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Research Article

Exploring the Impacts of the Beginning of the COVID-19 Pandemic on Critical Care Physicians and the Delivery of Patient Care in Eight Countries: A Qualitative Interview-Based Study

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Abstract

Purpose: To understand critical care physician experiences across multiple countries with the COVID-19 pandemic to inform future pandemic preparedness planning. **Methods:** In this qualitative descriptive study, 16 critical care physicians (from eight countries) identified in

convenience and purposive sampling took part in individual semi-structured interviews from April 7, 2020 to August 27, 2020 that captured the first wave of the pandemic. Open coding was conducted by two researchers who facilitated inductive thematic analysis. **Results:** Key themes identified following thematic analysis included the following: (a) sourcing and implementation of trusted information; (b) health systems–level preparedness with accessible supports; (c) institutional adaptations, including changes to patient care; (d) professional safety and occupational well-being; (e) triage and restricted visitation policies; and (f) managing personal familial responsibilities. **Conclusion:** The COVID-19 pandemic transformed the ways in which critical care physicians cared for their patients and personally coped with challenges. Perspectives of critical care physicians are important for ongoing pandemic planning and should be included in future pandemic policy development.

Keywords: critical care, COVID-19, pandemic, interviews, preparedness

Introduction

Shortages in life-saving interventions such as personal protective equipment, hospital and intensive care unit (ICU) beds, and mechanical ventilators emerged globally in the first wave of the COVID-19 pandemic, driving many health care systems to rapidly develop triage plans to support the allocation of these limited resources (Cag et al., 2021; Maves et al., 2020; Ng-Kamstra et al., 2020; Parsons Leigh et al., 2021). Human resources have also been in high demand throughout the pandemic, resulting in health care professionals being redeployed to emergency departments and ICUs from other areas of the health care system to avoid acute services being overwhelmed by surges in COVID-19 case numbers (Haldane et al., 2021; Kaye et al., 2021). Emerging research has shown increased stress and strain for patients, families, and health care professionals during the COVID-19 pandemic (Cag et al., 2021; Cattelan et al., 2021; Fiest, Krewulak, et al., 2021; Fiest, Parsons Leigh, et al., 2021).

Critical care medicine continues to be at the forefront of the pandemic response, given that the most severely ill patients diagnosed with COVID-19 were, and continue to be, cared for in ICUs by critical care physicians (Hajjar et al., 2021). Multiple studies conducted in Europe, North America, and Asia have demonstrated the mental health burden of the pandemic on front line health care professionals, especially those working in ICUs, where burnout was prevalent pre-COVID-19 (Di Tella et al., 2020; Pappa et al., 2020; Peng et al., 2021; Van Steenkiste et al., 2021). In Canada, the fear of anticipated or realized resource strain during the pandemic was shown to heighten psychological distress in critical care physicians that included concerns related to personal and familial safety (Parsons Leigh et al., 2021). An international survey of critical care health care professionals also described how the COVID-19 pandemic has impacted resources, staffing, and patient care globally, demonstrating that interventions tailored to health care professionals' needs are required to ameliorate their stress and burnout from working during a pandemic (Wahlster et al., 2021). Guidelines for preparation and management of ICUs during emergency situations such as the COVID-19 pandemic are increasingly being developed, and include specifics such as promoting infection prevention, increased infrastructure and staffing preparations, ICU capacity building, triage policies, and research development (Phua et al., 2020).

Research is emerging on the multi-faceted impacts of the pandemic on critical care physicians and the delivery of patient care

(Pendharkar et al., 2021). Health care professionals are on the front lines of public health crises, and their perspectives are invaluable when assessing the impacts and areas of improvement required within health care systems. Their experiences can provide insight on the impacts of the pandemic on patients, families, providers, and the health care system. Understanding these impacts will aid in the creation of effective evidenced-based pandemic preparedness planning. Therefore, the objective of this study was to understand how critical care physicians, their clinical practice, and the hospitals in which they work, were impacted by the initial stage of the COVID-19 pandemic across multiple countries. Our aim was to understand shared preparedness needs to inform future stakeholder-driven pandemic preparedness planning for the COVID-19 pandemic and future pandemics.

Methods

Study Design

We conducted a qualitative descriptive study (Kim et al., 2017) executed in accordance with the Consolidated Criteria for Reporting Qualitative Research (COREQ; Appendix A). The University of Calgary Conjoint Health Research Ethics Board (Ethics ID#: REB20-0377) and Dalhousie University Research Ethics Board (Ethics ID#: 2020-5106) approved this study.

Participants

FR applied a purposive and convenience sampling strategy, using personal contacts to recruit critical care physicians from the United States of America (USA), Canada, Turkey, England, Scotland, Italy, Spain, and Pakistan. These countries were chosen based on the location of pre-existing contacts of the research team. Participants were eligible if they were English-speaking critical care physicians (≥18 years) and able to provide informed consent. We aimed to recruit three participants from each location (n=24 total). We were prepared to continue sampling until data saturation was reached and no new themes relevant to the research questions were identified.

Interview Guide

The semi-structured interview guide explored three overarching topics: (a) the impact of COVID-19 on the health care system and its capacity to respond, (b) information needs, access, sharing, and dissemination; and (c) direct impact of COVID-19 on participants. The interview guide was developed iteratively through a series of working group meetings that included research assistants (RBM, CD, ES, LK), a qualitative research expert (JPL), and a physician assistant (CH). The interview guide was informed by news topics and clinical discussions, particularly grand rounds at a tertiary academic teaching hospital in Alberta, Canada, through March 2020. We pilot tested the interview guide with three critical care physicians to ensure the questions were appropriate in content and flow (Appendix B). The interview guide was refined after each pilot interview and was designed to focus on the first wave of the pandemic. Changes to the interview guide included removing two questions that were found to be redundant and improving the transition between the ice breaker question and the first question. Interviews were scheduled for 30 minutes and were closed by soliciting suggestions to enhance the response, including preparedness needs for COVID-19 in participants' hospitals.

Data Collection and Analysis

FR emailed invitations to critical care physicians, identified by both FR and JPL (a senior consultant in critical care medicine, and an expert in qualitative research, respectively). Participants provided written, informed consent prior to participating in the interview. Two investigators (CD, CH) conducted semi-structured interviews via telephone between April 7, 2020, and August 27, 2020. Investigators administered a short demographics

questionnaire at the end of the interview (Appendix B). Audio recordings were transcribed verbatim by a professional transcription company (https://www.rev.com/) and were quality checked and de-identified (names and context) in duplicate by two co-authors (CD, CH). Participants had the option to complete the interview by returning a written response format of the semi-structured questions. All participants were offered the opportunity to review their de-identified transcript as a form of member checking.

Two researchers (CD, AD) used NVivo 12 (https://www.qsrinternational.com/) to manage the data and facilitate thematic analysis (Braun & Clarke, 2006). Two investigators (CD, AD) independently reviewed a single transcript to generate an initial list of codes based on developing patterns and key ideas. The same two investigators then collaboratively developed a coding framework based on the outcomes of the initial open coding. They further analyzed the coding framework on an additional three transcripts, iteratively refining the codebook until all relevant ideas were included. A coding framework based on the outcomes of the open coding process was then collaboratively developed by the same two investigators, who continued to meet weekly after coding consecutive groups of three transcripts to discuss themes and coding discrepancies and refine the coding framework. With every adjustment to the framework, investigators re-coded previous interviews to maximize analytic integrity. The investigators conducted a secondary stratified analysis of textual data to further examine the interview data; one investigator (CD) analyzed by sex, marital status, and parental status, and the other investigator (AD) analyzed by age, country, and (private or public) health system. After independent analysis, investigators met to discuss findings and implications. Discrepancies in analysis were addressed through discussion in meetings between the coding investigators (CD, AD) and a qualitative research expert (JPL).

Results

Of the 32 critical care physicians who were emailed, 15 did not respond, one declined, and 16 (50%) consented to be interviewed, representing eight countries (USA, Canada, Turkey, England, Scotland, Italy, Spain, and Pakistan; Table 1). Six participants were interviewed during the first wave of the pandemic (Canada n=2; Turkey, Spain, England, and Scotland n=1 each), while 10 participants were interviewed within the interim between the first and second waves of the pandemic (USA and Italy n=2 each; Canada, Turkey, England, Scotland, Spain, and Pakistan n=1 each). The interviews averaged 29.3 minutes (standard deviation, 9.7 minutes); one participant completed the interview by returning a written response format of the semi-structured questions. Nine (56%) participants were female, and the median age of participants was 45.5 (interquartile range, 38.5, 56.75).

Physicians unanimously shared their perceptions on the importance of building pandemic preparedness from the experiences of the COVID-19 pandemic to adequately prepare for future public health crises and events that may be associated with strain on health care systems. Within this data, researchers (CD, AD) identified six recurring themes that included the following: (a) sourcing and implementation of trusted information; (b) health systems–level preparedness with accessible supports; (c) institutional adaptations, including changes to patient care; (d) professional safety and occupational well-being; (e) triage and restricted visitation policies; and (f) managing personal familial responsibilities. Exemplary quotations are provided in Appendix C.

Table 1

Demographic and Clinical Characteristics of the Critical Care Physician Participants

Demographic and Clinical Characteristics	*Critical Care Physicians (n=16)*
Age category, years, n (%)	
30–39	4 (25)
40–49	6 (37.5)
50–59	3 (19)
60–69	2 (12.5)
70–79	1 (6)
Female, n (%)	9 (56)
Marital Status, n (%)	
Married	15 (94)
Dependents, n (%)	
Children	13 (92)
Clinical Specialty, n (%)	
Critical Care	8 (50)
Critical Care & Anaesthesiology	6 (37.5)
Infectious Disease	1 (6.25)
Emergency Medicine	1 (6.25)
Type of Institution, n (%)	
Academic	14 (88)
Non-academic	1 (6)
Community	1 (6)
Country, n (%)	
Canada	3 (19)
Spain	2 (12.5)
Turkey	2 (12.5)
Scotland	2 (12.5)
England	2 (12.5)
USA	2 (12.5)
Italy	2 (12.5)
Pakistan	1 (6)

Sourcing and Implementation of Trusted Information

Participants from all interviews provided their perspectives on the challenge of sourcing and implementing trusted information regarding the COVID-19 pandemic. Most critical care physicians regarded the importance of reliable, evidence-based data: "I found the epidemiological data is the most helpful for understanding the most common patient, what they will look like."

Some critical care physicians created intentional distance from informational platforms in the interest of decreasing the visibility of information. Additionally, some participants noted the importance of limiting reliance on specific information sources:

> *I don't rely too much on social media to gather information. I can't say that I spend too much time focusing on what's posted on social media or text threads or chats or that type of thing. I kind of take them with a grain of salt.*

However, despite creating boundaries, critical care physicians recognized the difficulty in navigating the challenging and changing pandemic. Participants unanimously described the burden of having to constantly correct misinformation, such as information about masking, and found this task exhausting. One critical care physician recounted their experience with misinformation on social media platforms:

> *There was so much junk in the media about doctors, usually male, in fact let's be honest, always male, who thinks that they have the answer to everything, and their latest wonder cure, many of which were then proven to be pretty worthless.*

Health Systems–Level Preparedness with Accessible Supports

Participants shared their need to receive regular and clear information from leadership within their health systems regarding pandemic planning and policy changes. One critical care physician remarked on the clarity and efficiency of the preparedness within their health system:

> *When the [first] wave started there was a staged approach—coordinated, very clear communication. I think that the management of that went very smoothly actually in such a way that nobody was overwhelmed in terms of providing care.*

In contrast, one critical care physician described feeling distressed about the transmissibility of the virus that was perceived to be exacerbated with lack of health system preparedness:

> *Just the emotional toll that it's taking on a personal level for people to be walking in these rooms where you know that there's a risk of having that disease transmitted on to yourself. So emotionally, I think people are probably a little bit more taxed, certainly than usual, we were not prepared.*

Participants unanimously commented on the lack of systems-level accessible supports for staff. For example, participants noted a lack of available staff testing, which contributed to increased anxiety and worry of disease transmission.

Institutional Adaptations, Including Changes to Patient Care

All critical care physicians who participated shared logistical adaptations to patient care within their institutions. For example, one participant described their ICU being dedicated solely to coronavirus patients, while a previous recovery area was adapted to accommodate coronavirus negative ICU patients. Some physicians described their experiences with being involved in pandemic response teams:

> *I recommended to the administration that we have to form what we call a COVID-19 team. That was basically infectious disease, pulmonologists, hospitalists, pharmacists, nurses, infection prevention. So, we would round*

on actually each patient quickly for one to two minutes and make up a treatment plan for that day, for that specific patient.

In the end, critical care physicians, tired and burnt out, described the impact of adaptations within their institution that at times involved drastic changes to patient care: "Care admissions are being treated as positive and isolated until we can prove they are negative. We never would've isolated patients until we proved they haven't got a disease."

Professional Safety and Occupational Well-Being

Participants shared their perspectives on the challenge of adhering to policies that jeopardized their safety at work:

I think the problem of the mixed messages is in the beginning [of the pandemic]. From the hospital administration, they were getting scared they will have shortage of health care workers, or nurses, or physicians. So, the message was, even if you're sick, you can come to work.

Critical care physicians described their experiences with having to adapt to a workforce that was reduced purposefully to maintain physician safety. For example, one participant noted hospital leadership moving pregnant physicians and those 65 and older to administrative tasks during the pandemic. One critical care physician also described the impact of the pandemic on their training environment, opportunities, and career trajectory. Another shared a renewed sense of purpose in their clinical practice:

I mean, I think I would have had a really hard time if I was in a different specialty, or I wasn't able to directly participate, because part of it is it gave me a sense of purpose and feeling like I was doing something for the greater good during a really bad time.

All critical care physicians shared their perspectives on the unintended positive impact of the pandemic regarding shared lessons for future pandemic preparedness planning:

We've managed to recruit some of those [temporary] nursing staff to join our facility permanently. So, critical care at our site has come out of it [the pandemic] better equipped and much more cohesive, and more highly skilled with some additional workforce.

Triage and Restricted Visitation Policies

Critical care physicians shared that withholding and withdrawing life-sustaining treatment while mitigating suffering in the ICU during the COVID-19 pandemic was extremely complex. One participant reflected on the mental and ethical demands of triage:

We have to do a triage and that was the worst part and that was the really difficult part. I have [had a] hard time to deal with that because we sometimes we have to say no to patients that were 75 years old that were in a really good shape and no comorbid conditions. But I have another one of 68 that was in the same situation, and I had to decide to intubate the one of 68 and not intubate the one of 75 because we didn't have ventilators.

Participants also made note of the impact of restricted visitation policies that prevented family members from visiting their loved ones at end of life. They discussed the emotional distress caused by these policies for both families and physicians alike. One participant described these challenges as something physicians would carry with them for years to come. Another participant further described this challenge:

To tell the family that the husband or the wife or the father was dying in the ICU and they cannot come to see them. They cannot hold their hand, they cannot be with them. And I don't know, that was really tough.

The absence of patients' family members in the ICU was significant. One participant

described the challenges of updating families via Zoom or phone and expressed that the process was exhausting and impactful to their patient care.

Managing Familial Responsibilities

Participants described their perspectives on the challenge of managing personal familial responsibilities as they battled with increased demands in the ICU. Difficult for all, this was especially burdensome on families with young children:

> *I was watching my wife suffering the quarantine alone with the two boys with a lot of energy and she hardly had any time to sleep. And she, we have a little one, two years old that he's not sleeping well and she was not sleeping well and I couldn't help her because I was in the hospital almost every day, almost 20 hours a day and I couldn't be at home.*

Most participants agreed about the guilt felt when absent from their home:

> *I'm a mom with a four-year-old and a one-year-old. My husband is a physician as well, so we initially had a lot of concerns about how we were both going to continue to work full time. That was, I think, a particularly unique challenge for me, different than many of my colleagues who do not have young children, and most of them are male.*

Physicians also took opportunities to be actively involved in the care of extended family. One participant described taking on the additional task of shopping for their parents, to provide them with additional safety during the pandemic.

Discussion

We conducted a qualitative descriptive interview-based study across eight countries to explore how critical care physicians, their clinical practice, and the hospitals in which they work were impacted by the initial stage of the COVID-19 pandemic. Our findings indicate that changes and adaptations at the health system, institutional, and personal level, implemented to control spread of the SARS-CoV-2 virus, impacted the way critical care physicians cared for their patients and coped with the overwhelming emotional demands of the pandemic. These changes led to complex situations that have professional and personal consequences for physicians. The unintended consequences experienced by critical care physicians largely hinged on the notion that, despite seeking evidence-based information and receiving updates from leadership, critical care physicians experienced challenges related to restricted visitation and resource availability, and felt guilt related to leaving their families at home for extended periods of time. Our data highlight the importance of creating evidence-based pandemic planning from which we can adequately prepare for future public health crises and events that may be associated with strain on the health care system and challenges faced by critical care physicians.

Emerging research has demonstrated a significant emotional burden on front line health care workers (Cag et al., 2021; Pappa et al., 2020), including critical care physicians (Azoulay et al., 2020; Wahlster et al., 2021), during the COVID-19 pandemic. Potential resource shortages or circumstances outside of a physician's realm of (clinical) control were of particular concern to participants in our study (Parsons Leigh et al., 2021). This issue played out in real time as some were forced to triage critical care resources for patients, due to high patient volumes and a lack of solidified or actualized triage policies (White & Lo, 2020). Participants in our study expressed the immense emotional difficulty involved in making these decisions, particularly in an environment where efficient decisions needed to be made. This moral distress is described in literature where clinicians were fearful of having to ration resources (Solomon et al., 2020; Wynia, 2020). Earlier studies have also

demonstrated the need for ethical and legal parameters in triaging practices to support physicians in vulnerable triaging scenarios, particularly during crisis surge responses (Arabi et al., 2021; Aziz et al., 2020; Phua et al., 2020). Given the prevalence of symptoms of depression, anxiety, and burnout among physicians (Azoulay et al., 2020), our data underpins the need for attaining and maintaining good mental health and emotional well-being.

The preparedness of health systems to respond to the COVID-19 pandemic has been questioned by health care professionals around the world (Lal et al., 2021; Phua et al., 2020; Wahlster et al., 2021). In the current study, participants spoke about the need to reorganize ICUs to accommodate COVID-19 patients, redeploy high-risk staff into administrative roles, or train additional staff in the support of critically ill patients. In 2007, the World Health Organization published a framework with six building blocks (service delivery, health workforce, information, medical products, vaccines and technologies, financing, and leadership and governance [stewardship]) directed toward strengthening health systems globally (World Health Organization, 2007). Researchers have since proposed methods of approach to health systems resilience during shock scenarios, wherein systems see a rapid increase in the volume of critically ill patients (Blanchet et al., 2017; Hanefeld et al., 2018; Lal et al., 2021). Our findings illustrate that gaps remain in the strength and resilience of health systems globally, such as in the health systems building blocks of service delivery and health workforce, specifically within the ICU setting. The COVID-19 pandemic has revitalized the need for global health systems to plan and prepare for possible scenarios of surge and emergency situations.

Our findings highlight that policy changes, while necessary from a public health perspective, had unintended deleterious consequences on health care professionals working in the ICU during the COVID-19 pandemic. The COVID-19 pandemic resulted in limitations on patient family engagement in the ICU and participation in care that completely re-engineered physicians' methods to practice and had potential implications on their well-being (Cattelan et al., 2021; Kent et al., 2020; Leggett et al., 2020). Supporting a patient's family members is foundational to the practice of critical care medicine (Davidson et al., 2017); this aspect is rarely easy (Brown et al., 2018) and has been made more challenging in the COVID-19 pandemic, especially at end of life (Andrist et al., 2020). This includes patients dying alone due to restricted visitation policies in the ICU—the detrimental implications of this reality for patients, families, and critical care physicians cannot be understated (Moss, Krewulak, et al., 2021; Moss, Stelfox, et al., 2021).

Our findings can be used to prioritize strategies to combat the challenges faced by ICU physicians during the COVID-19 pandemic and future public health emergencies. For example, policy and research development should further examine and address the deleterious impacts of restricted visitation policies on both patient, family, and physician well-being. Utilizing evidenced-based information to improve public health and pandemic planning and preparedness can result in better patient care, physician well-being, and health systems functioning in the ICU environment. Capturing the lived experiences of stakeholders across health care jurisdictions and infusing these findings into future pandemic preparedness planning is an attractive area for future work.

Our co-designed interview guide was informed by narratives reported in the COVID-19 pandemic (Benatti, 2020; Landry & Ouchi, 2020; Neville, 2020; Rose et al., 2020) and tested in pilot interviews with critical care physicians. Interviews were conducted individually and at length, which allowed physicians time and space to describe experiences and offer important insights into the psychological burden that

afflicts their practice in the ICU.

There are limitations to consider when interpreting the findings of our study. As cases of COVID-19 fluctuated globally, health systems, access to resources, and experiences of critical care physicians may have differed, limiting the transferability of our work. Additionally, participants were also not systematically sampled, and interviews were conducted in the English language. However, we purposively recruited critical care physicians from countries with varied case counts and health systems to promote transferable findings. This study was conducted at the beginning of the pandemic prior to variants of concern and the development and implementation of vaccinations. Our small sampling frame limited our ability to achieve data saturation in our analysis; it was difficult to recruit critical care physicians during the first wave of the pandemic. Additional interviews to collect data past code saturation in order to assess meaning saturation are required for transferability of our results (Hennink et al., 2017).

Conclusion

The data from our qualitative descriptive interview-based study with critical care physicians across eight countries indicate that changes and adaptations at the health system, institutional, and personal levels to control spread of the SARS-CoV-2 virus transformed the way critical care physicians cared for their patients and coped with emotional demands of the COVID-19 pandemic. Contributing to the pandemic response, critical care physicians experienced challenges associated with restricted visitation policies and resource availability, as well as guilt about continuously leaving their families at home. Preparedness planning for future health crises and events that may be associated with strain on the health care system should include the experiences and perspectives of critical care physicians.

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Ethics Approval and Consent to Participate

The University of Calgary Conjoint Health Research Ethics Board (Ethics ID#: REB20-0377) and Dalhousie University Research Ethics Board (Ethics ID#: 2020-5106) approved this study.

Consent for Publication

Not applicable.

Availability of Data and Materials

The data sets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Competing Interests

The authors are unaware of any competing interests.

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Appendix A

Consolidated Criteria for Reporting Qualitative Research (COREQ): 32-item checklist

No. Item	Guide questions/description	Responses	Reported in Section
Domain 1: Research team and reflexivity			
Personal Characteristics			
1. Interviewer/facilitator	Which author/s conducted the interview or focus group?	CD, CH	Methods
2. Credentials	What were the researcher's credentials? E.g., PhD, MD	Jeanna Parsons Leigh (PhD), Chloe de Grood (MSc), Alexandra Dodds (MSc), Francesca Rubulotta (PhD, MD), Emily A. FitzGerald (MSc), Sara J. Mizen (MA), Karla D. Krewulak (PhD), Stephana J. Moss (PhD), Henry T. Stelfox (PhD), Kirsten M. Fiest (PhD).	Not reported
3. Occupation	What was their occupation at the time of the study?	Jeanna Parsons Leigh (Associate Professor), Chloe de Grood (Project Coordinator), Alexandra Dodds (Research Assistant), Francesca Rubulotta (Professor), Emily A. FitzGerald (Research Assistant), Sara J. Mizen (Research Assistant), Karla D. Krewulak (Senior Research Associate), Stephana J. Moss	Not reported

		(Senior Research Associate, Team Lead), Henry T. Stelfox (Professor, Director), Kirsten M. Fiest (Assistant Professor).	
4. Gender	Was the researcher male or female?	Female: JPL, CD, AD, FR, EF, SMi, SJM, KF, KK Male: HTS	Not reported
5. Experience and training	What experience or training did the researcher have?	All researchers had experience with qualitative research methods.	Not reported
Relationship with participants			
6. Relationship established	Was a relationship established prior to study commencement?	Yes	Methods
7. Participant knowledge of the interviewer	What did the participants know about the researcher? E.g., personal goals, reasons for doing the research	Participants were informed of the study's goals.	Not reported
8. Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? E.g., bias, assumptions, reasons and interests in the research topic	None	Not reported
Domain 2: Study design			
Theoretical framework			
9. Methodological orientation and Theory	What methodological orientation was stated to underpin the study? E.g., grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Thematic analysis	Methods
Participant selection			

10. Sampling	How were participants selected? E.g., purposive, convenience, consecutive, snowball	Convenience and purposive sampling	Methods
11. Method of approach	How were participants approached? E.g., face-to-face, telephone, mail, email	FR emailed invitations to critical care physicians identified by JPL and FR.	Methods
12. Sample size	How many participants were in the study?	16	Results, Table 1
13. Non-participation	How many people refused to participate or dropped out? Reasons?	1	Results
Setting			
14. Setting of data collection	Where was the data collected? E.g., home, clinic, workplace	Interviews were conducted over the phone.	Methods
15. Presence of non-participants	Was anyone else present besides the participants and researchers?	No	Not reported
16. Description of sample	What are the important characteristics of the sample? E.g., demographic data, date	Demographic data was recorded.	Results (Table 1)
Data collection			
17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	The guide was pilot tested with three critical care physicians.	Methods
18. Repeat interviews	Were repeat interviews carried out? If yes, how many?	No	Not reported
19. Audio/visual recording	Did the research use audio or visual recording to collect the data?	Audio recordings of the interviews were taken.	Methods
20. Field notes	Were field notes made during and/or after the interview or focus group?	No	Not reported
21. Duration	What was the duration of the interviews or focus group?	30 minutes	Methods
22. Data saturation	Was data saturation	Yes	Methods

	discussed?		
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?	Participants were provided with that option.	Not reported
Domain 3: Analysis and findings			
Data analysis			
24. Number of data coders	How many data coders coded the data?	Two data coders	Methods
25. Description of the coding tree	Did authors provide a description of the coding tree?	No	Not reported
26. Derivation of themes	Were themes identified in advance, or derived from the data?	Derived from the data.	Methods
27. Software	What software, if applicable, was used to manage the data?	NVivo 12	Methods
28. Participant checking	Did participants provide feedback on the findings?	No	Not reported
Reporting			
29. Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? E.g., participant number	Participant quotations were presented to illustrate the themes/findings.	Results, Appendix C
30. Data and findings consistent	Was there consistency between the data presented and the findings?	Yes	Results
31. Clarity of major themes	Were major themes clearly presented in the findings?	Yes	Results
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	Yes	Results

Note. Developed from "Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups," by A. Tong, P. Sainsbury, and J. Craig, 2007, *International Journal for Quality in Health Care, 19*(6), pp. 349–357. https://doi.org/10.1093/intqhc/mzm042

Appendix B

Interview Guide

***If on Zoom: ***
–Do not allow to join by video (Audio only)
–Enable wait room and use password for security

Introduction:
Thank you for agreeing to speak with us today. This study aims to investigate the global impact of COVID-19 on health care providers and health systems. We are conducting interviews around the world with critical care physicians as well as other health care providers who have been deployed from other medical specialties to work in an ICU during this time.

This interview will centre on your perceptions and behaviours regarding work on the front lines of a global pandemic. We look forward to the opportunity to learn from your insights. These topics serve as a guide only. If there are other insights you would like to offer, we would like to hear them.

Participation in this interview is completely voluntary. If at any point you feel uncomfortable with the process and wish to end your participation you are free to do so. If you would like to skip a question or end the interview early, feel free to let me know. If you do wish to withdraw your data you will have one week following the interview to do so, after which point due to the fragmentation of data in qualitative thematic analysis it will no longer be possible to remove your data.

Do you have any questions?
Do you agree to be recorded for research purposes?

<If participant has provided informed consent, start recording>

Thank you for participating.

Semi-structured interview questions
Discussion points: knowledge, experiences, perceptions, behaviours, underlying drivers, and implications

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Thank you for joining us. Today we will discuss health care providers' perceptions, experiences, and behaviours during the COVID-19 outbreak.

<u>Topic 1: Perceived Impact of COVID-19 on Health System and Capacity to Manage and Respond?</u>

1. Can you please describe your country's experience of the COVID-19 outbreak?
   - Stage of outbreak;
   - Degree of preparation;
   - Response and management

Now I would like you to think about the level of preparedness and impact of COVID-19 more locally. Can you begin by telling me about…

2. [What is] the impact of COVID-19 on your hospital and unit compared to routine operations?
   - Does your hospital have additional capacity to manage patients compared to normally?
   - Under normal circumstances, how full is the ICU at this time of year compared to now?
   - What is your [*hospital/unit*] capacity to meet and manage needs of ICU clinicians during the current pandemic?

3. What factors might jeopardize an ICU's capacity to safely manage COVID-19 cases during a pandemic? (Conditions leading to resource scarcity?)

   Interviewer can use probes below for emergency and critical care if physician has been redeployed there.

4. What are the unique issues you are dealing with as a [*critical care clinician / redeployed clinician*] in response to COVID-19?
   - How are you dealing with these issues?
   - Critical care – ventilators, space, lack of treatment protocol
   - Redeployed – training, comfort, safety, changed environment, autonomy

Topic 2: Information Access and Information Sharing/Dissemination

1. How do you get your information about COVID-19?
   - Key sources for information (e.g., government, social media)?
   - How do you vet credibility of information?
   - What about your capacity to stay up to date and informed?
   - What about social media information about COVID-19?
     - Is it helpful, distracting, detrimental?
2. How are you using information that you receive about COVID-19?
   - Patient care, Family care, Self-care
3. What do you think are key messages of misinformation about COVID-19?
   - How do you feel this has impacted your response?
   - Your colleagues?
   - Public response?

Topic 3: Direct Impact of COVID-19 on Self?

1a. [REDEPLOYED ONLY] How did you make the decision to join the critical care or emergency department workforce?
   - Professional considerations
   - Personal considerations

1. How has COVID-19 directly impacted your professional and personal life?
   - From an emotional perspective how does this make you feel [coping, stress, fear, uncertainty, predictability]?
   - How is your household making decisions to manage during this time?
2. What responsibilities should local health authorities have to their employees' families during the COVID-19 outbreak?
3. How do you think providers are making decisions about whether or not to go to work during the current infectious disease outbreak?
   - How does this normally work when you/colleagues are sick?

- Has this changed given the current situation?

Closing

1. What is one unique thing (outside of usual care) that your unit or hospital are doing right now to aid the current situation?

Do you have any final thoughts?
Thank you for participating in our COVID-19 study.
<turn off recorder>

Administrative Questions

1. Would you like to review your transcript for potentially identifying information?

If yes: What email address should we send it to?

2. Is there anyone else you think we should speak to about this topic?
   a. Could we please have their contact information or could you please pass on our email invitation to them?

Structured Demographic Questions

We are collecting personal and family demographic information in order to describe our participants in aggregate. Contact information is only for us if you would like to review the report generated from this work to ensure that it reflects your experiences. Please note that your demographic information and contact info will be stored in a password-protected database that is only accessible to the study research team. If you are not comfortable answering any of the below questions, you are welcome to skip any or all of those you do not wish to answer.

If applicable: At what email address/mailing address do you wish to receive your transcript?

1. What is your age, sex, and marital status?
2. What is your profession?
3. How many years has it been since you finished residency?
4. What is your current role? (e.g., intensivist, department head)
5. How many years have you been in your current role?
6. What is your clinical specialty?
7. Do you have any children?
8. Do your children live with you?
9. What are your child(ren) ages?
10. What is your country of residence (e.g., where are you currently working)?
11. What type of institution are you currently working in (academic, non-academic, regional, urban)?
12. How many beds in total does your hospital have?

☐ ≤250 ☐251–499 ☐ 500–1000 ☐ >1000

13. How big is the population your hospital serves?
14. How many COVID-19 positive patients have been in your hospital (to date)?

Appendix C

Perspectives of Critical Care Physicians Working in the Intensive Care Unit During the Initial Stage of the COVID-19 Pandemic

Themes	*Quotes*
Sourcing and Implementation of Trusted Information	"I deliberately made a disconnect because I would read all the time, the *New York Times* and the newspaper. I've stopped all that, deliberately because I don't want to see it." "I found the epidemiological data is the most helpful for understanding the most common patient, what they will look like." "There's a lot of weird messages about masks. I think that misinformation is harmful. I feel the need to constantly correct any misinformation to my family, to my patient's family, which is exhausting." "It's not outward misinformation but trying to sort through a new disease for which there's been no previous precedent to work by."
Health Systems–Level Preparedness With Accessible Supports	"When the [first] wave started there was a staged approach—coordinated, very clear communication. I think that the management of that went very smoothly actually in such a way that nobody was overwhelmed in terms of providing care." "We didn't have staff testing at the time, so I have to rely just on symptomatology. I was really quite anxious about being a spreader. Could I spread this amongst my colleagues?"
Institutional Adaptations Including Changes to Patient Care	"Our ICU is now purely for coronavirus patients. We are now completely dedicated to coronavirus patients. Our operating suite recovery area has been turned into the non-coronavirus ICU, so patients go there if they require critical care services but are coronavirus negative." "Our hospital had this floor labelled with 'critical care' and made that into a completely COVID ICU and they made a separate ICU for other patients that are non-COVID but require critical care for other reasons."
Professional Safety and Occupational Well-Being	"The decision our [hospital] leadership made was to remove the older folks. I think anyone 65 and older. Then we had two pregnant physicians at the time from service and I think that was a hard decision for them to make. It was a challenging decision across the board." "From a professional standpoint as a resident, it has taken us away from our training a little bit. Our training opportunities." "And I think the things that they [physicians] will think about in the years to come will be those deaths. They've been horrible. They've been really hard."
Triage and Restricted Visitation Policies	"After I round in the morning, I have to come back to my office and I just call families on the phone or on Zoom. I find it exhausting and not nearly as personally satisfying as it would be if I was in the room talking to them or updating them in the ICU. It pulls me away from direct patient care because I'm trying to update families and I think that's I would say pretty draining." "To tell the family that the husband or the wife or the father was dying in the

	ICU and they cannot come to see them. They cannot hold their hand, they cannot be with them. And I don't know, that was really tough." "one thing we think we can do in ICU … is you can do everything you can to give people a good death, and that I think is one of the most important things you can do as an intensive care doctor or nurse. And I feel that a good death involves the family and giving the family an experience of a good death. And I think we're really limited in how we can do that [during the pandemic]. And I think the things that they [physicians] will think about in the years to come will be those deaths. They've been horrible. They've been really hard."
Managing Familial Responsibilities	"My parents live on the other side of town. They're in their seventies and have the usual collection of comorbidities of people in their seventies, so they've not been out shopping, so I do the shopping for them and drop it off with them and so forth."