

## Impact of delayed non-urgent surgery during the COVID-19 pandemic on surgeons in Alberta: A qualitative interview study

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### Authorship and Guarantor Information

All those designated as authors have met all ICMJE criteria for authorship.

1. Substantial contributions to the conception or design of the work (KMS, MB); or the acquisition, analysis, or interpretation of data for the work (NJ, ES, JK, CS, JD); AND
2. Drafting the work or revising it critically for important intellectual content (all); AND
3. Final approval of the version to be published (all); AND
4. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved (all).

### Author Statement

NJ and KMS participated in the design and development of the protocol. NJ, ES, CS, JK and KMS participated in acquisition, analysis, or interpretation of the data. NJ and KMS drafted the manuscript, and NJ, ES, CS, JK, JD, MB, JD, and KMS critically reviewed and approved the final manuscript.

### Data Sharing and Availability of Materials

All data available upon reasonable request.

### Conflicts of Interest

There are no declared conflicts of interest from any of the contributing authors.

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COVID-19; Surgery; Surgical delays; Surgeon; Healthcare provider; Qualitative methodology

### Abstract

**Background:** During the COVID-19 pandemic non-urgent surgeries were delayed to preserve capacity for patients admitted with COVID-19. Surgeons were challenged personally and professionally during this time. We aimed to define and describe the impact of delays to non-urgent surgeries during the COVID-19 pandemic from the surgeons' perspective in Alberta.

**Methods:** We conducted semi-structured interviews with pediatric and adult surgeons in Alberta during the COVID-19 pandemic (January 2022 and March 2022). We used an interpretive description methodological framework and inductive thematic analysis in accordance with Braun & Clarke methodology to identify relevant themes and subthemes related to the impact of delaying non-urgent surgery on surgeons and their provision of surgical care.

**Results:** Twelve interviews were conducted with nine adult surgeons and three pediatric surgeons. Six themes were identified: (1) Accelerator for a surgical care crisis; (2) Health system inequity; (3) System-level management of disruptions in surgical services; (4) Professional and interprofessional impact; (5) Personal impact; and (6) Pragmatic adaptation to health system

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3 strain. Participants also identified strategies to mitigate the challenges experienced due to non-  
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5 urgent surgical delays during the COVID-19 pandemic (i.e., additional operating time, surgical  
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7 process reviews to reduce inefficiencies, and advocacy for sustained funding of hospital beds,  
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9 human resources, and community-based postoperative care).  
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12  
13 **Interpretation:** Our qualitative study describes the impacts and challenges experienced by adult  
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15 and pediatric surgeons of delayed non-urgent surgeries because of the COVID-19 pandemic  
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17 response. Surgeons identified potential health system, hospital, and physician-level strategies  
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19 to minimize future impacts on patients due to non-urgent surgical delays.  
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## Background

The SARS CoV-2 virus (COVID-19) was declared a pandemic by the World Health Organization on March 11, 2020 and led to an increased demand for hospital beds to care for patients with COVID-19 [1]. In response, strategic planning to preserve scarce material and human resources were developed; one approach was delaying non-urgent surgeries during periods of increased hospitalizations [2-4]. Non-urgent surgeries, defined as surgeries that are medically necessary but can be scheduled in advance, were radically impacted by these delays leading to increased surgical wait times and backlogs [5, 6].

Providing timely surgical care has been challenging even prior to the COVID-19 pandemic with 30% of scheduled hip, knee, or cataract surgeries routinely exceeding pre-specified Canadian wait time benchmarks [7]. This strain on surgical care delivery has been exacerbated by the COVID-19 pandemic with an estimated 28 million surgeries cancelled worldwide during the first 12 weeks of the COVID-19 pandemic [8]. Longer wait times for surgery expose patients to higher risks of poorer health-related quality of life, progression of underlying conditions, and worse surgical outcomes [7, 9-12]. Furthermore, surgical delays lead to increasing backlogs of non-urgent surgeries [13, 14]. There has been a focus on the impact of delaying non-urgent surgeries on surgical patients and healthcare systems, however, less is known about the experience of surgeons both professionally and personally despite the acknowledgment of substantial COVID-19 related burnout among healthcare providers [15-18]. Understanding the impact of surgical delays on surgeons is an important knowledge gap to address to support surgeons in their clinical environment during periods of high patient volume.

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3 In this qualitative study, we aimed to define and describe the impact of delaying non-urgent  
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5 surgeries during the COVID-19 pandemic on pediatric and adult surgeons in Alberta.  
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## 10 **Methods**

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12 This study is reported according to the Consolidated Criteria for Reporting Qualitative  
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14 Research checklist (Supplementary Table 1) [19].  
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### 20 *Study design & Setting*

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22 We used interpretive description, which was developed for disciplines where pragmatic  
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24 approaches to understanding and developing clinical recommendations are needed, as our  
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26 methodological framework to align with a constructivist and naturalistic approach to inquiry  
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28 aimed at generating clinically contextual knowledge [20, 21].  
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32 In Alberta, Canada to date there have been five “waves” of COVID-19 cases and  
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34 hospitalizations. During the multiple waves of COVID-19, 81,600 surgeries were delayed in  
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36 Alberta [22].  
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### 42 *Participant selection*

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44 Participants were eligible to participate if they were English-speaking adults aged 18  
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46 years or older, able to provide informed consent, and were pediatric or adult surgeons working  
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48 in Alberta during the COVID-19 pandemic. A convenience sample of participants was recruited  
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50 through social media posts on Twitter and through email invitations to personal email  
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52 addresses via research networks.  
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### *Data collection*

We conducted semi-structured interviews between January 21, 2022 and March 15, 2022. An interview guide was developed by members of the research team and reviewed by two senior surgeons with experience in health services research and healthcare delivery for feedback and refinement prior to administration (Appendix 1). Participant demographics were collected using standardized questions at the end of the interview.

Three female researchers (two graduate students and one research associate) trained in qualitative methods (ES, JK, CS) conducted all individual interviews over Zoom (Zoom Video Communications, Inc., San Jose, United States) with only the interviewer and participant present. Zoom was used as the platform to conduct interviews due to ongoing provincial public health restrictions preventing in-person interviews. Interviews were audio-recorded, subsequently transcribed verbatim, verified, and de-identified. Transcripts were not returned to participants. Field notes were kept and informed interpretation of the transcripts.

### *Data analysis*

Transcripts were imported into Nvivo12 (QSR International, Melbourne, Australia) for data analysis. Data were analyzed using inductive thematic analysis described by Braun and Clarke [23]. Two female researchers (NJ, ES) trained in the Braun and Clarke inductive qualitative analysis approach completed all analyses. Each transcript was analyzed and coded independently and in duplicate. Researchers held weekly meetings to develop a coding frame

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3 that encompassed key features of the data and to discuss discrepancies in the coding frame.  
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6 Researchers applied the coding frame determined by consensus to their transcripts following  
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8 each meeting. Subsequent meetings focused on merging codes into themes reflecting  
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10 participant responses. Participant recruitment and coding meetings continued until no new  
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12 codes or further themes were identified with subsequent interviews and data analysis.  
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15 Trustworthiness (credibility, dependability, and confirmability) was considered. Credibility  
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17 included member checking by researchers (two researchers administering interviews) and  
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19 participants (two participants reviewed results/interpretation). Dependability included  
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21 maintaining an audit trail of iterative coding meetings. Confirmability was addressed by holding  
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23 weekly meetings that included open and reflexive discussion that challenged the researchers'  
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25 perspectives to minimize personal bias.  
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### 32 *Reflexivity*

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35 Interviewers did not have a relationship with participants prior to the interviews.  
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37 Interviewers had research experience in surgical care during COVID-19 as they previously  
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39 conducted interviews for a study on the impact of surgical delays due to the COVID-19  
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41 pandemic from the patient perspective. All interviewers had formal graduate training in  
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43 qualitative methods or experiential training in carrying out semi-structured interviews. None of  
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45 the interviewers or analysts were surgeons or had surgery (planned or completed) during  
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47 COVID-19. One of the interviewers and primary analyst is an intensivist who cares for surgical  
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49 patients admitted to intensive care units.  
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## Ethical consideration

This study was approved by the University of Calgary Conjoint Health Research Ethics Board (REB20-0753). The informed consent process occurred prior to interviews and included sending participants an email outlining the study objectives, the informed consent script detailing the interview and data analysis process, providing opportunities to answer participant questions and obtaining oral informed consent.

## Results

Twelve interviews were completed (nine adult and three pediatric surgeons). Participant characteristics are described in Table 1. Interviews lasted a median duration of 30 minutes 11 seconds [IQR 24m21s – 33m12s].

Six major themes were identified: (1) Accelerator for a surgical care delivery crisis; (2) Health system inequity; (3) System-level management of disruptions in surgical services; (4) Professional and interprofessional impact; (5) Personal impact; and (6) Pragmatic adaptation to health system strain. Quotations illustrating themes/subthemes are provided in Table 2.

### *Accelerator for a surgical care delivery crisis*

Surgeons believed the COVID-19 pandemic unmasked and exacerbated longstanding health system issues related to the delivery of surgical care. Surgeons described strain on the health system prior to COVID-19 and the effect of evolving surgical demand during COVID-19 (Quotation 1 (Q1)).



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6 Surgeons felt that the impact of non-urgent surgical delays had additional consequences  
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8 on patient outcomes such as increased risk of adverse events, less predictable outcomes due to  
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10 more complex surgeries being required and increased chronic pain (Q2). Surgeons suggested  
11  
12 that these additional surgical delays prompted some patients to explore private surgical care  
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14 while other patients were presenting with advanced disease requiring urgent interventions due  
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16 loss of function (e.g., joint collapse, pain crisis) (Q3 & Q4). Cancer surgeons specifically  
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18 highlighted that their patients were presenting for surgical consults with more advanced cancer  
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20 which they believed was a direct, deleterious effect of surgical delays due to COVID-19 related  
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22 capacity constraints (Q5).  
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### 30 *Health system inequity*

31  
32 Surgeons perceived inequity in two ways during the COVID-19 pandemic: a  
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34 disproportionate impact on surgical services compared to other health services, and an  
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36 inequitable impact among different surgical services. Surgeons expressed their perception of  
37  
38 the disproportionate burden of the pandemic response on surgery patients (Q6). Surgeons with  
39  
40 higher volumes of non-urgent surgical cases reported feeling that surgical delays were  
41  
42 particularly inequitable for their patient caseloads (Q7). Surgeons who performed mostly  
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44 cancer surgeries, which were prioritized in Alberta throughout the COVID-19 pandemic, were  
45  
46 empathetic to their surgical colleagues who experienced greater impacts to their surgical  
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48 practices; however, cancer surgeons were not impervious to impacts on surgical practices and  
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50 did report receiving informal recommendations regarding triage of their surgical cases (Q8). The  
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3 feelings of inequitable care delivery were amplified by a lack of transparency and a lack of  
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5 available resources to support patients and their families (Q9 & Q10).  
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#### 10 *System-level management of disruptions in surgical services*

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13 Approaches to delaying non-urgent surgeries varied through different waves of the  
14  
15 COVID-19 pandemic based on the number of hospitalizations during a given time. Participants  
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17 expressed that early in the pandemic during the first wave, postponing non-urgent surgeries  
18  
19 felt excessive based on the flat number COVID-19 hospitalizations (Q11). Surgeons reported  
20  
21 that COVID-19 pandemic responses were initially viewed as inefficient and at times too reactive  
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23 but became more informed by emerging evidence and experience (Q12).  
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30 Participants expressed tensions between surgeons and administrative bodies on the  
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32 appropriate approach to making decisions on when to enact disruptions to surgical care to build  
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34 hospital capacity and the process for deciding which surgeries should be delayed (triaging).  
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36 Surgeons did not feel included in triage decision-making (Q13).  
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#### 42 *Professional and interprofessional impact*

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45 Surgeons reported experiencing professional and interprofessional impacts due to  
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47 surgical delays. Surgeons described having to adapt to new hospital processes such as new  
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49 policies surrounding personal protective equipment (Q14). They also took on new professional  
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51 roles and administrative tasks such as seeing additional patients in clinic, canceling surgical  
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53 cases, and talking to patients regarding postponing their surgeries (Q15). Several surgeons felt  
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3 worried regarding the consequences of the anticipated increased workload and burnout related  
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5 to surgical delays (Q16). A few surgeons experienced a decrease in their workload with lower  
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7 surgical volume during waves of increased COVID-19 hospitalizations (Q17).  
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13 Some surgeons described a sentiment of divisiveness and tension between colleagues  
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15 within their own discipline and across surgical services, where some non-urgent surgeries were  
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17 delayed and more urgent surgeries (i.e., cancer surgeries) were continued (Q18 & Q19).  
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### 20 21 22 23 *Personal impact*

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25 Many surgeons described the personal impact of delaying non-urgent surgeries and the  
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27 COVID-19 pandemic more broadly, which was complex and intertwined with their professional  
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29 lives. Surgeons described changes to income and their work-life balance reporting significant  
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31 financial consequences due to reduced surgical cases within a fee-for-service reimbursement  
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33 model in Alberta (Q20).  
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40 Like the public, surgeons were also personally impacted by having to abide by public  
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42 health measures (Q21). Surgeons did not describe the impact of surgical delays and the COVID-  
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44 19 pandemic on caring for their school-aged children without school; however, the effect on  
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46 work-life balance was noted by several surgeons. While some reported a loss of work-life  
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48 balance due to increased work-related demands and concern regarding developing burnout  
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50 with the accumulation of surgical backlog (Q22), others described how the reduction in time  
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3 devoted to their professional career provided an opportunity for a practice change and greater  
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5 focus on work-life balance (Q23).  
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#### 10 *Pragmatic adaptation to health system strain*

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13 Surgeons were adaptive and empathetic to the health system strain they experienced  
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15 which changed the way in which they delivered care (e.g., virtual appointments) to reduce the  
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17 impact of non-urgent surgical delays.  
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23 All surgeons understood of the need and rationale behind delaying non-urgent surgeries  
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25 and expressed acceptance and empathy towards the difficult choices required by local decision-  
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27 makers. Surgeons were pragmatic in the way they adapted to delivering care during surgical  
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29 delays describing ways in which they changed the delivery of patient care to best support  
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31 patients during periods of high COVID-19 hospitalizations (e.g., completing more procedures in  
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33 clinic) (Q24). There were additional changes in communication modalities with patients, with  
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35 surgeons leveraging telehealth strategies and virtual follow-up with patients (Q25 & Q26).  
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42 Surgeons suggested strategies to mitigate some of the challenges experienced due to  
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44 surgical delays. These strategies included enabling more opportunities for shared decision-  
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46 making between surgical services with stakeholder input around patient care decisions to  
47  
48 better identify appropriate patients at least risk of negative consequences from experiencing a  
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50 surgical delay (Q27). Other described strategies included decoupling of surgeons completing  
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52 surgeries from their patients and the private administration of day surgeries through  
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3 alternative care models and capacity building through extended hours for non-urgent surgical  
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5 scheduling (Q28 & Q29). Figure 1 provides a summary of surgeon generated strategies to  
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7 mitigate some of the challenges of surgical delays, address surgical backlog and avoid future  
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9 delays.  
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## 15 **Discussion**

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18 This qualitative study describes how surgeons were impacted by delays in non-urgent  
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20 surgeries due to strained hospital capacity during the COVID-19 pandemic. Our results suggest  
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22 that both adult and pediatric surgeons across multiple specialties reported health system,  
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24 professional, and personal impacts due to these delays. Surgeons described how non-urgent  
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26 surgical delays exposed pre-existing issues related to the ability of the health system to meet  
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28 the demand for surgical care that became more apparent as a result of the COVID-19 pandemic.  
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35 The COVID-19 pandemic changed the way non-urgent surgeries were prioritized due to  
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37 strained clinical and infrastructural demands on health systems resulting from the influx of  
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39 patients with COVID-19 [24], challenging health systems to determine how to best navigate the  
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41 delivery of surgeries [2, 3, 25, 26]. Several surgical societies developed guidelines on surgical  
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43 prioritization during periods of scarce hospital resources [2, 3, 26]. However, there is little  
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45 guidance available on how to address surgical backlog following periods of high strain on  
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47 hospital resources. Previous studies evaluating initiatives to reduce non-urgent surgery wait  
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49 times in Canada have suggested using single-entry models which generate a single queue  
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51 directing patients to the next available surgeon as a means to increase availability of services,  
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3 reduce the number of patients placed on wait lists and optimize health system performance  
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5 (i.e., wait time monitoring, set performance targets) [7, 27, 28]. Our findings additionally  
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7 suggest advocacy for additional funding, service expansion (e.g., extended and weekend  
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9 operating times), and considerations for outsourcing (i.e., private health centres) as further  
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11 short-term and long-term strategies to address this backlog [7, 27, 29]. Long-term strategies  
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13 will have to additionally address patient-centered health system performance to optimize  
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15 operating room efficiencies, administrative efficiencies, and patient care pathways to have  
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17 sustained benefit on surgical wait times and backlogs [7, 27]  
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25 Our study suggests that any interventions to reduce surgical wait times must also  
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27 engage surgeons and include supportive strategies to avoid ongoing professional and personal  
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29 impacts due to sustained high-volume demand for surgical care. Healthcare providers have  
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31 experienced both physical and psychological risk throughout the COVID-19 pandemic and the  
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33 risk of burnout among surgeons has been well-documented even prior to the COVID-19  
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35 pandemic [15-18]. Addressing modifiable risk factors for surgeon burnout (e.g., equitable  
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37 workload among surgeons, financial compensation) during these periods of increased workload  
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39 will be important to address surgical backlog as a result of the COVID-19 pandemic [16].  
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47 There are several strengths to this study. The inclusion of surgeons from multiple  
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49 surgical specialties provided diverse perspectives and experiences. A multi-disciplinary team of  
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51 researchers and clinicians generated the interview guide, and one-on-one interviews were  
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53 completed to foster psychological safety and depth to participant answers. The study also has  
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3 limitations. The study findings are specific to clinical settings in Canada that experienced surges  
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5 of high hospital capacity demand due to COVID-19 infections. As this study explored the impact  
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7 of non-urgent surgical delays on both pediatric and adult surgeons within an academic  
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9 environment, it is possible that themes specific to some surgical specialties in a non-academic  
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11 environment may have been missed.  
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### 18 **Conclusion**

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20           Delaying non-urgent surgeries was necessary due to increased demand for hospital  
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22 resources to care for COVID-19 patients, but surgeons experienced professional and personal  
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24 impacts due to surgical delays changing the way that they are able to deliver care to their  
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26 patients. Personal and infrastructural supports for surgeons are needed as surgeons work to  
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28 address the backlog of non-urgent surgeries in the future.  
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36  
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**Table 1.** Participant characteristics

Characteristic	Adult surgeons (n=9)	Pediatric surgeons (n=3)
<b>Age category, years, n(%)</b>		
20-29	0 (0%)	0 (0%)
30-39	2 (22%)	0 (0%)
40-49	3 (33%)	2 (67%)
50-59	2 (22%)	1 (33%)
≥60	2 (22%)	0 (0%)
<b>Sex, n(%)</b>		
Female	1 (11%)	2 (67%)
<b>Work environment, n(%)*</b>		
Academic	9 (100%)	2 (67%)
Non-academic	1 (11%)	1 (33%)
<b>Surgical practice, n(%)</b>		
Dentistry	0 (0%)	1 (33%)
Head and neck	3 (33%)	0 (0%)
Gynecology	2 (22%)	0 (0%)
General	1 (11%)	1 (33%)
Orthopedics	2 (22%)	1 (33%)
Thoracic	1 (11%)	0 (0%)
<b>Work experience in role, years, n(%)</b>		
0-5	1 (11%)	1 (33%)
6-10	2 (22%)	0 (0%)
11-15	2 (22%)	1 (33%)
≥16	4 (44%)	1 (33%)

\* One participant reported working in both academic and non-academic environments

**Table 2.** Exemplar quotations for themes and subthemes.

Quote #	Subtheme	Exemplar quotation
<b>Accelerator for a surgical care delivery crisis</b>		
1	Healthcare system strain	"The Canadian healthcare system operates at maximum capacity all the time, even when there's not a crisis, there's no room for contingencies, right? Especially something as sustained as this. So when you run the system that tightly to stay within budget and I get it, healthcare is an overwhelmingly expensive proposition, but when you run on the edge of capacity all the time, you can ramp it up for a little while, like if there was a plane crash or something, people can work really hard for a week or two, for a lot of hours but if for something like this that goes on for two years, the limits of our capacity become really apparent" [Participant 003]
2	Impact on patient-centered outcomes	"They're quality of life surgeries, but at some point, quality of life diminishes to the point where it becomes medically imperative to do a joint replacement, say, for severe arthritis of the hip. So we've had a few more patients, at least in my subjective understanding or subjective experience, in the last seven years of my faculty position that we've had to bring in as an urgent pain crisis or failure to thrive for a joint replacement, which we know has less, or has inferior outcomes relative to your traditionally electively scheduled joint replacements." [Participant 008]
3	Direct impact on care delivery	"...what's happened as well is the number of emergencies or situations where people really need urgent care because they can no longer function or they've had, for example, a collapse of their joint, those numbers of cases are also increasing." [Participant 004]
4	Access to surgery	"Like I said before, we do have other options, since there are private surgical facilities, that we can go to. They were quite good at accommodating people." [Participant 002]
5	Direct impact on care delivery	"I think we have seen late presentations delayed to get to us, because those patients have to see their family doctor first, and then go on to see another ENT, and then get referred to us. So, that's where I think a lot of the delays have happened, not so much once we see them to get them to the OR." [Participant 009]
<b>Health system inequity</b>		
6	Disproportionate burden on surgery patients	"So I feel this pandemic has disproportionately affected surgery, and I feel surgeons and our surgical patients and our surgical leaders have really made a lot of concessions and a lot of sacrifices for the greater good." [Participant 008]
7	Disproportionate burden on non-urgent surgeries	"It felt like it was not a priority and we were being told that everything was equitable. At one point I did receive some acknowledgement from leadership that our discipline was the last to catch up or the most behind on catching up in canceled cases. And that was both validating and infuriating because all of this time they've been pretending that things are equitable." [Participant 001]
8	Resource constraint	"So just a couple of things off the top of my head although again, we were allowed to proceed with cancer surgery there are some of us that do what would be considered some of the ultra radical surgeries which might take an entire day of surgery on one patient. And we were sort of informally told that we should not be booking these patients because it would be seen as sort of an inappropriate use of time and resources during this time. So the feeling was rather than operating on a 40-year old to do something really aggressive in an entire day surgery, you should

		probably not doing that surgery and rather taking that day to do three cases or three patients." [Participant 002]
9	Lack of transparency	"And in terms of where we're at now, how do I feel about this? I feel a little bit like this is [provincial health system]'s fault that they could have done a better job. I saw a recent [newspaper] article where they claimed they're not canceling surgeries that was published 12 hours after they canceled my OR slate. I just feel like angry, at least be honest with the public about what's happening." [Participant 001]
10	Lack of resource availability	"And I think a lot of our patients who are undergoing very life-challenging procedures have, I think, been neglected or denied having their appropriate supports with them through their voyages, at least within the hospital setting, which has been distressing." [Participant 008]
<b>System-level management of disruptions in surgical services</b>		
11	Inharmonious implementation of policies	"Well, I think earlier in the pandemic there were alternatives, we just didn't know, because we canceled some surgeries and delayed surgeries, expecting the hospital to fill up when it was not yet full, and later in the pandemic, that shifted to letting things go until it's full, which is a slightly different paradigm, which works better because we're getting more done, because the hospital didn't actually fill up to the point where we had to cancel everything, which we did for a couple weeks about a year ago" [Participant 009]
12	Response informed by experience and evidence	"I think that the surgical leadership will benefit from having to move through a pandemic and you can see it in the second and later waves, the communication and the strategies for dealing with it was more certain and more polished" [Participant 006]
13	Stakeholder involvement in triage decision-making	"And then what's really silly is that now they're no longer asking the surgeons if there's certain patients on that list, according to acuity who should be removed. So then one of my colleagues last week had a very time-sensitive cancer surgery just arbitrarily removed, and somewhat ironically, had he been able to provide input he would've said, "This is the one that needs to be done. The other one or two, if you're thinking of removing one, definitely remove that one because that one's less acute." [Participant 002]
<b>Professional and interprofessional impact</b>		
14	Personal protective equipment use	"I think the secondary impact was just managing new requirements for personal protective equipment in the hospital, the additional burden and time and confusion around that." [Participant 006]
15	Additional professional roles	"I think it's not like the ORs closed and then we weren't doing anything. A lot of people worked extra, they took the burden of canceling cases, talking to the patients, hearing their concerns, rebooking them, and only to have them postponed again. And so that takes a toll, it's frustrating and the normal flow is disrupted and that is very taxing and it's a heavy burden" [Participant 007]
16	Workload changes	"...many of us feel quite worried about the clinical demands that we will face to try to meet the backlog...I think many of us are worried about it being quite stressful" [Participant 002]
17	Workload changes	"That seems to be exaggerated with the pandemic that, going into a wave, we're halfway through a wave, all of a sudden there's fewer people coming in, and then kind of a month after a wave finishes, then there's this crush of patients, often with advanced disease that have been delayed. So it's always been a challenge in this career, is that the busyness sort of comes and goes, but it's worse now." [Participant 003]

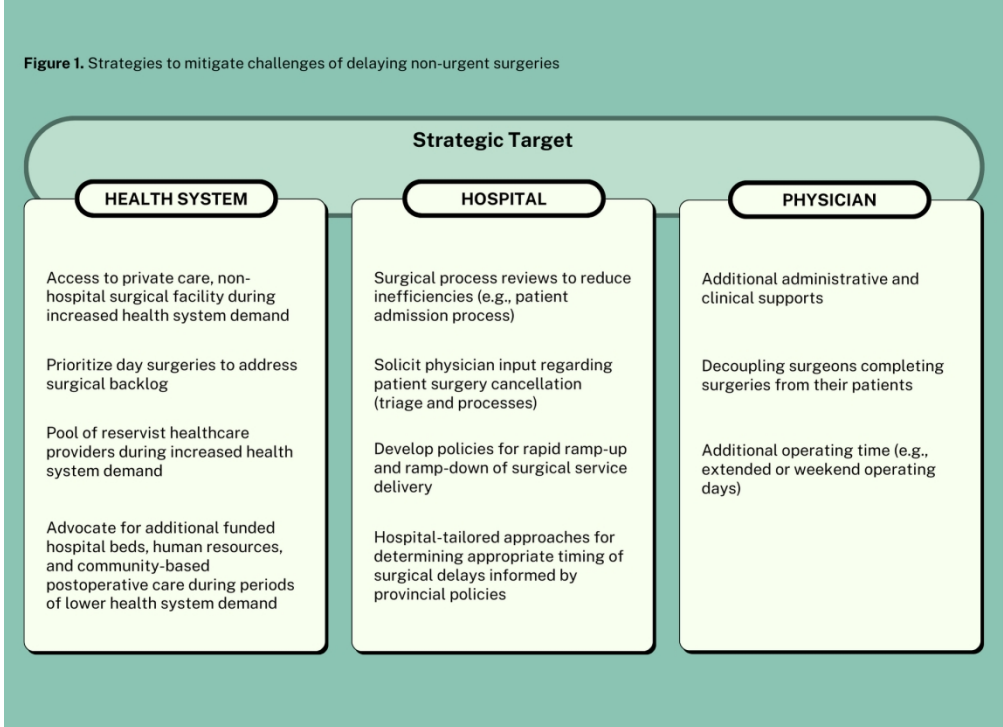
18	Interprofessional tension	"I would just I think, you know, again, that concept of the haves and the have nots, right? They've really not even across surgical disciplines, but within departments, where you've got people who may be doing more benign surgery as opposed to cancer surgery. There has created quite a divisiveness so I think that's at a personal and on a professional level that has been kind of taxing." [Participant 002]
19	Interprofessional tension	"I think that there is certainly some discord brewing between services because I hear that certain disciplines flaunted the restrictions by bringing patients in through the emergency room and claiming that [their] scheduled surgeries [were], now, urgent surgeries." [Participant 001]
<b>Personal impact</b>		
20	Financial consequences	"It's had a significant impact on income, which I'm sure not ... there's not a lot of sympathy for physicians being relatively high earners, their income is down, but the factor means there's staff that still need to be paid out of my professional income. And so things are tight, tight enough that I've had to take loans to keep everything afloat" [Participant 001]
21	Public health measures	"I think it's obviously personal restrictions, your lifestyle is significantly altered, the schooling of my children has been significantly changed, interactions with friends and family curtails and then obviously the stressors at work" [Participant 007]
22	Anticipatory burn out	"And so it's just sort of created a lot of stress in the sense that I am now left with a long list of patients that are all way out of window. And there's only so much I can do in terms of OR time because you sort of have to balance access to the OR for patients with your own sort of life." [Participant 001]
23	Work-life balance	"You know what, it's been pretty amazing for me. It was nice. It was nice to take a break for a few months. It was nice to make some changes to the practice. We canceled every appointment in our book and started fresh. We moved everybody who we'd canceled and started fresh and kind of went down from there, but it was nice to make some changes to the schedule. It was lovely to have dinner with my family every night, instead of running kids to sports." [Participant 002]
<b>Pragmatic adaptation to health system strain</b>		
24	Alternative strategies for surgical care delivery	"...our ORs were closed for a little while there too. And so we were doing a lot of the cases in minor surgery." [Participant 005]
25	Communication modalities	"So I think it's more acceptable now even by families. Families kind of think, "Oh, I should really see the surgeon." I think they kind of go, "You know what? It's okay not to see them." Because they're so used to Zooming or telephones now." [Participant 003]
26	Communication modalities	"And then rejigging, how patients could access chatting with us, given that they couldn't initially come physically to the clinics. And so, a transition to much more phone or other methods of consultation." [Participant 006]
27	Shared decision-making	"And so the example that I just gave you, if I know based on... If my surgical executive team tells me that, "[Name], you and your team are going to have to cut out five patients from your list next week." Well, give us the opportunity to tell you who those patients are according to acuity, don't just randomly start crossing off names because then that is not the right approach." [Participant 002]

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28	Alternative strategies for surgical care delivery	“So typically, if I met a patient, I would do their surgery and follow through with them. What we had to do was decouple that because we just had much more limited OR time. And so, we wanted to prioritize within our group, the patients, not just within our individual practices.” [Participants 006]
29	Alternative strategies for surgical care delivery	“I think there are some higher ups that are thinking outside the box, whether it be using private surgical centers to catch up on elective cases. Funding these cases outside the hospital setting makes a whole lot of sense in my mind.” [Participant 005]

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Strategies to mitigate challenges with delaying non-urgent surgeries

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## Appendix

**Appendix 1.** Semi-structured interview guide.**Semi-Structured Interview Guide**

Thank-you for taking the time to participate in this interview to help us understand the impact of delaying non-urgent surgeries on healthcare providers. My name is {insert name}, I am a {insert role}. The primary investigator is Dr. Khara Sauro.

You have been invited here today because we are interested in hearing your experience as a healthcare provider for patient who had a planned surgery delayed during the COVID-19 pandemic response. We will ask for your experience.

Thank you again for your participation.

Before we begin, I would like to make sure that you know that there are no right or wrong answers in our discussion today; we are interested in all comments. We don't want to miss any of your comments and feedback, so we are taking detailed notes and audio recording our conversation.

Please be assured what is said and discussed today will be kept confidential and any information you provide will be kept in a password protected folder on a secure server, accessible only by members of the research team. As is noted in the informed consent, your participation is voluntary and you are free to decline participation at any point should you wish to do so for any reason. Please let me know if you have any questions.

Do you have any questions before we begin?

1. What is your professional role (surgeon, operating room nurse, recovery nurse, other)?
  - a. If a surgeon, ask the types of surgery they perform
2. How long have you worked in your current role?
3. How long have you worked as {insert role/profession}?
4. What is your age?
 

Prompts: [If participant preferred], Age group: <20 years, 20-29 years, 30-39 years, 40-49 years, 50-59 years, ≥60 years
5. What is the gender with which you identify?
6. What type of institution do you currently work in?
 

Prompts: [If participant preferred], Academic, Non-academic, regional, or urban



## Appendix

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3 7. How many beds does your hospital have?

4 Prompts: [If participant preferred], ≤250, 251-499, 500-1000, >1000

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6 8. How has the pandemic impacted you, professionally?

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10 9. How has the COVID-19 pandemic response changed your clinical or surgical workload?

11 Prompts:

12 a. How much has it increased or decreased?

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14 10. How has delaying non-urgent surgeries impacted the surgical service at your hospital?

15 Prompts:

16 a. Has your hospital had to delay or cancel surgeries to make room for Covid-19 patients?

17 b. Has your hospital had to change policies and procedures around surgery during Covid-  
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21 11. Can you please tell us, in your opinion, how has delaying surgeries impacted your patients?

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23 12. What is your opinion on the decisions to delay surgeries in response to the Covid-19 pandemic?

24 Prompts:

25 a. What do you think the alternate options were?

26 b. How could the people making the decisions do a better job in the future?

27 c. What do you think was done really well?  
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30 13. What do you think are possible ways to minimize the impact of surgical delays, such as those  
31 experienced during the Covid-19 pandemic, on surgical patients in the future?  
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33 I would just like to take a moment and summarize what we've talked about today. <Summarize key  
34 points>.  
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36 Do you have anything else to add that we may not have captured?  
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39 Thank you so much for speaking with me today and for providing your experiences.  
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## Supplementary Table

**Supplementary Table 1.** Consolidated criteria for Reporting Qualitative research (COREQ) Checklist.

<b>Domain 1: Research team and reflexivity</b>		
<i>Personal Characteristics</i>		<i>Location in Manuscript, section (page number)</i>
Which author/s conducted the interview or focus group?	ES, JK, CS	Methods (Page 5)
What were the researcher's credentials? E.g. PhD, MD	NJ (MD, MSc), ES (BKin/BCom), JK (BSc), CS (MSc), JD (RN, PhD candidate), KMS (PhD)	Title Page
What was their occupation at the time of the study?	NJ (Attending Physician), ES (Graduate Student), JK (Graduate Student), CS (Research Associate), JD (Graduate Student), MB (Attending Physician), JD (Attending Physician), KMS (Assistant Professor)	Not reported in manuscript
Was the researcher male or female?	Female: NJ, ES, JK, CS, JD, MB, KMS; Male: JD	Methods (Page 5 & 6)
What experience or training did the researcher have?	All (training in qualitative methods, facilitator experience)	Methods (Page 6 & 7)
<i>Relationship with participants</i>		
Was a relationship established prior to study commencement?	No	Methods (Page 6)
What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	Participants received an email outlining the objectives of the study, verification of ethical approval, and an informed consent form detailing the interview process. An additional oral consent process was completed with all participants and an opportunity to ask and answer all questions occurred prior to commencement of the semi-structured interview.	Methods (Page 7)
What characteristics were reported about the interviewer/facilitator? e.g., Bias, assumptions, reasons and interests in the research topic	Yes. Interviewers were graduate students and research associate	Methods (Page 6)
<b>Domain 2: Study design</b>		
<i>Theoretical framework</i>		
What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Interpretive description; inductive thematic analysis in accordance with Braun & Clarke methodology	Methods (Page 4)
<i>Participant Selection</i>		
How were participants selected? e.g. purposive, convenience, consecutive, snowball	Convenience	Methods (Page 5)
How were participants approached? e.g. face-to-face, telephone, mail, email	Recruited via e-mail, social media	Methods (Page 5)
How many participants were in the study?	12	Results (Page 7)

## Supplementary Table

How many people refused to participate or dropped out? Reasons?	Not applicable	Not applicable
<i>Setting</i>		
Where was the data collected? e.g. home, clinic, workplace	Virtually via Zoom	Methods (Page 5)
Was anyone else present besides the participants and researchers?	No	Methods (Page 5)
What are the important characteristics of the sample? e.g. demographic data, date	Demographic data	Table 1, Results
<i>Data collection</i>		
Were questions, prompts, guides provided by the authors? Was it pilot tested?	Interview guides were provided by authors and reviewed by two senior surgeons	Methods (Page 5), Supplementary files
Were repeat interviews carried out? If yes, how many?	No	Not reported in manuscript
Did the research use audio or visual recording to collect the data?	All semi-structured interviews were audio-recorded only using the audio recording feature on Zoom	Methods (Page 5)
Were field notes made during and/or after the interview or focus group?	Yes, but field notes were not utilized in the data analysis	Methods (Page 5)
What was the duration of the interviews or focus group?	All interviews lasted approximately 30 minutes	Methods (Page 5)
Was data saturation discussed?	Yes	Methods (Page 6)
Were transcripts returned to participants for comment and/or correction?	No	Methods (Page 5)
<b>Domain 3: analysis and findings</b>		
<i>Data analysis</i>		
How many data coders coded the data?	Two (NJ, ES)	Methods (Page 6)
Did authors provide a description of the coding tree?	Yes	Methods (page 6)
Were themes identified in advance or derived from the data?	Inductive thematic analysis	Methods (Page 6)
What software, if applicable, was used to manage the data?	NVivo12	Methods (Page 6)
Did participants provide feedback on the findings?	Interviewers and two participants reviewed Results	Methods (Page 6)
<i>Reporting</i>		
Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g., participant number	Yes. Quotations associated with participant number	Results (Pages 8-12), Table 2
Was there consistency between the data presented and the findings?	Yes	Results (Pages 8-12), Table 2
Were major themes clearly presented in the findings?	Yes	Results (Pages 7)

Supplementary Table

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Is there a description of diverse cases or discussion of minor themes?	Yes	Results (Page 8-12)
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