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Review article

The impact of the COVID-19 pandemic on wellness among vascular surgeons

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ABSTRACT

The coronavirus disease 2019 (COVID-19) pandemic has placed significant strain on the health and welfare of all health care professionals, including vascular surgeons. This review summarizes the implications of the pandemic on the health and wellness of surgeons and trainees, with a particular focus on those in vascular surgery (VS). A literature review was completed using common resource databases. We provide a brief history of burnout in VS and explore burnout and wellness in VS during this unprecedented pandemic. We then offer recommendations to address mental health needs by the VS workforce and highlight opportunities to address the gaps in the literature. The impact of COVID-19 on the professional and personal lives of surgeons and trainees in VS is notable. More than half of vascular surgeons reported some degree of anxiety. Factors associated with anxiety and burnout include COVID-19 exposure, moral injury, practice changes, and financial impacts. Trainees appeared to have more active coping strategies with dampened rates of anxiety compared to those in practice. Women appear to be disproportionately affected by the pandemic, with higher rates of anxiety and burnout. Groups underrepresented in medicine seemed to have more resilience when it came to burnout, but struggled with other inequities in the health care environment, such as structural racism and isolation. Strategies for addressing burnout include mindfulness practices, exercise, and peer and institutional support. The COVID-19 pandemic has had a substantial mental health impact on the VS workforce globally, as shifts were made in patient care, surgical practice, and work-home life concerns.

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1. Introduction

Wellness and occupational burnout are increasingly recognized as formidable forces in the retention (or lack thereof) of the health care workforce [1]. Wellness is defined as “a quality or state of being in good health” [2], while burnout is a mental state of emotional exhaustion, depersonalization, and a diminished sense of personal accomplishment [3,4]. Several factors have been identified as causes of occupational burnout in medicine: work environment dissatisfaction, work-life integration challenges, ergonomic stresses, and the everchanging health care environment affecting health care resource use [5].

As of February 2021, there have been more than 2.4 million deaths secondary to coronavirus disease 2019 (COVID-19) [6]. Acknowledging the lives lost and the lives impacted by COVID-19, it is clear that individuals, communities, and global societies have suffered because of this pandemic. In addition, the pandemic resulted in an unprecedented strain on health care systems and caused distress to health care professionals [7-9]. In this review, we aim to explore the implications of the COVID-19 pandemic on wellness and burnout of vascular surgeons in practice and in training. We review the impact of the COVID-19 pandemic on patients cared for by vascular surgeons, on the practices and careers of vascular surgeons, and on the institutions that support vascular surgery (VS) practices. We then discuss how wellness and burnout are shaped by the impact of the pandemic on vascular surgeons, with specific attention paid to the differential impact on women and groups underrepresented in medicine (URiM). Finally, we review lessons learned to mitigate burnout and increase a sense of wellness during these challenging times to address the ongoing wellness needs of vascular surgeons.

2. Methods

This literature review sought to provide a brief history of burnout and explore the current landscape of burnout and wellness in VS during the unprecedented COVID-19 pandemic. A literature review was completed using the PubMed/MEDLINE, Scopus, EMBASE, and Google Scholar databases for articles from October 2019 to February 2021. The literature was reviewed for articles relevant to “COVID-19,” “vascular surgery,” “wellness,” and “burnout” in English and French. The review was further broadened to include other surgical and medical subspecialties when there was a knowledge and evidence gap specific to VS. Key concepts were identified, and sources of evidence were summarized as they pertain to patient care, practice changes, and education. The impact on women and those groups URiM was also summarized where applicable. The American Association of Medical Colleges defines URiM as “racial and ethnic populations that are underrepresented in the medical profession relative to their numbers in the general population” [10]. Finally, strategies for coping and resilience were summarized.

3. COVID-19 impact on patients cared for by vascular surgeons

The peak of the COVID-19 pandemic led to the redistribution of health care resources and cancellation of elective surgical operations. From March to May 2020, during a 12-week period of peak disruption to hospital services due to COVID-19, the COVIDSurg Collaborative estimated that more than 28 million operations would be cancelled or postponed globally [11]. Similar trends were being evaluated by the Vascular and Endovascular Research Network’s (VERN) COVER (Covid-19 Vascular Service) study [12], which is a global survey aimed at evaluating the disruption in vascular services. This disruption was a considerable strain on all health care systems and has been associated with distress in health care personnel [13].

One recent survey of vascular surgeons in practice and training during the peak of the pandemic showed that the overwhelming majority of the survey respondents (91.7%) had cancellations of elective VS operations, with the Northeast and Southeast regions of the United States having the most case cancellations proportional to the pandemic impact in these areas [14]. Other surveys also demonstrated an overwhelming majority of vascular surgeons were performing urgent and emergent cases only [15], with significant VS practice changes [16]. Similar events were simultaneously happening internationally during the peak of the pandemic [11,17]. During that time, triaging of patients with VS needs became critical and the Vascular Surgery Activity Condition (VASCCON) [18] system was borne. VASCCON was modeled after DEFCON (the Defense Readiness Condition) used by the US military to describe the various stages of readiness in response to an external threat, such as a global pandemic. VASCCON offers a stepwise de-escalation of surgical activities from 5 (normal vascular surgery scheduling of cases) to 1 (no surgical activity) [18].

Given the global cancellation of elective cases and shifts in resource use, the COVID-19 pandemic had a considerable impact on the way patients with vascular disease were cared for. There was a considerable reduction in screening for abdominal aortic aneurysms and higher size thresholds for repair [19]. There was also a shift to treating aortic and peripheral arterial pathologies with endovascular interventions, even when open repair options were preferred in order to minimize intensive care unit and overall hospital stays [19,20]. This shift toward treating patients with a primary endovascular strategy during the pandemic was in addition to the already present endovascular shift being made in VS practice before the pandemic [14,21]. Furthermore, delays in providing timely vascular care were prevalent during the COVID-19 pandemic. One study [22] found that 4.5% of patients cared for by vascular surgeons experienced adverse events “attributed to a delay in surgery.” The adverse events were defined as disease progression, hospitalization, urgent operations, or death related to the index procedure or diagnosis [22]. For example, there was a trend of increased limb loss among patients with chronic limb-threatening ischemia. Musajee et al [23] demonstrated that patients with chronic limb-threatening ischemia being treated during the pandemic had significantly worse amputation-free survival

and limb salvage compared to patients treated prepandemic. Furthermore, undergoing treatment during the pandemic was an independent predictor of worse primary patency and freedom from major adverse limb events [23].

This was attributed to treatment delays associated with late presentations because of social distancing and lockdown measures [23,24]. The long-term sequelae of COVID-19 pandemic on clinical and patient-centered outcomes in VS and other surgical specialties are unknown, and will become a critical piece as we retrospectively evaluate the larger impact of the pandemic on patient care [25,26].

In the decade before the pandemic, telemedicine was used modestly and predominantly in primary and mental health care [27]. The adoption of telemedicine grew exponentially in response to the social distancing and lockdown measures necessitated by the pandemic. To make telemedicine a feasible alternative to in-person clinic visits, many regulatory health agencies allowed temporary waivers for reimbursement and HIPAA (Health Insurance Portability and Accountability Act) restrictions [27–30]. Vascular surgeons quickly adapted and embraced telemedicine as a tool for triaging and postoperative monitoring for patients with vascular disease [31–33]. In the outpatient setting, patients cared for by vascular surgeons had significantly reduced travel distances, commuting time, and costs associated with telemedicine utilization. Also, studies have found that there was significant patient satisfaction concerning their health care experience using telemedicine [34,35].

4. COVID-19 impact on vascular surgeons and burnout

Burnout is associated with worsening performance in surgeons and trainees and can lead to increased stress and risk of depression [36–38]. Before the pandemic, vascular surgeons appeared to be at a high risk for burnout, suicide, low career satisfaction, and quality of life [39–41]. Recognizing the association between surgeon burnout, patient outcomes, and workforce retention [42–44], the Society for Vascular Surgery (SVS) Wellness Taskforce was created in 2017 and was charged with assessing and addressing vascular surgeon burnout, with the aim of improving member wellness. In 2018, the Wellness Task Force disseminated a survey to the SVS society members to identify the prevalence of burnout, depression, and suicidal ideation among practicing vascular surgeons to guide future policy, advocacy, and member programs to support this workforce crisis. This demonstrated that one-third of survey respondents reported burnout, 37% endorsed symptoms of depression in the past month, and 8% indicated that they had considered suicide in the past year [45,46]. Addressing burnout among vascular surgeons with the compounding stress of the COVID-19 pandemic became a central area of focus for the Wellness Task Force, who dedicated their efforts to mitigate distress in the VS workforce.

The impact of occupational and personal stressors on the risk of physician burnout during the COVID-19 pandemic is growing (Table 1). In April of 2020, the SVS Wellness Task Force sponsored an anonymous Pandemic Practice, Anxiety, Coping, and Support Survey designed to capture the cross-sectional

experiences of vascular surgeons and trainees during a time of uncertainty. Of the 1,609 respondents, 23.3% reported moderate and severe anxiety, and more than half reported some degree of anxiety. Factors that were significantly associated with this reporting were directly related to the day-to-day COVID-19 impact, such as staying in a separate room at home or at an alternate lodging, donning and doffing personal protective equipment, worrying about potential treatment delays with adverse patient outcomes, and financial concerns [47]. Furthermore, other factors associated with self-reported anxiety were female sex and avoidant coping strategies, such as substance abuse, disengagement, and self-blame [47].

Current evidence suggests that the type of physician practice may influence how susceptible a physician is to developing burnout during a crisis. A systematic review highlighted how physicians' prepandemic work setting may influence the risk of burnout during the COVID-19 pandemic, with frontline physicians paradoxically less affected than others [48]. This phenomenon may be explained by the nature of frontline physicians' work, where uncertainty is part of their professional daily routine, potentially offering them baseline resilience and coping strategies in an environment of ongoing practice changes during the pandemic [49]. However, this perceived advantage may be outweighed by a greater risk of exposure to COVID-19, with resulting higher rates of distress and occupational burnout [50]. Although the practices of vascular surgeons vary across the United States and globally, only 23% of vascular surgeons had moderate to severe anxiety and many were coping well with active coping strategies, such as emotional support, positive reframing, and strategic planning [47].

4.1. Moral injury

The inability to provide optimal high-quality care amidst this pandemic has led to a resounding moral injury among health care providers [51]. Moral injury occurs when individuals perpetuate acts that go against their value system or moral beliefs. The concept of moral injury was first described in the context of service members returning from the Vietnam War with symptoms resembling post-traumatic stress disorder related to conflicts with their value systems [52]. Similarly, surgeons and physicians may have numerous conflicts weighing "individual clinical ethics versus public health ethics, best medical practices versus resource scarcity, and expert practice versus practicing at the edge or beyond one's competencies" [53]. During the pandemic, cancellations of operations, delays in care, lack of resources, and shifts in resource management may have led to multiple moral insults resulting in a compounding effect of unresolved conflicts leading to moral distress and occupational burnout.

4.2. Vascular surgery practice changes

The day-to-day activities of surgeons, including in-person clinics, multidisciplinary meetings, education, and professional activities, were quickly replaced with virtual clinics and meetings. Although the virtual interaction facilitated ongoing access for physician support, complex decision-making, and access to care [19], it may have also led to psychological

Table 1 – The impact of COVID-19 in health care professionals and vascular surgeon burnout.

Evidence for burnout during COVID-19 pandemic among health care workers [48]
 Burnout was prevalent in health care workers during the COVID-19 pandemic.
 There were higher rates of burnout in nonfrontline workers compared to frontline workers.
 Burnout was associated with female gender, long work hours, fears of infections, exposed to COVID-19 infection, and lack of perceived support by friends.
 Prevent burnout and occupational stress through support, self-awareness and mindfulness activities.

Evidence for burnout during COVID-19 pandemic among vascular specialists [42,47]
 Half of vascular surgeons reported some degree of anxiety with >20% reporting moderate or severe anxiety.
 Burnout in vascular surgery trainees is associated with depression, perceived stress, and lower levels of social support and self-efficacy.
 Anxiety associated with surgeons having a separate room at home or staying at the hospital or a hotel after work, donning and doffing personal protective equipment, worry about potential adverse patient outcomes due to care delay, and financial concerns.
 Active coping strategies was associated with less anxiety.

Abbreviation: COVID-19, coronavirus disease 2019.

distress, a sense of isolation, mental fatigue, and increasing sedentary time [54]. This is speculative as the impact of a virtual world on wellness has not yet been extensively explored among physicians and surgeons during the pandemic. Previous work has focused on the effect of screen time among adolescents and children reporting more depressive symptoms, burnout, and sleep disturbances, with a higher rate impact among females compared to males [55–57]. It has also been demonstrated that there appears to be a dose-dependent response with longer duration of screen time having a more profound impact on levels of stress and anxiety in this young population [58–60]. It is unclear whether these findings translate to adults or physicians during the pandemic. Furthermore, the prolonged use of smart devices might also have an impact on physical health due to increased sedentary time; however, this has not been shown consistently [61]. The hunched over postures while looking at smart devices and screens for extended periods of time may lead to long-term ergonomic issues impacting physical and emotional health [62].

4.3. The financial impact of COVID-19 on vascular surgery practices

The redistribution of resources and suspension of elective surgical operations has also placed financial stress in VS and across all interventional disciplines. In the United States, the financial impact in a tertiary care hospital VS division resulted in losses ranging from 39% to 65% compared to the prepandemic period the previous year [13]. In a recent survey, solo, private, and community-based vascular surgeons reported significantly higher anxiety levels related to economic changes compared with those working in academic centers, given the extreme reduction of revenues and a lack of significant financial reserves to absorb the economic impact [47].

5. Career-related gender differences in the impact of COVID-19

The struggles women face with professional activities and work–life integration were more pronounced during the

COVID-19 pandemic. The impact of the pandemic on women in medicine is widely heterogeneous, depending on career stage, scope of practice (teaching, research, private), and personal life commitments [63]. Collectively, however, the pandemic adds to the existing gender-related systemic inequities that plague trainees and physicians, threatening to undo the significant progress made in the past decades, and leaving a legacy of difficulties for the generation to come.

Among surgeons, women are more likely to experience anxiety, depression, and burnout compared to male surgeons [64,65]. This has been attributed to societal sexism [66,67], gender bias [68], workplace discrimination [69,70], and familial obligations that disproportionately affect women [48,63,71]. In the recent VS pandemic impact survey, vascular surgeons who are women reported higher rates of anxiety compared to vascular surgeons who are men [47]. Similarly, physician trainees who are women reported significantly more stress at work than their peers who are men [50]. A Brazilian study of head and neck surgeons also reported how women experience significantly more symptoms of anxiety and burnout, and decreased productivity at work and at home [72].

There is a pervasive notion that women in medicine are more likely to compromise their career advancement in order to meet home- or family-related needs compared to men in medicine (maternal bias) [63]. In addition, the pandemic-related increase in demands of childcare, meal preparation, and grocery shopping has disproportionately affected women, including physicians who are women. This has translated to fewer hours for clinical activities [63]. Telemedicine and remote teaching can be significantly more challenging for women who need to simultaneously care for children at home [73]. Before the pandemic, more than half of female vascular surgeons did not believe they had enough balance between their professional and personal lives [46]. Furthermore, women compared to men were more likely to have had a recent conflict between work and home responsibilities (68.5% v 57.4%; $P < .01$) and to have resolved this conflict in favor of work (57.5 v 42.8%; $P < .005$) [46].

Beyond the impact on clinical work, the COVID-19 pandemic has taken a toll on women's involvement in research. *JAMA Surgery* noticed a 4%, 6%, and 5% decrease in submitted

manuscripts with female first author, last author, and corresponding author, respectively, when comparing the two peak months of the first COVID-19 wave relative to the same time period 1 year prior [73]. Similarly, while COVID-19-related research soared since March 2020, the opposite was true for the proportion of female authors of COVID-19 submissions [74]. These changes can further amplify the difficulties that women in surgery face when seeking academic promotion and tenure, which is based largely on academic advancement with research productivity and publications.

Furthermore, there is an underrepresentation of women in leadership positions in medicine and surgery. This leads to a lack of understanding of the perspectives of a diverse group of women and rather allows for making decisions based on inaccurate stereotypical assumptions based on an outdated notion of the “female” archetype [75]. Although initiatives to promote diversity, equity, and inclusion in medicine and surgery have increased amidst the COVID-19 pandemic, it has drawn attention to gender inequities. Our profession can and should support and respect all physicians, irrespective of gender, and create work environments that achieve workplace equity and equality, without stigmatizing women or derailing their career progression [63].

6. The impact of COVID-19 on URiM physicians

Several studies on URiM physicians have demonstrated inconsistent findings on whether physicians who are URiM have greater burnouts compared to their White counterparts [76]. However, current wellness and burnout assessment tools do not take into account the experiences faced by URiM physicians, such as structural racism, sexism, discrimination, isolation, lack of inclusion, and social support [77,78]. In addition, the current instruments that categorize URiM physicians rely on the US Census Bureau classification and fail to capture the experiences of some physicians, such as those who identify as being of Middle Eastern and North African descent, but still face discrimination due to their origin or religion.

Discrimination of URiM may manifest in the devaluing of research and skill sets, resulting in race-based assumptions of competency and workplace micro-aggressions [79]. Furthermore, URiM physicians face the “minority tax,” which is the expectation to participate in additional, largely unpaid, responsibilities related to diversity, such as mentoring and advising URiM students [80]. Some have suggested that URiM physicians may face lower rates of burnout because of the resilience, coping, and social support they have already developed to face the perpetual battle of adversity and inequities facing URiM physicians [81].

7. The impact of COVID-19 on surgical trainees

Surgical education and training were also impacted due to suspensions or delays of conferences, displacement of residents and attendings to emergency and critical care services

instead of their specialty training, and research projects being suspended or re-aligned to tackle the COVID-19 pandemic [16,82]. A subset analysis of the Pandemic Practice, Anxiety, Coping, and Support Survey was distributed to VS trainees, integrated residents, and fellows in the United States. Vascular trainees were noted to have significant changes in clinical responsibilities: 91% reporting cancellation of elective procedures, 82% having call schedule changes, 24% having duties other than those related to VS, and 24% participating in outpatient care delivery. Major stressors included concerns about educational and professional development, infection risk to family/friends, and impact of care delay on patients. Despite these considerable changes to clinical responsibilities and personal and professional stressors, there were low rates of anxiety in VS trainees and VS trainees employed mostly active coping strategies and used online support systems [82].

8. Lessons learned from the COVID-19 pandemic

Despite the devastating impact of the COVID-19 pandemic, there are some benefits worth acknowledging as a “silver lining.” First, this pandemic provided a time of global introspection and opportunity for self-reflection [83]. The year 2020 was aptly named the year of vision and clarity. This pandemic opened our eyes with 20/20 vision to the fragile health care system; the care we deliver to our patients, colleagues, families, and ourselves; and the importance of wellness in a time of extreme uncertainty. This pandemic has also ushered in a wave of international collaborations and partnerships that would have been unlikely in the past, or would have occurred over a longer expanse of time. Many were necessary due to the urgency of the pandemic, spanning from policymakers and the pharmaceutical industry to physicians and scientists, but therein rose opportunity [31–34]. Others increased collaborative work with the widespread and rapid adoption of teleconferencing and group communications platforms, such as WhatsApp. For example, COVIDSurg Collaborative is an international collaborating group of surgeons and anesthesiologists who work on a spectrum from offering guidance on how to deliver surgical services appropriately to assessing the outcomes of surgery in patients diagnosed with COVID-19 [35,36]. There are countless more formations, like the COVID-19 Clinical Research Coalition targeting resources available in low- and middle-income countries, that have been critical in battling this pandemic, in addition to furthering preparedness for future outbreaks and contributing to research for other fields of medicine and public health [37].

9. Mitigating burnout: strategies and solutions

The World Health Organization defines self-care as “what people do for themselves to establish and maintain health, and to prevent and deal with illness,” including hygiene, nutrition, lifestyle, environmental, and socioeconomic factors.

Coping with the adverse effects of burnout compounded by the COVID-19 pandemic was a necessity. Critical to mitigating the detrimental effects of burnout is first formulating strategies and implementing skills that promote increased well-being and improve resilience strategies, not only during the burnout crisis in this pandemic period but at large. The following is a nonexhaustive list of proposed strategies for mitigating burnout.

- 1 Mindfulness: Mindfulness is a practice of “compassionate and intentional awareness” [84]. Mindfulness transitioned into health care pervasively as a practice of “non-judgmental, curious, and self-compassionate awareness of one’s moment-to-moment experiences” [85]. Over the past decade, physicians have begun to delve into the concept of mindfulness in efforts to reduce burnout and improve quality of life. Furthermore, providing physicians with tools to implement mindfulness has been shown to decrease burnout and improve wellbeing in health care providers [86].
- 2 Exercise: Developing a consistent exercise routine has been shown to decrease anxiety, depression, and burnout [87]. With social distancing measures and lockdown measures in place, group exercises transitioned to an online platform fostering a safe and protective community. Innovative solutions to foster wellness, physical health, and collegiality were created during this pandemic. For example, physicians and surgeons created Peloton groups or bubbles to exercise in a safe space to foster and enhance their own wellness [88].
- 3 Peer support: The necessary public health principles of social distancing and density reduction have been extremely challenging due to the lack of in-person interactions. This new era has forced a virtual format for regular day-to-day activities and relationships. A variety of both formal and informal peer-to-peer connections have blossomed from the devastation of the pandemic. Amid the COVID-19 strain on physicians, vascular surgeons were assertive in building strong peer support structures. The use of social media allowed vascular surgeons to share best practices in real time. Multiple social media platforms have been used by vascular surgeons, including Twitter, Facebook, LinkedIn, WhatsApp, as well as SVS Connect. These various platforms have allowed surgeons to meet others globally, share concerns and worries, provide peer support, and assist in clinical questions and research dissemination. Importantly, whichever medium was used, it provided the opportunity for closeness despite being physically apart [89].
- 4 Institutional support: The SVS organizational leadership recognized the importance of peer and community support for its members during the pandemic. The SVS developed formal programs through the SVS Wellness Taskforce, as well as dedicated town halls [90]. These town halls focused on clinical concerns, as well as wellness and coping strategies. Peer support awareness and discussions were at the forefront of these endeavors and were very well attended, with more than 4,500 viewers across the livestreaming event and additional views on YouTube, Twitter, and Facebook.

10. Conclusions

The COVID-19 pandemic has affected physician wellness through the multidimensional aspects of professional and personal lives, and the interplay between the two. This literature review was designed to explore the current landscape of the impact of COVID-19 on vascular surgeon wellbeing, and we may have failed to include evidence that might have been captured in a rigorous systematic process. As we continue to evolve in these times of uncertainty, thoughtful and mindful leadership addressing the psychological impact and open nonjudgmental dialogue to address these mental health concerns is paramount to maintaining a healthy workforce. Identifying vulnerable populations at risk for burnout and implementing institutional policies and strategies to address these psychological concerns should be in place for those needing mental health resources and services. Health systems must prioritize the health and wellbeing of their providers before, during, and after crises like the COVID-19 pandemic.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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