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COVID-19 and surgery: A thematic analysis of unintended consequences on performance, practice and surgical training

Dale F. Whelehan^{*}, Tara M. Connelly, Paul F. Ridgway

Discipline of Surgery, School of Medicine, Trinity College Dublin, The University of Dublin; Department of Surgery, Tallaght University Hospital, Ireland

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ABSTRACT

Purpose: The shift in the national focus and allocation of resources to the management of COVID-19 has led to significant changes to surgical practice including the delay of elective surgery. The aim of this study was to explore the implications of such changes on surgeons.

Method: Using a qualitative study design, semi-structured interviews were conducted with general surgery consultants and non-consultant hospital doctors from a major tertiary hospital in the Dublin region between March–May 2020. Data collection proceeded iteratively using a thematic analysis approach with quality controls such as memoing and collaborative analysis.

Results: Fourteen surgeons (8 male, 6 female) were interviewed. The majority ($n = 11$, 78.6%) were NCHDs. Significant themes determined included ‘impacts’ on a variety of constructs such as performance, self-reported fatigue and wellbeing. Training themes elucidated included the effects of the cancellation of elective admissions on reduced operative exposure for trainees. Senior surgical staff were particularly focused on increased complexity in patient management. New policy requirements such as personal protective equipment use and novel rotas have had implications for aspects of work engagement. The pandemic and subsequent national restrictions imposed has afforded opportunities for improved well-being but also resulted in greater solitude in surgeons.

Conclusions: Rhetoric surrounding fatigue management and virus control dominates the conversation on the relationship between COVID-19 and surgery. Tipping the balance back to parity of fatigue management with service delivery in surgery will be key for sustainability of the surgical workforce.

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Introduction

Traditionally, a surgeon's work life has been predominantly comprised of operative procedures, in-patient clinical care, out patient management and administrative duties. Such tasks demanded a high level of competency in technical, cognitive and emotional skill. Current evidence suggests that the COVID-19 pandemic has placed significant stress on healthcare systems worldwide.¹ Since the onset of the pandemic, the surgical profession has seen seismic changes to

the way in which services are provided. Such changes have resulted from prioritisation of patient cases in response to the influx of COVID-19 cases. This includes the cancellation of elective and semi-urgent procedures and out patients appointments, reallocation of workload, and allocation of non-medics into medical fields. The consequences of changes in workflow for surgeons in the acute phase of the COVID-19 pandemic remains unknown.

In the pre-pandemic era, surgery as a profession reported a high level of fatigue when compared to norms.² This has been shown to be due to both personal and professional factors.

^{*} Corresponding author. Discipline of Surgery, School of Medicine, Trinity College Dublin, Dublin, Ireland.

E-mail address: whelehd@tcd.ie (D.F. Whelehan).

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The COVID-19 pandemic is a known major stressor to healthcare personnel. Its effect of the stress and fatigue on surgeons is unknown. Ireland successfully ‘flattened the curve’ preventing an overwhelming number of cases in the acute phase of the pandemic. The longer term implications of the decisions made and emergency healthcare policies implemented to attain this achievement are unknown. Similarly, the outstanding changes which should be considered should a second wave of cases present nationally are unknown. In the current study we use thematic analysis to attempt to explore the implications of such changes on surgery in what has been a historical time for healthcare nationally.

Specifically the objectives are to:

- To explore the impact of COVID-19 on professional performance of surgeons
- To explore the impact of COVID-19 on professional development of surgeons
- To explore the impact of COVID-19 on personal performance and wellbeing of surgeons

Method

Approach

An interpretive and iterative thematic analysis approach, informed by Braun and Clarke’s approach to data collection and analysis was used to identify, analyse and interpret the meaning of new constructs in the context of COVID-19.³ The research was conducted in accordance with the gold standard Consolidated criteria for reporting qualitative research (COREQ) checklist with appropriate justifications provided in [Appendix A](#).⁴ Semi structured interviews with general surgery consultants and non-consultant hospital doctors (NCHDs) were conducted over a two month period between March–May 2020 which was indicative of the acute management phase of the COVID-19 pandemic. All staff were primarily based in a tertiary hospital in the Dublin region, though some additionally conducted practice in secondary hospital settings. This setting faced significant changes to surgical practice and was designated as having ‘COVID’ hospital status (i.e. PCR confirmed COVID-19 cases in the intensive care wards and general wards) during the interviews. Participants were recruited by two investigators (DW and TMC). Thereafter, purposeful theoretical sampling of particular training levels was sought in order to understand sub themes. Data collection was ceased when the research team felt sufficient theoretical saturation, a qualitative metric used typically for ‘study power’ was reached, informed by high-quality informative dialogue was reached.⁵

Data collection

Semi-structured, individual interviews were conducted through socially distanced interviewing or online. An empirical interview guide ([Appendix B](#)), informed by previous research on fatigue in surgeons conducted within the

department,^{6,7} focused on four major themes. The questions focused on four major constructs in the context of the implications of COVID on: 1) work hours and work practice, 2) training and management, 3) system changes and 4) surgeons’ psychology. The questions were revised and developed throughout the interviews to ensure reflexivity of the research, a commonly used quality metric in qualitative research described by Jootun et al.⁸ The interviews were audio-recorded and transcribed verbatim, with any identifiable characteristics of the participants or locations removed at data collection. The principal investigator (DW) performed a preliminary review of the open-coding structure in order to identify gaps in the emerging categories and to assist in targeting further purposeful theoretical sampling to reach thematic formation.

Data analysis

Initial analysis used open-coding conducted by the primary investigator (DW), followed by collapsing of early codes into major categories through axial coding structures to help inform theme integration. The software NVIVO © (Version 1.1 QSR International Victoria, Australia) was used for data analysis. Open-coding of the transcripts was informed by existing codes, yet independent coding of each manuscript took place.

Quality control

Four metrics for ensuring analytical quality control were utilised – 1) open coding 2) memoing 3) reflexivity 4) collaborative analysis. A series of reflective memos were authored by the principal investigator, and discussed with the research team, in order to comprehend the relationship between the developing categories. This quality measure ensures rigour of the research findings and enables explicit disclosure of how the perspectives of the researchers informed the research direction and findings.⁹ Reflexivity in data collection and analysis ensures that emerging themes are explored in a comprehensive and analytical manner. A standardised approach of non-leading questions was upheld throughout the process to reduce risk of investigator bias. Ethical approval exploring the relationship between sleep, fatigue and surgical performance was given by The Joint Research Ethics Committee of the institution of the researchers.

Results

Our data set included 14 interview transcripts of interviews with 8 male and 6 female NCHDs ($n = 11$) and consultants ($n = 3$) working in the Department of Surgery in a tertiary hospital in Dublin with allocated ‘COVID’ status. All NCHDs complete general surgery on-call work. Two NCHDs were working in surgical subspecialties (urology, $n = 1$ and vascular surgery, $n = 1$). The majority were at the registrar level ($n = 7$), followed by SHOs ($n = 4$) and consultants ($n = 3$). All participants had previously engaged in research with this research team in the area of sleep deprivation in surgery.

A number of interconnected themes were explored in the analysis as summarised in [Fig. 1](#). The pace of work for

surgeons has significantly reduced during the first two months of the pandemic. Particularly, the number of surgical procedures in which trainees are engaged in has significantly dropped. This has led to many feeling like they have more mental fatigue at work as they are mainly involved in ward-based work. Such changes have led to changes in surgical performance in the domains of technical, cognitive and emotional skill. In particular, younger trainees feel that the that COVID-19 has significantly impacted their training progression given the lack of exposure to surgeries during the pandemic. Some feel this may impact their progression in subsequent years and, for some, the lack of performing surgical procedures impacts on their professional identity overall. Despite many personal impacts during the pandemic, including anxiety relating to both acquiring COVID-19 and transmitting it to others, sleep patterns have not changed significantly amongst surgical staff. A positive impact, however, for many, particularly those who contracted COVID-19, is an increased focus on wellbeing on which they hadn't previously focused on in the past. It has also afforded some the opportunity to perform meaningful research which they hadn't had the opportunity to do pre-pandemic due to time constraints. Significant changes to the means in which patient care is delivered including telemedicine impacted work-flow and engagement. A theme explored regarding the future was the most worrying impact of the COVID-19 pandemic in the medium-term, with a 'tsunami' expected once elective procedures are operating once again. Focused discussion of these themes are summarised.

Impact on fatigue in surgeons

There appears to be a strife (i.e. a conflict in opinion) amongst participants in what they perceive fatigue to be and whether

COVID-19 has influenced their self-perceived judgement of fatigue. This irreconcilable difference is best described by one participant in saying 'In one way I feel less fatigued. Less physically fatigued. Not much is required of me now as the pace is much slower. Mentally however I am finding the slower pace much more difficult to deal with. I like to be kept busy and I love operating, which I don't get to do much of now which is frustrating' (P5). It would appear that emotional frustrations in work and link to work engagement are influencing self-perceived fatigued levels. A summary of the findings are given in [Table 1](#).

Impact on surgical performance

There was more of a consensus on whether the COVID-19 pandemic has impacted on overall surgical performance, particularly in the cognitive and affective domains. It was reported that it was difficult to assess performance in the context of COVID, but there was a general understanding that COVID has impacted overall work practice, particularly with regards to exposure to clinical cases for trainees. A summary of the findings are given in [Table 2](#).

Impact on surgical practice

The COVID-19 pandemic, and the subsequent risk of virus spread to between healthcare workers and patients brought about significant change to surgical practice of surgeons including changes to surgery provision, increased use of PPE and workflow. Such changes also required surgery to adapt to processes such as tele-medicine and develop long-term strategic direction of service provision in order to meet patient needs. A summary of the findings are given in [Table 3](#).

Impact on training

There was distinct differences in the impact of COVID-19 between consultants and trainees (see [Table 4](#)). A significant shift in focus on training occurred which had unintended positive and negative consequences summarised. In particular, reduced surgical training opportunities was felt by many to impact future career progression opportunities and effective learning "I feel like if you're not operating though that we're not really learning – or getting fulfilment out of learning" (P64).

Impact on professional identity

The emerging role of professional identity and its link with professional engagement became a key theme with some suggesting that the change in work practices has impacted their desire to thrive in their workplace as captured through this salient quote – "maybe because I was enjoying work a little but less than usual, or more happy to take those days off when I usually am itching to get in" (P15). A summary of the findings are given in [Table 5](#).

Impact on personal wellbeing

The underlying impact of COVID on surgeons can be summarised with one quotation – 'it just never feels like you get a

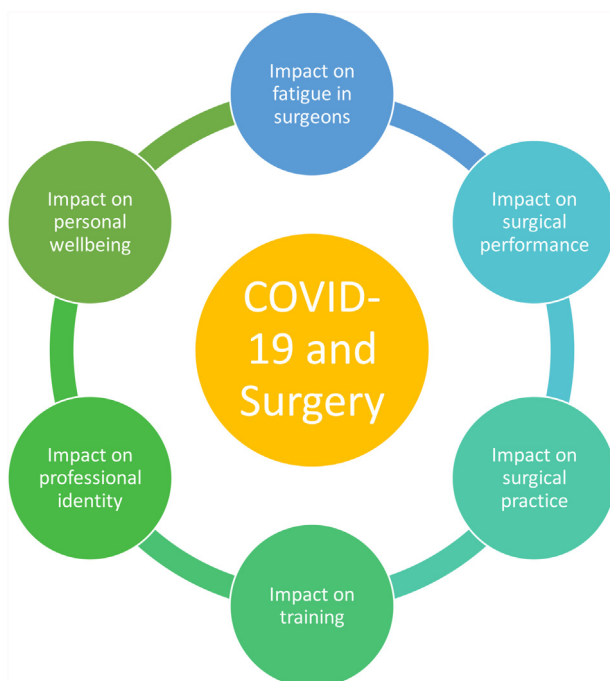


Figure 1 – Six interconnected themes on the impact of COVID-19 on the Surgical Profession.

Table 1 – Summary of thematic findings on ‘impact on fatigue in surgeons’.

Impact on Fatigue in Surgeons
- Increased
○ Lack of adrenaline
“There isn’t as much excitement or adrenaline for us as we don’t have as much surgical work to do” (P15)
○ Mundane tasks
“There is more routine mundane tasks like paperwork and research. There is a fatigue associated with boredom” (P15)
○ Stress in dealing with the ‘unknown’
“The unknown was more stressful than dealing with the known when it came to COVID positive patients” (P5)
○ Dealing with new protocols
“We have different setups now and different type of management plans. More vigilance is required in work” (P5)
○ Stress in dealing with future workloads
“Knowing that there are dozens of scopes, minor ops (sic) and day cases as well as cancer operations building up is stressful” (P4)
○ Post-Viral Fatigue
“I had some post-COVID fatigue” (P15)
○ PPE Use
“PPE can be exhausting by the end of the day because of dehydration” (P62)
- Reduced
○ New work-rota models
“I feel less fatigued. We are working long hours but alternating days with our colleagues. There is more time to rest and work on research” (P4)
- Sleep patterns
○ Harder to regulate circadian rhythm
“I am subject to an increased acute sleep deprivation when I’m in for 2 days in a row but then I sleep a lot more the days I’m off – it is harder to regulate my sleep hours now” (P64).
○ Easier to regulate circadian rhythm
“I’m trying not to sleep in too late as I don’t want to completely mess up my biological clock” (P15)

break from the virus – and in work you have this heightened exposure to it’ (P64). A summary of positive and negative impacts are given in [Table 6](#).

Discussion

The purpose of this research was to understand the impact of the onset of the COVID-19 pandemic on the surgical profession. Within that, identification and understanding of six key ‘impact’ themes from in-depth interviews arose with surgeons in our COVID status hospital; 1) self-reported fatigue 2) surgical performance 3) surgical practice 4) training 5)

professional identity and 6) personal wellbeing. The topics of fatigue and anxiety related to COVID-19 were of particular interest to both surgeons’ wellbeing and provision of quality patient care. With minimal literature exploring COVID-19’s impact on medical professions thus far, based on the abundance of literature on the impact of fatigue in surgery pre-pandemic it can be hypothesised that COVID-19 will have short and longer term consequences.² Among the varied understandings and perceptions of the consequences of COVID-19 on surgical life, the researchers have identified two overarching rhetorics which have implications for all six ‘impact’ areas; the rhetoric of personnel fatigue management and the rhetoric of virus control.

Table 2 – Summary of Thematic Findings on ‘Impact on Surgical Performance’.

Impact on Surgical Performance
- Technical Skill
○ No change in advanced trainees
“I’d say my technical is unchanged” (P15)
○ Negative Impact in earlier trainees
“My technical skill has gone down a lot as we aren’t doing any operating – it’s a use it or lose it type of skill” (P64).
- Cognitive Skill
○ Negative impact for thought processes
“My thought processes are a little bit slower because I’m not as sort of stimulated by adrenaline” (P15)
○ Negative impact for cognitive load in decision-makers
“Cognitive load has changed to sorting patients with the anxiety of new decision making – putting patients off who have cancer, risking surgery and COVID exposure for those with cancer” (P2)
- Affective skill
○ Reduced emotional lability to meet patient needs
“More anxiety on all fronts about losing track of patients, outcomes due to delayed surgery” (P2)
○ Reduced emotional lability due to reduced peer support
“We have also tried to reduce the number of staff members for safety reasons – but this has an impact on collegiality” (P61)
“Less interactions with colleagues which is difficult and can have a strain. It can feel quite lonely” (P64)

Table 3 – Summary of Thematic Findings on ‘Impact on Surgical Practice’.**Impact on Surgical Practice**

<ul style="list-style-type: none"> - Changes in Service provision and management <ul style="list-style-type: none"> ○ Cancelled elective surgeries “Not doing any elective surgery since about mid-march – so that is 6 weeks. I have done 3 operations since about then” (P15) ○ Triaging of priority cases for surgery “You are continually prioritising patients and risk stratifying” (P2) “Emergency cases are also hugely influenced as you have to weigh the risks of increased mortality associated with COVID post-op” (P5) ○ Endoscopy changed to consultant led process outside the hospital “I’m not doing any endoscopy at the moment either as it is currently a consultant led process ... Led by gastroenterology and surgical consultants” (P5) ○ Telemedicine and Strategy Development “Virtual clinics are not ideal – no interaction/examination with patient” (P5) “Need to learn how to continue normal health care delivery with COVID as a presence. Need to start managing patients with this new risk” (P2) ○ Resource Management “This onslaught of work when services begin to open back up will be really difficult to manage within current staffing levels” (P64) - Additional PPE use <ul style="list-style-type: none"> ○ Slowed down efficiency “Donning and doffing between wards makes everything so, so slow” (P16) ○ Negative impact on ergonomics of surgery “Very difficult to operate in the heavy mask, particularly if the goggles fog” (P4) “more difficult in theatre as you probably have reduced situational awareness” (P64) ○ Ineffective communication with patients “I feel like we aren’t really engaging properly with patients either. A lot of our patients are hard of hearing and they can’t understand us when we are wearing the masks” (P64) - New work-rotas <ul style="list-style-type: none"> ○ Continuity of patient care “Handovers are sometimes not up to the mark and you end up missing parts of patients management when they are inpatients” (P5). ○ Team cohesion “Don’t get to see my colleagues as much which doesn’t help with morale and engagement with work” (P64)
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Fatigue management

The rhetoric of fatigue management, as understood by the participants of the study, was that there was both intended and unintended consequences of COVID-19 on levels of fatigue resulting from themes such as service provision, personal wellbeing and professional identity. However, COVID-19 did provide opportunities for personal and professional management of fatigue in the longer-term.

The juxtaposition in fatigue

It is known that surgeons were subject to a busy work-flow pre-pandemic with high volumes of elective procedures. While this busy workflow resulted in high levels of physical fatigue, it was, antipodally, challenging and stimulating for many surgeons. The dramatic decrease in work-load may challenge surgeons in a way previously unbeknownst to them and related to theories around cognitive load and under stimulation.¹⁰ Such ‘low-mentally demanding’ tasks may expose a baseline level of fatigue and sleepiness that was previously masked by a high workload. The increase in these tasks may result in an increased likelihood of ‘automatic behaviour syndrome’ characterised by an increased risk of error making secondary to poor judgement in monotonous work.¹¹ Many subjects in the current study spoke of the difficulty in maintaining focus in their work and finding enjoyment in their work due to a lack of operative exposure. The opportunity to develop other aspects of competency in the profession such as focusing on academic work and engaging in service development was not unanimously supported by all surgeons and didn’t appear to offset baseline levels of fatigue

to the same extent that surgical exposure did. This supports evidence suggesting that a surgeon’s primary perceived role is to develop competency in procedural performance. In particular, since most of the participants were training, it is likely that training focus emphasises parity between developing technical skill when compared to non-technical skills such as management, communication and leadership. An increase in alternative approaches to service provision including telemedicine, increased complexity in decision making in surgical situations, and increase in complex system navigation was also found to be contributing to levels of fatigue in both trainees and consultants. Surgeons had to utilise higher order abstract thinking processes not typically utilised as part of their day to day process as well as ‘innovate’ within resource-constraint environments.

Sleep as a prophylactic

Interestingly, sleep didn’t appear to play a significant role in levels of reported fatigue changes in surgeons. This is unsurprising as fatigue is more typically influenced by ‘time on task’ demands.¹² While there is reduced ‘time on task’ in surgical procedures, there is an increased committal focus on tackling the COVID-19 pandemic in healthcare staff generally. A constant ‘draining’ effect of focus on COVID-19, with heightened exposure and additional stressors in the workforce, is likely to have resulted in the onset of new mental fatigue in surgeons. The ramifications for this are yet unknown and will likely affect surgeons’ physical and mental health as services begin to resume once again. Parity of sleep amongst other preventative healthcare measure is, amongst other professional and regulatory issues, a cultural issue

Table 4 – Summary of Thematic Findings on ‘Impact on Surgical Training’.**Impact on Surgical Training****- Negative Impact**

- Reduced exposure to surgery

“I’m not getting much in terms of operative training – just emergency cases” (P15)

- Younger trainees most impacted

“Has a big impact on us when we’re at such a junior stage. really needed these months of technical practice to help with the future” (P16)

- Less access to senior mentorship

“We have less access to senior members of the team which means less training and mentorship” (P64)

- Positive Impact

- Online learning from National Training Body

“We have online tutorials once a week with consultants all over the country” (P15)

- Opportunity for independent learning

“I’ve had more time to read academic papers so my diagnoses have definitely got better” (P64)

- Opportunity to do research

“I’m getting a lot more academic work done which is good” (P15)

- Opportunity to develop non-technical skills

“We had a lot of institutional training – and learning the ins and outs of work like intensivists was a good learning experience” (P64)

Table 5 – Summary of Thematic Findings on ‘Impact on Professional Identity’.**Impact on Professional Identity****- Negative Impact**

- Disengagement with work

“I’m generally dissatisfied at work. everyone is fairly checked out” (P16)

- Loss of purpose

“They are not operating – for a surgeon that is their livelihood. you still have to have that feeling you are operating” (P5)

- Feeling helpless

“I think a surgeons job is to assist in fixing a physical problem at hand – we have lost a large part of that role now. I feel kind of useless in the grand scheme of things” (P64)

- Lack of achievement

“Just feel I achieve very little in a given day, despite spending many hours in the hospital” (P5)

- Positive Impact

- Appreciating the multidisciplinary team

“I look at some of the busier disciplines now – like ICU and our nursing colleagues and I think you begin to appreciate the role they play in the whole system a lot more” (P64)

within the profession which makes opportunities to increase sleep in individuals complex.¹³ Efforts to address work-related anxiety, which induces night time associated insomnia, as well as changing culture approaches to sleep in surgery should be strongly advocated for as practitioners

enter into a new, busier, and more stressful work-life as elective cases resume. Knowing that healthcare staff are contracting the virus at a much higher rate than the generation population, and that one of the primary longer-term symptoms of COVID is post-viral fatigue, appropriate sleep

Table 6 – Summary of Thematic Findings on ‘Impact on Personal Wellbeing’.**Impact on Personal Wellbeing****- Negative Impact**

- Awareness of increased risk to healthcare workers

“Knowing that half of the intubated COVID patients in ICU are healthcare professionals is stressful” (P4)

- Post-viral Fatigue

“I still feel quite exhausted 6 weeks after the virus. there is risks around developing CFS” (P64)

- Fear of spreading the virus

“Anxiety very high in the beginning – still considerable regarding risk to my family. Will I bring COVID home and make my family sick?” (P2)

- Isolation

“when you’re not allowed to travel very much and go out and meet people – all that has contributed to a low level background of stress” (P15)

- Positive Impact

- More opportunity to exercise

“I have been making a real conscious effort to do lots more exercise and looking after my own well-being, particularly in the context of having had COVID” (P15)

- More opportunity to reflect

“Because we slowed down everything I could take a break and see how busy my life was and how much I’ve neglected things like my physical health” (P64)

quantity and quality, as well as focus on graded return to responsibilities to prevent risk of developing conditions such as Chronic Fatigue Syndrome.¹⁴

Other prophylactics

In addition, a focus on wellbeing and exercise was highlighted by many as a way of preserving their mental health during the pandemic. The increased availability in time off from work, in addition to mandated limitations to personal life liberties, has afforded some surgeons the opportunity to engage in health-promoting levels of physical activity, which have previously been recorded as below recommended requirements.¹⁵ It is important as services resume, and workload increases once again, that positive habits formed during the pandemic are not lost to a sense of professional duty to overwork. The focus on sufficient hydration and healthy diet to reduce human-factor related decrements in performance will also be important,¹⁶ as the requirements of PPE use in surgery are likely to remain in place for coming months.

Virus control

The second rhetoric which appeared strongly in the research findings is that of efforts to control the virus surrounding healthcare settings, including increased PPE use, as well as the consequences that has had on aspects of performance, training and long-term service provision planning.

Elective case cancellation

With the cancellation of elective procedures, from the policy perspective of reducing aerosol generating procedures, trainees have experienced radical changes to the way in which they are being trained. Altered surgical practice through tele-methods, in conjunction with reduced senior mentorship and operative exposure has left many feeling uncertain about their future opportunities in the profession. A significant reduction in surgical operations will lead to an influx in presenting acute cases in the medium and long-term which will have to be catered for in the context of managing virus spread. In particular, quarantine protocols around elective cases and provision of appropriate recovery spaces must be considered as services resume.

Personal protective equipment

The additional requirements around PPE use have caused practice to slow, particularly in ward round settings. An unintended consequence of its use is a decreased opportunity to develop patient-doctor rapport which is likely to have had implications for other aspects of performance such as displaying empathy, informed consent, shared decision-making, and effective communication. With PPE requirements likely a necessity for the future, innovative approaches to overcome these barriers such as displaying a photo of yourself, or using technological approaches which are been validated for effective management¹⁷ may assist in patient care and satisfaction.

Longer term impact on surgeons

The control of the virus is the primary focus of the national effort at present. Surgeons, at pre pandemic baseline were subject to

an increased level of fatigue when compared to the general population due to issues such as working overcapacity. With expected surges in workload in the coming months as services begin to resume, and as backlogs of surgical cases present in elective and emergency settings, a focus on the principles of managing fatigue in the workplace and in promoting personal wellbeing will be more important than ever. Efforts to mitigate fatigue such as increased in-house rest facility provision and a concerted effort to educate staff on importance of resiliency and stress management should be introduced in all settings, embedded with evidence-based understandings of the impact of stress on performance.¹⁸ Considerations for the mandating of protected breaks, revision of current work-rotas and evaluation of their effectiveness to manage fatigue and screening of fatigue levels and appropriate mitigating opportunities should be made by senior management. The spirit and focus on enhancing the healthcare service which has been so prevalent during the pandemic through initiatives such as #feedourheroes and #oncallforireland, and have been greatly received by staff - '*colleagues from all over the hospital have really come together to look after each other. really nice to see and a silver lining during the pandemic*' (P4) and will play an important role going forward for supporting surgical staff during their surge in work.

Qualitative approach and future research

A qualitative approach to this research was chosen to explore the array of intended and unintended consequences. All qualitative research is contextualised to the setting in which the data collection takes place, and this inevitably shapes the research findings. Given this research occurred in a 'COVID' status hospital, it is likely that a broad generalisation of the findings can be applied to acute hospital settings in Ireland. Contextual aspects, such as service changes will be specific to Ireland alone, but generalisations can be considered when it comes to surgical performance, training provision and the baseline fatigue related to COVID-19 experienced by the general public. Had participants been recruited from more rural hospital settings, where COVID-19 cases were not as prevalent, different impacts with regards to levels of stress may have been founded. This is a limitation to the current study. The approach of thematic analysis also is designed to extract themes from a series of subjective data – and thus quality control measures to ensure rigour of the data were employed to reflect the meaningful impact of COVID-19 on surgeons.

Studying the themes in the context of beginning of the pandemic where surgeons were preparing for 'the unknown', at the peak of the pandemic where fatigue and resources would intuitively be most affected, and at the start of a decrease in numbers was the remit of this research. Future research exploring the impact in the medium-term, particularly as elective services resume, as well as the impact of delayed training opportunities for trainees career progression and professional identity would be worthwhile and timely.

Conclusions

The results of our thematic analysis demonstrate two rhetorics which require a balance; virus control and fatigue

management. A balance between the two rhetorics will prevent overcrowding and draining of resources whilst minimising personnel fatigue to prevent an under resourced healthcare system. These rhetorics emerged from six themes which were of particular relevance to our surgeon cohort as discussed above.

Pre-COVID, surgeons reported working large numbers of hours due to constraints in personnel availability. In the current study, we identified that, going forward, after the pandemic, additional anticipated and unanticipated stressors to the healthcare system are inevitable. Lessons learned and themes elucidated in the current study will help guide planning for the post pandemic era.

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Appendix A. Supplementary data

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