their working conditions or if the situation will remain unchanged once this is all over. What this essay has brought to light is that scientifically proven ways of increasing surgeon psychological (and physical) well-being exist. Now, the ball is in the health care system's court, and they must intervene in order to treat this (much-longer ongoing) pandemic.

7 Bibliography

- Ali, A. M., & McVay, C. L. (2016). Women in Surgery: A History of Adversity, Resilience, and Accomplishment. *J Am Coll Surg*, 223(4), 670-673. doi:10.1016/j.jamcollsurg.2016.06.012
- Allespach, H., Sussman, M., Bolanos, J., Atri, E., & Schulman, C. I. (2020). Practice Longer and Stronger: Maximizing the Physical Well-Being of Surgical Residents with Targeted Ergonomics Training. *J Surg Educ*, 77(5), 1024-1027. doi:10.1016/j.jsurg.2020.04.001
- American Psychological Association. (2013). *Diagnostic and statistical manual of mental disorders : DSM-5* (5th ed. ed.). Arlington, VA: American Psychiatric Association.
- Arora, S., Sevdalis, N., Nestel, D., Woloshynowych, M., Darzi, A., & Kneebone, R. (2010). The impact of stress on surgical performance: a systematic review of the literature. *Surgery*, 147(3), 318-330, 330.e311-316. doi:10.1016/j.surg.2009.10.007
- Ashton-James, C. E., Tybur, J. M., Grieser, V., & Costa, D. (2019). Stereotypes about surgeon warmth and competence: The role of surgeon gender. *PLoS ONE*, 14(2), e0211890. doi:10.1371/journal.pone.0211890
- Audu, C. O., & Coleman, D. M. (2019). Prioritizing personal well-being during vascular surgery training. *Semin Vasc Surg*, 32(1-2), 23-26. doi:10.1053/j.semvascsurg.2019.01.003
- Balasubramanian, A., Paleri, V., Bennett, R., & Paleri, V. (2020). Impact of COVID-19 on the mental health of surgeons and coping strategies. *Head Neck*, 42(7), 1638-1644. doi:10.1002/hed.26291
- Balch, C. M., Freischlag, J. A., & Shanafelt, T. D. (2009). Stress and burnout among surgeons: understanding and managing the syndrome and avoiding the adverse consequences. *Arch Surg*, 144(4), 371-376. doi:10.1001/archsurg.2008.575
- Balch, C. M., & Shanafelt, T. (2010). Combating stress and burnout in surgical practice: a review. *Adv Surg*, 44, 29-47. doi:10.1016/j.yasu.2010.05.018

- Bartholomew, A. J., Houk, A. K., Pulcrano, M., Shara, N. M., Kwagyan, J., Jackson, P. G., & Sosin, M. (2018). Meta-Analysis of Surgeon Burnout Syndrome and Specialty Differences. *J Surg Educ*, 75(5), 1256-1263. doi:10.1016/j.jsurg.2018.02.003
- Benson, S., Truskett, P. G., & Findlay, B. (2007). The relationship between burnout and emotional intelligence. Australian surgeons and surgical trainees. *ANZ Journal of Surgery*, 77, A79-A79. doi:10.1111/j.1445-2197.2007.04129_12.x
- Bercot, R. (2015). Le devenir des femmes en chirurgie. La diversité des mondes de socialisation. *Travail et emploi*, 141(1), 37-52. doi:10.4000/travailemploi.6563
- Bercot, R., & Mathieu-Fritz, A. (2007). La crise de recrutement des chirurgiens français : entre mythes et réalités. [The Crisis in Recruiting French Surgeons: Distinguishing between Myth and Reality]. *Revue française de sociologie*, 48(4), 751-779. doi:10.3917/rfs.484.0751
- Berman, L., Rialon, K. L., Mueller, C. M., Ottosen, M., Weintraub, A., Coakley, B., . . . Heiss, K. (2021). Supporting recovery after adverse events: An essential component of surgeon well-being. *J Pediatr Surg*. doi:10.1016/j.jpedsurg.2020.12.031
- Bittner, J. G. t., Khan, Z., Babu, M., & Hamed, O. (2011). Stress, burnout, and maladaptive coping: strategies for surgeon well-being. *Bull Am Coll Surg*, 96(8), 17-22.
- Bland, K. I., & Isaacs, G. (2002). Contemporary trends in student selection of medical specialties: the potential impact on general surgery. *Arch Surg*, 137(3), 259-267. doi:10.1001/archsurg.137.3.259
- Block, J., & Block, J. H. (2006). Venturing a 30-year longitudinal study. *American Psychologist*, 61(4), 315-327. doi:10.1037/0003-066X.61.4.315
- Block, J., & Kremen, A. M. (1996). IQ and ego-resiliency: Conceptual and empirical connections and separateness. *Journal of Personality and Social Psychology*, 70(2), 349-361. doi:10.1037/0022-3514.70.2.349
- Brandt, M. L. (2017). Sustaining a career in surgery. *Am J Surg*, 214(4), 707-714. doi:10.1016/j.amjsurg.2017.06.022

- Brotman, D. J., Golden, S. H., & Wittstein, I. S. (2007). The cardiovascular toll of stress. *Lancet*, 370(9592), 1089-1100. doi:10.1016/s0140-6736(07)61305-1
- Campbell, D. A., Jr., Sonnad, S. S., Eckhauser, F. E., Campbell, K. K., & Greenfield, L. J. (2001). Burnout among American surgeons. *Surgery*, 130(4), 696-705. doi:10.1067/msy.2001.116676
- Cassell, J. (1997). Doing Gender, Doing Surgery: Women Surgeons in a Man's Profession. *Human Organization*, 56(1), 47. Retrieved from <https://www.proquest.com/scholarly-journals/doing-gender-surgery-women-surgeons-mans/docview/1310295265/se-2?accountid=12156>
- <https://bib.uclouvain.be/openresolver/?sid=ProQ%3Aapao&id=1310295265&genre=article&issn=00187259&volume=56&issue=1&jtitle=Human+Organization&spage=47&atitle=Doing+Gender%2C+Doing+Surgery%3A+Women+Surgeons+in+a+Man%27s+Profession&title=Doing+Gender%2C+Doing+Surgery%3A+Women+Surgeons+in+a+Man%27s+Profession&aulast=Cassell&aufirst=Joan&btile=&isbn=&date=Spring+1997>
- Centers for Disease Control and Prevention [CDC]. (2017). Sleep and Sleep Disorders. Retrieved from <https://www.cdc.gov/sleep/index.html>
- Cerrato, J., & Cifre, E. (2018). Gender Inequality in Household Chores and Work-Family Conflict. *Frontiers in Psychology*, 9(1330). doi:10.3389/fpsyg.2018.01330
- Chegini, S., & Chegini, S. (2015). Attitudes towards a career in surgery amongst students and trainees. *International Journal of Surgery*, 23, S97-S98. Retrieved from <https://www.embase.com/search/results?subaction=viewrecord&id=L72169822&from=export>
- Choong, P. F. (2013). Burnout: a leadership challenge. *ANZ J Surg*, 83(7-8), 495-496. doi:10.1111/ans.12289
- Chopra, R. (2017). The Misconceptions About Surgeons. *Indian Journal of Surgery*, 79(2), 177-177. doi:10.1007/s12262-016-1579-6
- Conseil National de l'ordre des médecins. (2020). *ATLAS DE LA DÉMOGRAPHIE MÉDICALE EN FRANCE SITUATION AU 1er JANVIER 2020* (Vol. 1). Retrieved from <https://www.conseil-national.medecin.fr/sites/default/files/external->

package/analyse_etude/1grhel2/cnom_atlas_demographie_medicale_2020_tome
1.pdf

- Corless, K. G., Samy, A., Kamil, A., Ryan, E. J., Shafik, L., Bassily, K., . . . Hogan, A. M. (2020). The future of general surgery in Ireland: factors influencing career decisions of medical students. *Irish Journal of Medical Science*. doi:10.1007/s11845-020-02347-8
- Demerouti, E. (2008). The Oldenburg Burnout Inventory: A good alternative to measure burnout and engagement. *Handbook of Stress and Burnout in Health Care*.
- Dimou, F. M., Eckelbarger, D., & Riall, T. S. (2016). Surgeon Burnout: A Systematic Review. *Journal of the American College of Surgeons*, 222(6), 1230-1239. doi:10.1016/j.jamcollsurg.2016.03.022
- Doherty, G. M. (2019). How Do We Prevent Burnout in Surgery? *Adv Surg*, 53, 131-143. doi:10.1016/j.yasu.2019.04.017
- Drosdeck, J. M., Osayi, S. N., Peterson, L. A., Yu, L., Ellison, E. C., & Muscarella, P. (2015). Surgeon and nonsurgeon personalities at different career points. *J Surg Res*, 196(1), 60-66. doi:10.1016/j.jss.2015.02.021
- Dutheil, F., Aubert, C., Pereira, B., Dambrun, M., Moustafa, F., Mermillod, M., . . . Navel, V. (2019). Suicide among physicians and health-care workers: A systematic review and meta-analysis. *PLoS ONE*, 14(12), e0226361. doi:10.1371/journal.pone.0226361
- Dyrbye, L. N., Shanafelt, T. D., Balch, C. M., Satele, D., Sloan, J., & Freischlag, J. (2011). Relationship between work-home conflicts and burnout among American surgeons: a comparison by sex. *Arch Surg*, 146(2), 211-217. doi:10.1001/archsurg.2010.310
- Dyrbye, L. N., Thomas, M. R., Massie, F. S., Power, D. V., Eacker, A., Harper, W., . . . Shanafelt, T. D. (2008). Burnout and suicidal ideation among U.S. medical students. *Ann Intern Med*, 149(5), 334-341. doi:10.7326/0003-4819-149-5-200809020-00008
- Eurostat. (2019). *Ageing Europe* Luxembourg: Publications Office of the European Union, 2019.

- Feldman, G., Hayes, A., Kumar, S., Greeson, J., & Laurenceau, J.-P. (2006). Mindfulness and Emotion Regulation: The Development and Initial Validation of the Cognitive and Affective Mindfulness Scale-Revised (CAMS-R). *Journal of Psychopathology and Behavioral Assessment*, 29(3), 177. doi:10.1007/s10862-006-9035-8
- Freudenberger, H. (1974). Staff burn-out. *Journal of Social Issues*, 30, 159-166.
- Galaiya, R., Kinross, J., & Arulampalam, T. (2020). Factors associated with burnout syndrome in surgeons: a systematic review. *Ann R Coll Surg Engl*, 102(6), 401-407. doi:10.1308/rcsann.2020.0040
- Ganschow, P. (2012). Attitude of medical students towards a surgical career - A global phenomenon? *Zentralblatt fur Chirurgie - Zeitschrift fur Allgemeine, Viszeral- und Gefasschirurgie*, 137(2), 113-117. doi:10.1055/s-0031-1283983
- Ginsburg, S. G. (1974). The problem of the burned out executive. *Personnel Journal*, 53, 598-600.
- Glynn, R. W., & Kerin, M. J. (2010). Factors influencing medical students and junior doctors in choosing a career in surgery. *The surgeon : journal of the Royal Colleges of Surgeons of Edinburgh and Ireland*, 8(4), 187-191. Retrieved from <https://www.embase.com/search/results?subaction=viewrecord&id=L360243872&from=export>
- Grossman, R. (2018). The surgical personality: does it matter? *The Bulletin of the Royal College of Surgeons of England*, 100(3), 130-132. doi:10.1308/rcsbull.2018.130
- Grunfeld, E., Whelan, T. J., Zitzelsberger, L., Willan, A. R., Montesanto, B., & Evans, W. K. (2000). Cancer care workers in Ontario: prevalence of burnout, job stress and job satisfaction. *Cmaj*, 163(2), 166-169.
- Hammermeister, J., & Burton, D. (2001). Stress, Appraisal, and Coping Revisited: Examining the Antecedents of Competitive State Anxiety with Endurance Athletes. *Sport Psychologist*, 15, 66-90. doi:10.1123/tsp.15.1.66
- Heinemann, L., & Voigt, T. (2017). Burnout Research: Emergence and Scientific Investigation of a Contested Diagnosis. *SAGE Open*, 7, 215824401769715. doi:10.1177/2158244017697154

- Heiss, K., & Clifton, M. (2019). The unmeasured quality metric: Burn out and the second victim syndrome in healthcare. *Semin Pediatr Surg*, 28(3), 189-194. doi:10.1053/j.sempedsurg.2019.04.011
- Hughes, K. (2015). Like a Surgeon: About That Surgical Stereotype. Retrieved from [https://behindtheface.com/2015/02/surgical-stereotypes/#:~:text=%E2%80%9CStereotype%20Surgeon%E2%80%9D%20is%20a%20\(Aggressive.](https://behindtheface.com/2015/02/surgical-stereotypes/#:~:text=%E2%80%9CStereotype%20Surgeon%E2%80%9D%20is%20a%20(Aggressive.)
- Hughes, P. H., Brandenburg, N., Baldwin, D. C., Jr, Storr, C. L., Williams, K. M., Anthony, J. C., & Sheehan, D. V. (1992). Prevalence of Substance Use Among US Physicians. *Jama*, 267(17), 2333-2339. doi:10.1001/jama.1992.03480170059029
- Institute of Medicine Committee on Quality of Health Care in America. (2000). In L. T. Kohn, J. M. Corrigan, & M. S. Donaldson (Eds.), *To Err is Human: Building a Safer Health System*. Washington (DC): National Academies Press (US)
- Copyright 2000 by the National Academy of Sciences. All rights reserved.
- International Labour Organization [ILO]. (2019). *The business case for change*.
- Jin, C. J., Martimianakis, M. A., Kitto, S., & Moulton, C. A. (2012). Pressures to "measure up" in surgery: managing your image and managing your patient. *Ann Surg*, 256(6), 989-993. doi:10.1097/SLA.0b013e3182583135
- Johns Hopkins Medicine. (n.d.). Preparing for Surgery: The Operating Room. Retrieved from <https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/the-day-of-surgery-getting-ready-for-surgery-the-operating-room>
- Jones, K. I., Amawi, F., Bhalla, A., Peacock, O., Williams, J. P., & Lund, J. N. (2015). Assessing surgeon stress when operating using heart rate variability and the State Trait Anxiety Inventory: will surgery be the death of us? *Colorectal Dis*, 17(4), 335-341. doi:10.1111/codi.12844
- Kahn, D., Pillay, S., Veller, M. G., Panieri, E., & Westcott, M. J. R. (2006). General surgery in crisis - Factors that impact on a career in general surgery. *South African Journal of Surgery*, 44(3), 108-112. Retrieved from <https://www.embase.com/search/results?subaction=viewrecord&id=L44265576&from=export>

- Kao, L. S., & Thomas, E. J. (2008). Navigating Towards Improved Surgical Safety Using Aviation-Based Strategies. *Journal of Surgical Research*, 145(2), 327-335. doi:https://doi.org/10.1016/j.jss.2007.02.020
- Kern, M., Buia, A., Tonus, C., Weigel, T. F., Dittmar, R., Hanisch, E., & Zapf, D. (2019). [Psychological stressors, resources and well-being of surgeons in Germany : A cross-sectional study]. *Chirurg*, 90(7), 576-584. doi:10.1007/s00104-018-0780-5
- Kirby, R. (2017). Surgeons and the 'God complex'. *Trends in Urology & Men's Health*, 8(3), 5-5. doi:10.1002/tre.576
- Kivimäki, M., & Kawachi, I. (2015). Work Stress as a Risk Factor for Cardiovascular Disease. *Curr Cardiol Rep*, 17(9), 630. doi:10.1007/s11886-015-0630-8
- Klein, J., Frie, K. G., Blum, K., Siegrist, J., & dem Knesebeck, O. v. (2010). Berufliche Gratifikationskrisen, Job Strain und Burnout bei chirurgisch tätigen Krankenhausärzten. [Effort-Reward Imbalance, Job Strain and Burnout among Clinicians in Surgery]. *Psychother Psychosom Med Psychol*, 60(09/10), 374-379.
- Kristensen, T., Borritz, M., Villadsen, E., & Christensen, K. (2005). The Copenhagen Burnout Inventory: A new tool for the assessment of burnout. *Work and Stress - WORK STRESS*, 19, 192-207. doi:10.1080/02678370500297720
- Lases, S. S., Lombarts, M. J., Slootweg, I. A., Arah, O. A., Pierik, E. G., & Heineman, E. (2016). Evaluating Mind Fitness Training and Its Potential Effects on Surgical Residents' Well-Being: A Mixed Methods Pilot Study. *World J Surg*, 40(1), 29-37. doi:10.1007/s00268-015-3278-z
- Lawal, T. A., & Afolabi, A. O. (2013). Factors influencing the choice of surgery as a career by pre-registration interns. *African Health Sciences*, 13(3), 814-819. doi:10.4314/ahs.v13i3.42
- Lazarus, R. S. (1985). The psychology of stress and coping. *Issues Ment Health Nurs*, 7(1-4), 399-418. doi:10.3109/01612848509009463
- Lebares, C. C., Guvva, E. V., Ascher, N. L., O'Sullivan, P. S., Harris, H. W., & Epel, E. S. (2018). Burnout and Stress Among US Surgery Residents: Psychological Distress and Resilience. *J Am Coll Surg*, 226(1), 80-90. doi:10.1016/j.jamcollsurg.2017.10.010

- Lu, P. W., Columbus, A. B., Fields, A. C., Melnitchouk, N., & Cho, N. L. (2020). Gender Differences in Surgeon Burnout and Barriers to Career Satisfaction: A Qualitative Exploration. *J Surg Res*, 247, 28-33. doi:10.1016/j.jss.2019.10.045
- Marmon, L. M., & Heiss, K. (2015). Improving surgeon wellness: The second victim syndrome and quality of care. *Seminars in Pediatric Surgery*, 24(6), 315-318. doi:https://doi.org/10.1053/j.sempedsurg.2015.08.011
- Maslach, C. (1976). Burned-Out. *Human Behavior*, 9, 16-22.
- Maslach, C., & Jackson, S. (1981). The Measurement of Experienced Burnout. *Journal of Organizational Behavior*, 2, 99-113. doi:10.1002/job.4030020205
- Maslach, C., & Jackson, S. (1982). Burnout in Health Professions: A social psychological analysis. In.
- Maslach, C., & Jackson, S. (1996). *Maslach Burnout Inventory -- Human Services Survey (HSS)*.
- Maslach, C., Jackson, S., & Leiter, M. (1997). The Maslach Burnout Inventory Manual. In (Vol. 3, pp. 191-218).
- Maslach, C., & Leiter, M. P. (2017). New insights into burnout and health care: Strategies for improving civility and alleviating burnout. *Med Teach*, 39(2), 160-163. doi:10.1080/0142159x.2016.1248918
- Maslach, C., Schaufeli, W. B., & Leiter, M. P. (2001). Job burnout. *Annu Rev Psychol*, 52, 397-422. doi:10.1146/annurev.psych.52.1.397
- Masten, A. S. (2001). Ordinary magic. Resilience processes in development. *Am Psychol*, 56(3), 227-238. doi:10.1037//0003-066x.56.3.227
- McQueen, S., Mobilio, M. H., & Moulton, C. A. (2020). Fractured in surgery: Understanding stress as a holistic and subjective surgeon experience. *Am J Surg*. doi:10.1016/j.amjsurg.2020.04.008
- Milam, L. A., Cohen, G. L., Mueller, C., & Salles, A. (2019). The Relationship Between Self-Efficacy and Well-Being Among Surgical Residents. *J Surg Educ*, 76(2), 321-328. doi:10.1016/j.jsurg.2018.07.028
- Miller, P. (2019). #MeToo in Surgery: Narratives by Women Surgeons. *Narrat Inq Bioeth*, 9(3), 179-183. doi:10.1353/nib.2019.0060

- Moorthy, K., Munz, Y., Dosis, A., Bann, S., & Darzi, A. (2003). The effect of stress-inducing conditions on the performance of a laparoscopic task. *Surgical endoscopy*, 17, 1481-1484. doi:10.1007/s00464-002-9224-9
- Murden, F., Bailey, D., Mackenzie, F., Oeppen, R. S., & Brennan, P. A. (2018). The impact and effect of emotional resilience on performance: an overview for surgeons and other healthcare professionals. *Br J Oral Maxillofac Surg*, 56(9), 786-790. doi:10.1016/j.bjoms.2018.08.012
- Mushtaq, J., & Tahir, M. (2014). Factors influencing medical students' pursuit of a surgical career. *International Journal of Surgery*, 12, S82. Retrieved from <https://www.embase.com/search/results?subaction=viewrecord&id=L71954929&from=export>
- Oreskovich, M. R. (2012). Prevalence of Alcohol Use Disorders Among American Surgeons. *Archives of Surgery*, 147(2), 168. doi:10.1001/archsurg.2011.1481
- Oxford University Press [OUP] (2020). Definition of Surgeon [online]. Lexico.com. Available at: <https://www.lexico.com/definition/surgeon> (Accessed: December 2020).
- Oxford University Press [OUP] (2020). Definition of Surgery [online]. Lexico.com. Available at: <https://www.lexico.com/definition/surgery> (Accessed: December 2020).
- Oxford University Press [OUP] (2020). Definition of operating room [online]. Lexico.com. Available at: https://www.lexico.com/definition/operating_room (Accessed: May 2021).
- Patel, R., Huggard, P., & van Toledo, A. (2017). Occupational Stress and Burnout among Surgeons in Fiji. *Front Public Health*, 5, 41. doi:10.3389/fpubh.2017.00041
- Paulas, R. (2015). Why are so many surgeons assholes? And how can we make them nicer? *Pacific Standard Magazine*. Retrieved from <https://psmag.com/social-justice/why-is-my-surgeon-acting-like-biff-from-back-to-the-future>
- Peel, J. K., Schlachta, C. M., & Alkhamesi, N. A. (2018). A systematic review of the factors affecting choice of surgery as a career. *Canadian journal of surgery. Journal canadien de chirurgie*, 61(1), 58-67. Retrieved from

<https://www.embase.com/search/results?subaction=viewrecord&id=L625508712&from=export>

- Preece, R. A., & Cope, A. C. (2016). Are Surgeons Born or Made? A Comparison of Personality Traits and Learning Styles Between Surgical Trainees and Medical Students. *J Surg Educ*, 73(5), 768-773. doi:10.1016/j.jsurg.2016.03.017
- Price, E. T., Coverley, C. R., Arrington, A. K., Nfonsam, V. N., Morris-Wiseman, L., & Riall, T. S. (2020). Are We Making an Impact? A Qualitative Program Assessment of the Resident Leadership, Well-being, and Resiliency Program for General Surgery Residents. *J Surg Educ*, 77(3), 508-519. doi:10.1016/j.jsurg.2019.12.003
- Pulcrano, M., Evans, S. R., & Sosin, M. (2016). Quality of Life and Burnout Rates Across Surgical Specialties: A Systematic Review. *JAMA Surg*, 151(10), 970-978. doi:10.1001/jamasurg.2016.1647
- Ramadanov, N. (2021). Teamwork in a Surgical Department. In: IntechOpen.
- Riall, T. S., Teiman, J., Chang, M., Cole, D., Leighn, T., McClafferty, H., & Nfonsam, V. N. (2018). Maintaining the Fire but Avoiding Burnout: Implementation and Evaluation of a Resident Well-Being Program. *J Am Coll Surg*, 226(4), 369-379. doi:10.1016/j.jamcollsurg.2017.12.017
- Robertson, R., & Hill, A. G. (2020). Building resilience in the face of adversity: the STRONG surgeon. *ANZ J Surg*, 90(9), 1766-1768. doi:10.1111/ans.16199
- Rollman, B. L., Mead, L. A., Wang, N.-Y., & Klag, M. J. (1997). Medical Specialty and the Incidence of Divorce. *New England Journal of Medicine*, 336(11), 800-803. doi:10.1056/nejm199703133361112
- Rydenfält, C. (2014). *Teamwork in the operating room: The role of organizational design and implications for patient safety*.
- Salles, A., Liebert, C. A., Esquivel, M., Greco, R. S., Henry, R., & Mueller, C. (2017). Perceived Value of a Program to Promote Surgical Resident Well-being. *J Surg Educ*, 74(6), 921-927. doi:10.1016/j.jsurg.2017.04.006
- Salles, A., Milam, L., Cohen, G., & Mueller, C. (2018). The relationship between perceived gender judgment and well-being among surgical residents. *Am J Surg*, 215(2), 233-237. doi:10.1016/j.amjsurg.2017.08.049

- Salles, A., Wright, R. C., Milam, L., Panni, R. Z., Liebert, C. A., Lau, J. N., . . . Mueller, C. M. (2019). Social Belonging as a Predictor of Surgical Resident Well-being and Attrition. *Journal of Surgical Education*, 76(2), 370-377. doi:10.1016/j.jsurg.2018.08.022
- Sandi, C. (2013). Stress and cognition. *Wiley Interdiscip Rev Cogn Sci*, 4(3), 245-261. doi:10.1002/wcs.1222
- Schernhammer, E. S., & Colditz, G. A. (2004). Suicide Rates Among Physicians: A Quantitative and Gender Assessment (Meta-Analysis). *American Journal of Psychiatry*, 161(12), 2295-2302. doi:10.1176/appi.ajp.161.12.2295
- Scott, A. J., & Kahn, D. (2017). Factors influencing medical students in pursuing a career in surgery: a cross-sectional survey. *South African journal of surgery. Suid-Afrikaanse tydskrif vir chirurgie*, 55(2), 24-30. Retrieved from <https://www.embase.com/search/results?subaction=viewrecord&id=L627873598&from=export>
- Scott, I. M., Matejcek, A. N., Gowans, M. C., Wright, B. J., & Brenneis, F. R. (2008). Choosing a career in surgery: Factors that influence Canadian medical students' interest in pursuing a surgical career. *Canadian Journal of Surgery*, 51(5), 371-377. Retrieved from <https://www.embase.com/search/results?subaction=viewrecord&id=L352483236&from=export>
- <http://www.cma.ca/multimedia/staticContent/HTML/N0/l2/cjs/vol-51/issue-5/pdf/pg371.pdf>
- Seelandt, J. C., Kaderli, R. M., Tschann, F., & Businger, A. P. (2014). The surgeon's perspective: Promoting and discouraging factors for choosing a career in surgery as perceived by surgeons. *PLoS ONE*, 9(7). doi:10.1371/journal.pone.0102756
- Selye, H. (1973). The evolution of the stress concept. *Am Sci*, 61(6), 692-699.
- Selye, H. (1976). Forty years of stress research: principal remaining problems and misconceptions. *Can Med Assoc J*, 115(1), 53-56.
- Senturk, J. C., & Melnitchouk, N. (2019). Surgeon Burnout: Defining, Identifying, and Addressing the New Reality. *Clin Colon Rectal Surg*, 32(6), 407-414. doi:10.1055/s-0039-1692709

- Sexton, J. B., & Helmreich, R. L. (2000). Analyzing cockpit communications: the links between language, performance, error, and workload. *Hum Perf Extrem Environ*, 5(1), 63-68. doi:10.7771/2327-2937.1007
- Sexton, J. B., Thomas, E. J., & Helmreich, R. L. (2000). Error, stress, and teamwork in medicine and aviation: cross sectional surveys. *BMJ*, 320(7237), 745-749. doi:10.1136/bmj.320.7237.745
- Shanafelt, T., Balch, C., Bechamps, G., Russell, T., Dyrbye, L., Satele, D., . . . Freischlag, J. (2009). Burnout and Career Satisfaction Among American Surgeons. *Annals of surgery*, 250, 463-471. doi:10.1097/SLA.0b013e3181ac4dfd
- Shanafelt, T. D., Balch, C. M., Bechamps, G., Russell, T., Dyrbye, L., Satele, D., . . . Freischlag, J. (2010). Burnout and medical errors among American surgeons. *Ann Surg*, 251(6), 995-1000. doi:10.1097/SLA.0b013e3181bfdab3
- Shanafelt, T. D., Balch, C. M., Bechamps, G. J., Russell, T., Dyrbye, L., Satele, D., . . . Freischlag, J. A. (2009). Burnout and career satisfaction among American surgeons. *Ann Surg*, 250(3), 463-471. doi:10.1097/SLA.0b013e3181ac4dfd
- Shanafelt, T. D., Balch, C. M., Dyrbye, L., Bechamps, G., Russell, T., Satele, D., . . . Oreskovich, M. R. (2011). Special report: suicidal ideation among American surgeons. *Arch Surg*, 146(1), 54-62. doi:10.1001/archsurg.2010.292
- Shanafelt, T. D., Bradley, K. A., Wipf, J. E., & Back, A. L. (2002). Burnout and self-reported patient care in an internal medicine residency program. *Ann Intern Med*, 136(5), 358-367. doi:10.7326/0003-4819-136-5-200203050-00008
- Shanafelt, T. D., Hasan, O., Dyrbye, L. N., Sinsky, C., Satele, D., Sloan, J., & West, C. P. (2015). Changes in Burnout and Satisfaction With Work-Life Balance in Physicians and the General US Working Population Between 2011 and 2014. *Mayo Clin Proc*, 90(12), 1600-1613. doi:10.1016/j.mayocp.2015.08.023
- Shanafelt, T. D., Kaups, K. L., Nelson, H., Satele, D. V., Sloan, J. A., Oreskovich, M. R., & Dyrbye, L. N. (2014). An interactive individualized intervention to promote behavioral change to increase personal well-being in US surgeons. *Ann Surg*, 259(1), 82-88. doi:10.1097/SLA.0b013e3182a58fa4
- Shanafelt, T. D., Oreskovich, M. R., Dyrbye, L. N., Satele, D. V., Hanks, J. B., Sloan, J. A., & Balch, C. M. (2012). Avoiding burnout: the personal health habits and

wellness practices of US surgeons. *Ann Surg*, 255(4), 625-633.
doi:10.1097/SLA.0b013e31824b2fa0

Sheldon, G. F. (2011). The Evolving Surgeon Shortage in the Health Reform Era. *Journal of Gastrointestinal Surgery*, 15(7), 1104-1111. doi:10.1007/s11605-011-1430-0

Stamp, T., Termuhlen, P., Miller, S., Nolan, D., Hutzler, P., Gilchrist, J., & Johnson, R. M. (2005). Before and after resident work hour limitations: an objective assessment of the well-being of surgical residents. *Curr Surg*, 62(1), 117-121. doi:10.1016/j.cursur.2004.09.013

Stefanaki, C., Pervanidou, P., Boschiero, D., & Chrousos, G. P. (2018). Chronic stress and body composition disorders: implications for health and disease. *Hormones (Athens)*, 17(1), 33-43. doi:10.1007/s42000-018-0023-7

Steptoe, A., & Kivimäki, M. (2012). Stress and cardiovascular disease. *Nat Rev Cardiol*, 9(6), 360-370. doi:10.1038/nrcardio.2012.45

Sudan, R., & Seymour, K. (2016). The Impaired Surgeon. *Surg Clin North Am*, 96(1), 89-93. doi:10.1016/j.suc.2015.09.006

Sutton, P. A., Mason, J., Vimalachandran, D., & McNally, S. (2014). Attitudes, motivators, and barriers to a career in surgery: A national study of uk undergraduate medical students. *Journal of Surgical Education*, 71(5), 662-667. doi:10.1016/j.jsurg.2014.03.005

Van Way, C. W., Jr. (2010). Is there a surgeon shortage? *Missouri medicine*, 107(5), 309-312. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/21207779>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6188411/>

Vickers, S. M., & Vickers, A. L. (2017). Lessons Learned from Mentors and Heroes on Leadership and Surgical Resilience. *J Gastrointest Surg*, 21(1), 1-11. doi:10.1007/s11605-016-3257-1

Vuong, S. (2010). Does a stereotypical surgical personality exist? Retrieved from <https://www.kevinmd.com/blog/2010/08/stereotypical-surgical-personality-exist.html#:~:text=The%20stereotypical%20surgical%20personality%20is,%2C%20and%20a%20poor%20communicator.%E2%80%9D>

- Wallenius, C., Larsson, G., & Johansson, C. (2004). Military Observers' Reactions and Performance When Facing Danger. *Military Psychology*, 16, 211-229. doi:10.1207/s15327876mp1604_1
- Warschkow, R., Steffen, T., Spillmann, M., Kolb, W., Lange, J., & Tarantino, I. (2010). A comparative cross-sectional study of personality traits in internists and surgeons. *Surgery*, 148(5), 901-907. doi:10.1016/j.surg.2010.03.001
- West, C. P., Huschka, M. M., Novotny, P. J., Sloan, J. A., Kolars, J. C., Habermann, T. M., & Shanafelt, T. D. (2006). Association of perceived medical errors with resident distress and empathy: a prospective longitudinal study. *Jama*, 296(9), 1071-1078. doi:10.1001/jama.296.9.1071
- Wetzel, C. M., Black, S. A., Hanna, G. B., Athanasiou, T., Kneebone, R. L., Nestel, D., . . . Woloshynowych, M. (2010). The effects of stress and coping on surgical performance during simulations. *Ann Surg*, 251(1), 171-176. doi:10.1097/SLA.0b013e3181b3b2be
- Wetzel, C. M., Kneebone, R. L., Woloshynowych, M., Nestel, D., Moorthy, K., Kidd, J., & Darzi, A. (2006). The effects of stress on surgical performance. *Am J Surg*, 191(1), 5-10. doi:10.1016/j.amjsurg.2005.08.034
- Whitaker, M. (2018). The surgical personality: does it exist? *Ann R Coll Surg Engl*, 100(1), 72-77. doi:10.1308/rcsann.2017.0200
- Wirtzfeld, D. A. (2009). The history of women in surgery. *Can J Surg*, 52(4), 317-320.
- World Health Organization. (2004). ICD-10 : international statistical classification of diseases and related health problems : tenth revision. In (2nd ed ed.). Geneva: World Health Organization.
- World Health Organization. (2020). Healthy diet. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/healthy-diet>
- Wünsch, L. (2017). Frauen in der Chirurgie: Keine Männerdomäne. *Deutsches Arzteblatt International*, 13(1), 25. Retrieved from <https://www.aerzteblatt.de/int/article.asp?id=187356>
- Wurm, W., Vogel, K., Holl, A., Ebner, C., Bayer, D., Mörtl, S., . . . Hofmann, P. (2016). Depression-Burnout Overlap in Physicians. *PLoS ONE*, 11(3), e0149913. doi:10.1371/journal.pone.0149913

- Yerkes, R. M., & Dodson, J. D. (1908). The relation of strength of stimulus to rapidity of habit-formation. *Journal of Comparative Neurology and Psychology*, 18(5), 459-482. doi:<https://doi.org/10.1002/cne.920180503>
- Yu, T. C., Jain, A., Chakraborty, M., Wilson, N. C., & Hill, A. G. (2012). Factors influencing intentions of female medical students to pursue a surgical career. *Journal of the American College of Surgeons*, 215(6), 878-889. doi:10.1016/j.jamcollsurg.2012.08.018
- Zaré, S. M., Galanko, J. A., Behrns, K. E., Sieff, E. M., Boyle, L. M., Farley, D. R., . . . Farrell, T. M. (2005). Psychologic well-being of surgery residents after inception of the 80-hour workweek: a multi-institutional study. *Surgery*, 138(2), 150-157. doi:10.1016/j.surg.2005.05.011
- Zheng, H., Shao, H., & Zhou, Y. (2018). Burnout Among Chinese Adult Reconstructive Surgeons: Incidence, Risk Factors, and Relationship With Intraoperative Irritability. *The Journal of Arthroplasty*, 33(4), 1253-1257. doi:<https://doi.org/10.1016/j.arth.2017.10.049>

The training of surgeons is long, strenuous, and ultimately leads to the development of a multitude of technical and non-technical skills. Unfortunately, while they are extensively taught about surgery, they fail to learn how to live as surgeons. Their personal relationships as well as their mental and physical health suffer from the lifestyle they lead, as indicates the abundant literature available on this subject.

Health practitioners are especially prone to occupational burnout due to the nature of their work. Surgeons, even more so if they are female, manifest alarmingly high rates of this syndrome, with many surveys identifying rates of around 40% of surgeons with symptoms of occupational burnout. The burden of surgeon work-related burnout and other mental illnesses is high in social, human, and economic terms. It leads to a wide array of adverse consequences varying from a decreased quality of patient care to increased physician turnover, only to name a few. The quality of life of surgeons being way below population norms, medical students are reluctant to engage in surgical careers which contributes to the surgeon recruitment crisis that many hospitals are facing.

Surgeons are strained and their situation is worsening over time. Therefore, it is crucial that surgeon well-being is addressed and that strategies to promote mental health for these health care professionals are implemented in order for the health care system to continue providing the best possible care for the patients. Hence, the aim of this work is to break down the literature on surgeon burnout, starting with the reluctance of students to pursue this career, over the contributing factors to burnout and its consequences, to potential solutions to increase surgeon well-being on a multidimensional level. It answers three questions: 1.How does surgeon burnout arise? 2.What are the consequences of it? 3.How can surgeon well-being be improved?

To answer these questions, this paper proceeds by breaking down the literature on the three following subjects. The first one, surgery as a career choice, provides context for comprehending the following chapters and introduces some key elements, such as work-home balance. The second subject, surgeon burnout, offers an in-depth comprehension of the intensifying crisis that surgeons are facing, and the third subject, increasing surgeon well-being, focuses on investigating the possible personal and institutional factors that could contribute to increasing surgeon wellness, all while discussing the gender specific problematics. For every one of these subjects, the literature is systematically reviewed, resulting in an essay that offers an extensive comprehension of the surgical lifestyle, its issues, and possible paths of resolution.