

BMJ Open How do care environments shape healthcare? A synthesis of qualitative studies among healthcare workers during the COVID-19 pandemic

Mia Harrison ,¹ Tim Rhodes,^{1,2} Kari Lancaster¹

To cite: Harrison M, Rhodes T, Lancaster K. How do care environments shape healthcare? A synthesis of qualitative studies among healthcare workers during the COVID-19 pandemic. *BMJ Open* 2022;**12**:e063867. doi:10.1136/bmjopen-2022-063867

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2022-063867>).

Received 14 April 2022

Accepted 11 September 2022



© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

¹Centre for Social Research in Health, University of New South Wales, Sydney, New South Wales, Australia

²Department of Public Health, Environments and Society, London School of Hygiene & Tropical Medicine, London, UK

Correspondence to

Dr Mia Harrison;
mia.harrison@unsw.edu.au

ABSTRACT

Objective To investigate how care is shaped through the material practices and spaces of healthcare environments during the COVID-19 pandemic.

Design Critical interpretive synthesis (CIS) of qualitative research.

Participants Studies included qualitative research investigating the experiences of healthcare workers involved in the care of individuals during the COVID-19 pandemic.

Results 134 articles were identified in the initial sampling frame with 38 studies involving 2507 participants included in the final synthesis. Three themes were identified in the analysis: (1) the hospital transformed, (2) virtual care spaces and (3) objects of care. Through the generation of these themes, a synthesising argument was developed to demonstrate how material spaces and practices of healthcare shape care delivery and to provide insights to support healthcare providers in creating enabling and resilient care environments.

Conclusions The findings of this study demonstrate how healthcare environments enable and constrain modes of care. Practices of care are shaped through the materiality of spaces and objects, including how these change in the face of pandemic disruption. The implication is that the healthcare environment needs to be viewed as a critical adaptive element in the optimisation of care. The study also develops a versatile and coherent approach to CIS methods that can be taken up in future research.

INTRODUCTION

This paper investigates how the materiality of the healthcare environment shapes care experiences, and how care practices and spaces transform in uncertain health contexts. Taking the COVID-19 pandemic as our case, this review synthesises qualitative studies investigating the experiences of healthcare workers involved in the care of patients during the COVID-19 pandemic. While these studies attend to COVID-19 in an ‘emergency’ framing, they call attention to enduring concerns that will affect healthcare practices and spaces in the years to come. The COVID-19 context presents an opportunity

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study employed a critical interpretive synthesis method for review of literature, which enabled the development of new insights about how the materiality of healthcare environments shaped practices of care during the COVID-19 pandemic, thus extending the goals of the included studies.
- ⇒ This study used a flexible and iterative purposive sampling strategy, which prioritised diversity and richness of qualitative data over exhaustive representation.
- ⇒ This study is oriented towards practice and presents a starting point for the development of further theoretical work.
- ⇒ Included studies were primarily limited to the earlier stages of the COVID-19 pandemic and inconsistently defined COVID-19 care and treatment.
- ⇒ Included studies were limited to interview, focus group and survey methods.

to identify the ways through which the materiality of the care environment enables and constrains ways of doing healthcare with particular attention to care as an emergent and adaptive feature of its environment and situation.^{1–4} This work is important, not only for considering how care is adapted in fast-moving situations of disruption such as emergency but also for how adaptive responses to care can endure as part of a systemic response.²

Existing reviews into the experiences of healthcare workers during the COVID-19 pandemic have primarily focused on the mental health impacts of COVID-19 on healthcare workers (and interventions and strategies for coping) and other barriers to and adaptations for care including those related to resource allocation, access to relevant information and training, the impacts of wearing personal protective equipment (PPE), stigma and logistical challenges, particularly around infection control and prevention.^{5–18} Another

review examined the impacts of environments on workers in the COVID-19 context more broadly, including the environments of healthcare workers.¹⁹ To investigate this further, we trace how aspects of the healthcare environment (ie, the sites, spaces, and conditions through which care is delivered and/or received) shape the healthcare experience, particularly in uncertain or rapidly changing health contexts. We consider ways of identifying how healthcare workers can be better supported not only *in* but also *through* their environments. We finally explore how healthcare services might develop efforts to create enabling and resilient environments of care for healthcare workers as well as patients.

This analysis has practical implications, as the forms of care provided by healthcare workers, as well as the quality of such care, are contingent on how healthcare environments adapt to changing health needs and contexts. The effects of this adaptability are compounded in times of emergency and disruption. Our orientation in this synthesis is informed by recent work on materialities and ecologies of care^{20–24} and how the care environment affects the care delivery experience.^{25–29} To our knowledge, this is the first synthesis of qualitative research to consider how healthcare environments materially affect the delivery of COVID-19 care.

METHODOLOGY

We draw on Dixon-Woods *et al*'s methods for critical interpretive synthesis (CIS) of qualitative research to develop our approach to review.³⁰ Dixon-Woods *et al* argue that while conventional comprehensive review methods are useful for aggregative syntheses of data, they present limitations when it comes to *interpretive* approaches to synthesising 'a large and complex body of evidence'.³⁰ A critical interpretive approach to synthesising qualitative evidence is useful because it does not merely describe issues identified within the original studies but also generates new ideas and 'assemble[s] findings into a form that is useful in informing policy'.³⁰ Such an approach requires a sample that is *rich* and *diverse*, rather than exhaustive, as the focus is on generating theory rather than systematically summarising all available data.^{30–32} CIS is thus more concerned with '*appropriateness of sampling*' than '*comprehensiveness*'.³¹ This requires an iterative and flexible approach to review, where the research question, sampling strategy and analysis are continuously and reflexively refined.^{30,33} The aim here is to develop insights that move beyond the designs of the original studies and have the capacity to produce novel contributions to health policy and clinical practice.

Guided by Dixon-Woods *et al*'s methods, we outline each step of our approach to synthesis.³⁰ It should be noted that these steps are not necessarily performed sequentially or independently. Instead, steps may overlap, run concurrently and repeat in response to emerging analysis and theory generation.

Review question

We established an analytical focus for our review around the materiality of the healthcare environment. By this, we mean we attended to matter, such as objects (both medical and mundane), bodies, buildings and infrastructures, and how matter relates with practices, knowledges, spaces, temporalities and affects in the care environment.^{20,21} We furthermore considered how the care environment itself is made through these relations and what is at stake in that making.^{20,21} This analytical focus guided our search and was iteratively refined in response to emerging findings.³⁰ Unlike with conventional review methodologies, and in keeping with CIS methods, we did not formulate a hypothesis in advance but reflexively refined the research question and analysis throughout.³⁰

Search strategy

An explicit, highly structured and protocol-driven search strategy is ill-suited to the review of complex qualitative evidence as it risks missing relevant materials and can be less efficient than other strategies.^{30,34} We combined traditional search strategies with other, more iterative methods to assemble a sampling frame. We began with a search of PubMed and Google Scholar databases using the search query "(healthcare OR (health AND care)) AND (worker OR professional OR staff) AND covid-19 AND qualitative". These search terms were kept intentionally broad to allow for greater inclusivity across topics and disciplines in line with the exploratory nature of the review process.³⁰ Further searches were also performed in hand-selected journals and via backwards and forwards citation chaining, using Google Scholar for the latter. Finally, we used informal networks such as personal contacts and Twitter to monitor for additional literature that may have been missed in the initial search, especially given the fast-moving production of research in the COVID-19 context.^{30,34} We adopted a 'snowballing' approach to our search, allowing studies that emerged throughout the review process to be included in the final sample.³⁴

Eligibility criteria

In the early stages of study selection, it was important to keep the boundaries of our search flexible to allow the review question to dynamically evolve in response to emerging findings. However, given the speed and volume of research being produced within the COVID-19 context, there was a practical need to limit the number of papers included in the initial review. Eligible articles included English-language original studies collecting primary qualitative data including interviews, surveys with free-text responses, focus groups and observation. Mixed-method studies were eligible for inclusion if evidence of all findings was demonstrated in the qualitative data. All articles were peer reviewed and published or in press with the accepted manuscript available online by 31 December 2021.

Eligible studies investigated the experiences of healthcare workers involved in the care of individuals with

COVID-19. This posed two challenges. First, the category of healthcare workers has no singular definition across studies and geographical contexts, with some articles taking a broad approach and some focusing on specific professions. We adopted an inclusive definition of healthcare workers including, but not limited to, medical and paramedical practitioners, nurses, midwives, allied health professionals, emergency health workers, personal care workers, health management and support personnel, students and trainees, and other health and health associate professionals.

Second, in the context of the pandemic, where the healthcare systems of most countries are directly involved in COVID-19 management and care, it is difficult to define what constitutes COVID-19 care. Healthcare workers in settings that are not established to provide specific COVID-19 care may still encounter individuals experiencing COVID-19 illness who are also, or solely, in need of non-COVID-19 healthcare. Conversely, healthcare workers who are explicitly engaged in the care of patients with COVID-19 are often also involved in care of other patients who are not infected and have other healthcare needs. Most studies did not make clear and consistent distinctions between practices of care performed for patients with and without COVID-19, and the experiences of healthcare workers related to the specific care of patients with COVID-19 cannot be disentangled from the broader experiences of providing healthcare during the COVID-19 pandemic. Furthermore, many of the concerns and practices of front-line COVID-19 healthcare workers and other healthcare workers are shared, including managing infection risks and the use of PPE.

We included articles that explicitly reported the experiences of caring for individuals with confirmed or suspected COVID-19, irrespective of whether COVID-19 care was a primary responsibility of the study participants. We additionally included studies in which there was ambiguity as to whether the participants themselves were involved in the *direct* care of patients with COVID-19, but the practices, spaces and concerns identified in the findings were consistent with other studies. Studies that did not focus on the experiences of healthcare workers in care *provision* (eg, studies investigating experiences of healthcare workers as patients with COVID-19 themselves) were excluded.

Sampling and quality determination

We employed an iterative and purposive sampling strategy to select papers for inclusion. Rather than producing an exhaustive sample within a rigid and highly specified inclusion criteria, purposive sampling enables the inclusion of ‘relevant’ literature on the basis of likelihood to contribute to the development of theory, with an ultimate aim of ‘conceptual saturation’.^{30 33} This allows for the inclusion of a richer and more diverse sample of literature. Thomas and Harden argue that aiming for conceptual saturation may be more appropriate for reviewing qualitative literature than traditional sampling approaches, as

Table 1 Phases of sampling

Phase I	Articles were screened for eligibility and relevance on the basis of titles and abstracts. Selected articles were imported with PDFs into EndNote V.20 for full-text indexing (n=134).
Phase II	A sample of articles (n=53) was read in full, and emerging themes were identified, manually coded and synthesised into possible search terms with particular attention to our analytical interest in the materiality of healthcare environments.
Phase III	All indexed PDFs were searched using synthesised search terms, and matching articles were screened for inclusion on the basis of the full-text for quality, richness of primary data and relevance (n=96).
Phase IV	All articles included in phase III were screened for final inclusion on the basis of contribution to theory development (n=38).

the conceptual findings of the synthesis will not change with the addition of further studies beyond the point of saturation.³⁵

CIS rejects a ‘stage’ approach to review, instead producing a method that is iterative, dynamic and responsive to the evolving concerns of the synthesis.³⁰ In practice, this involved including and excluding literature on an ongoing basis to adapt to emerging lines of analytical inquiry. The aim here is not reproducibility.³⁰ Instead, much like with analysis of data in primary qualitative research, CIS methods produce an interpretation of the evidence that is demonstrably grounded and prioritises ‘meaningful’ analysis.³⁰ While total transparency of study selection is not feasible within such a method, we have simplified our selection process into four phases (table 1).

While the phases of sampling represented in table 1 are listed in sequential order, phase II and phase III are not discrete and singular steps, but rather ‘a constant dialectic process conducted concurrently with theory generation’.³⁰ Articles sampled in phase II were iteratively and purposively selected on the basis of titles and abstracts with attention to diversifying study context and aims until emerging themes no longer meaningfully deviated from existing coded themes. Search terms synthesised in phase II were also continuously tested for usefulness and refined in response to emerging themes (table 2); for example, despite the attention to material objects within the synthesis, ‘material’ was determined to be an unhelpful search term as it captured all articles that referenced ‘supplementary materials’. Similarly, articles selected in phase I were iteratively included and excluded on the basis of relevance in phase III as the concerns of the synthesis evolved.

Following Dixon-Woods *et al*, we adopted an approach to quality appraisal in phase III that maximised inclusion at a conceptual level, rather than taking a hierarchical

Table 2 Synthesised search terms

Search term(s)	Sample (N)
bed	75
body OR bodies OR bodily	68
disinfect	25
dispose OR disposal	9
facility OR facilities	61
gear	33
mask	93
PPE	101
redeploy	26
room	90
space OR spatial	58
telehealth OR teleconsult OR telemedicine	23
ventilator	46
virtual OR digital OR remote	70
war OR battle OR soldier	62
waste	12
zone	23

PPE, personal protective equipment.

approach determined by particular methodological standards.³⁰ Though articles would only be *included* on the basis of their interpretive value, articles would also only be *excluded* if they were deemed to be ‘fatally flawed’.³⁰ We developed a set of appraisal prompts adapted from those proposed by Dixon-Woods *et al* for assessing if an article should be excluded on this basis (box 1).³⁰ Finally, phase IV of the sampling process appraised all articles included in phase III for their overall contribution to the conceptual findings of the review. As the methodological aim of this review was to reach conceptual saturation, we deemed it unnecessary to include multiple articles that all presented the same findings without meaningful variation. Articles that produced no additional insights to other included articles and did not provide rich empirical data for interpretive analysis were excluded in this phase (table 3).

Data extraction and analysis

Data were collected and organised by synthesised search terms (table 2). Emerging themes were identified across the collected data and a ‘synthesising argument’ was developed.³⁰ The goal of the synthesising argument

Box 1 Quality appraisal prompts

- ⇒ Are the objectives of the research clearly stated?
- ⇒ Is the research design clearly described and appropriate?
- ⇒ Are data collection methods transparent?
- ⇒ Are data analysis methods clearly described and appropriate?
- ⇒ Are there sufficient data to support the authors’ interpretations?

is to make sense of ideas across the review by bringing together arguments and evidence within multiple studies in ways that are explanatory and theoretically generative, and attend to the relationships between constructs.³⁰ We analysed both the primary data presented within the studies, and the interpretations by the study authors, to generate new interpretative findings (what Dixon-Woods *et al* describe as ‘synthetic constructs’).³⁰ We then generated three themes to organise these synthetic constructs, which allowed us to present our synthesising argument in a way that was internally coherent and facilitated a stronger theoretical understanding of material practices and spaces of healthcare environments.

Patient and public involvement

There was no patient or public involvement in this study.

FINDINGS

Our synthesising argument is organised across three interconnected themes: (1) the hospital transformed, (2) virtual care spaces and (3) objects of care. To present these themes, we have included illustrative extracts of participant responses from included studies.

Theme 1: the hospital transformed

During the COVID-19 pandemic, the hospital environment has undergone spatial, material and temporal transformations to accommodate changing healthcare needs. Three distinct but intersecting burdens on physical space in the hospital setting emerged in the literature: the increase in hospitalisations in COVID-19-affected geographical locations; the need for hospital zoning to separate confirmed or suspected COVID-19 cases from other patients; and the need for general physical distancing between all staff, patients and visitors in the hospital. These burdens led to material and organisational changes in the hospital, which impacted how healthcare was done in these environments.

The introduction of COVID-19 cases into hospitals presented a need for higher capacity emergency departments and intensive care units to keep up with the demand, as well as additional isolation facilities to prevent further infection within the hospital.^{36 37} Hospitals and healthcare delivery environments implemented and strengthened triage systems to establish ‘hot zones’, which separated patients with confirmed or suspected COVID-19 from other patients.^{36 38–40} This required the adaptation of existing spaces and infrastructure, and changes to hospital staffing to support this zoning, leading to further recruitment and redeployment of healthcare workers.^{36 41} Redeployed healthcare workers reported low support, inadequate specialised knowledge and training for COVID-19 care, a lack of familiarity with patient treatments, poor communication and feelings of uncertainty, which impacted the quality of patient care delivery.^{38 42–44} ‘They gave us 2 1/2 hours overview lecture on [Intensive Therapy Unit] setting then that is that, working in

Table 3 Study characteristics

Author (year)	Aims	Country or region	Sample (n)*	Qualitative data collection method*
Al Ghaifri <i>et al</i> (2020) ³⁷	To explore the experiences and perceptions of medical professionals working front-line in the management of COVID-19	Oman	40	Focus groups
Arnetz <i>et al</i> (2020) ⁴²	To explore perceptions of stress for nurses working in the early stages of the COVID-19 pandemic	USA	455	Survey with free-text response
Aughterson <i>et al</i> (2021) ⁶¹	To explore the psychosocial impact of the COVID-19 pandemic on front-line healthcare and social care workers	UK	25	Semistructured interviews
Baldwin and George (2021) ⁴⁵	To develop an understanding of the experiences and needs of healthcare workers during and after the COVID-19 outbreak	UK	19	In-depth, semistructured interviews
Banerjee <i>et al</i> (2020) ⁵⁷	To explore perceptions, experiences and challenges of healthcare workers involved in dementia care during the COVID-19 pandemic	India	148	In-depth, semistructured interviews
Billings <i>et al</i> (2021) ⁶⁴	To explore the experiences, views and needs of mental health professionals supporting front-line healthcare and social care workers during the COVID-19 pandemic	UK	28	Semistructured interviews
Blake <i>et al</i> (2021) ³⁸	To evaluate well-being centres established to provide psychological support to healthcare workers during the COVID-19 pandemic	England	24	Semistructured interviews
Butler <i>et al</i> (2020) ³⁹	To explore perspectives and experiences of clinicians on resource limitation and patient care during the COVID-19 pandemic	USA	60	Semistructured interviews
Chandler-Jeanville <i>et al</i> (2021) ⁵¹	To explore the lived experiences and perceptions of the COVID-19 pandemic among front-line nurses and their relatives	France	49	Semistructured interviews
Chen <i>et al</i> (2021) ⁶⁷	To explore the experiences of wearing PPE for nurses caring for patients with COVID-19	China	15	Semistructured interviews
Cheong (2020) ⁶²	To explore the impact of the COVID-19 pandemic on hospital-based clinical pharmacists	Malaysia	19	Semistructured interviews
Conlon <i>et al</i> (2021) ³⁶	To understand the experiences of emergency care staff during the COVID-19 pandemic	Ireland	15	Semistructured interviews
Crowe <i>et al</i> (2021) ⁶⁸	To examine the mental health of critical care nurses providing direct COVID-19 care during the early phase of the pandemic	Canada	15	Semistructured interviews
Deliktas Demirci <i>et al</i> (2021) ⁸²	To explore the experiences and coping strategies of nurses working on COVID-19 wards	Turkey	15	In-depth, semistructured interviews
Digby <i>et al</i> (2021) ⁴³	To investigate the well-being of hospital staff during the early stage of the COVID-19 pandemic	Australia	321	Survey with free-text response
Fernández-Castillo <i>et al</i> (2021) ⁷⁰	To examine the experiences of intensive care nurses during the COVID-19 pandemic	Spain	17	Semistructured interviews

Continued

Table 3 Continued

Author (year)	Aims	Country or region	Sample (n)*	Qualitative data collection method*
Galehdar <i>et al</i> (2020) ⁷¹	To explore experiences of distress among nurses caring for patients with COVID-19	Iran	20	In-depth, semistructured interviews
Hayirli <i>et al</i> (2021) ⁴⁹	To describe how PPE and distancing affect teamwork in the emergency setting	USA	55	Semistructured interviews
Hoemke <i>et al</i> (2021) ⁴⁶	To explore the experiences and concerns related to healthcare workers' use of PPE during the COVID-19 pandemic and its impact on care delivery	UK	46	In-depth, semistructured interviews
Jia <i>et al</i> (2021) ⁷³	To examine nurses' ethical challenges in delivering COVID-19 care	China	18	In-depth, structured interviews
Kurotschka <i>et al</i> (2021) ⁵⁸	To explore the care experiences of general practitioners during the first phase of the COVID-19 pandemic	Italy	149	Survey with free-text response
Liberati <i>et al</i> (2021) ⁴⁸	To investigate the experiences of healthcare workers in secondary mental health services during the COVID-19 pandemic	England	35	Semistructured interviews
Liu <i>et al</i> (2020) ⁴⁰	To explore the experiences of healthcare workers recruited to provide direct care for patients with COVID-19	China	13	In-depth, semistructured interviews
Montgomery <i>et al</i> (2021) ⁶³	To investigate the experiences of healthcare workers in critical care settings during the COVID-19 pandemic	UK	40	Semistructured interviews
Ness <i>et al</i> (2021) ⁶⁹	To investigate challenges faced by healthcare workers during the COVID-19 pandemic	USA	23	Semistructured interviews
Newman <i>et al</i> (2021) ⁴⁴	To explore the psychological impact of the COVID-19 pandemic on front-line healthcare workers	UK	395	Survey with free-text response
Norful <i>et al</i> (2021) ⁶⁵	To investigate the impact of stress on front-line healthcare workers during the initial outbreak of COVID-19	USA	55	Open-ended interviews
Palacios-Ceña <i>et al</i> (2021) ⁴¹	To examine the experiences of front-line physical therapists during the COVID-19 pandemic	Spain	30	In-depth, semistructured interviews
Parsons Leigh <i>et al</i> (2021) ⁴⁷	To investigate the perceptions and experiences of critical care physicians in the context of resource strain during the COVID-19 pandemic	Canada	15	Semistructured interviews
Pastrana <i>et al</i> (2021) ⁵⁶	To explore the impact of COVID-19 on palliative care	41 countries	79	Survey with free-text response
Rao <i>et al</i> (2021) ⁵³	To examine the perspectives of front-line clinicians providing care to patients with COVID-19	USA	50	Semistructured interviews
Rees <i>et al</i> (2021) ⁶⁶	To explore the experiences of paramedics providing care during the COVID-19 pandemic	Wales	20	Semistructured interviews

Continued

Table 3 Continued

Author (year)	Aims	Country or region	Sample (n)*	Qualitative data collection method*
Ross <i>et al</i> (2021) ⁶⁰	To investigate the experiences of paediatric hospital social workers during the COVID-19 pandemic	USA	55	Focus groups
Saleem <i>et al</i> (2021) ⁵⁰	To explore the experiences of front-line Pakistani emigrant physicians working in the UK during the COVID-19 pandemic	UK	10	In-depth, semistructured interviews
Sheng <i>et al</i> (2020) ⁷²	To explore the impact of involvement in COVID-19 rescue on professional identity among nurses	China	14	Semistructured interviews
Testoni <i>et al</i> (2021) ⁵⁵	To examine COVID-19-related stress in doctors and nurses	Italy	17	In-depth, semistructured interviews
Williams Veazey <i>et al</i> (2021) ⁶⁴	To explore how entanglements of affect, space and evidence shape care in the COVID-19 context	Australia	63	In-depth, semistructured interviews
Yip <i>et al</i> (2021) ⁵⁹	To examine the experiences of junior nurses providing care to patients with COVID-19 in acute care settings	Hong Kong	40	Semistructured interviews

*For mixed-method studies and studies investigating multiple populations, only primary qualitative data collected from healthcare worker participants (as defined under 'eligibility criteria') are represented.
PPE, personal protective equipment.

an environment that you don't know [...] Asked to give medications which you're not competent to do so'.⁴⁴

Studies also evaluated the materiality of healthcare environments in relation to staff comfort and safety. Existing spaces for staff in the hospital, including changing and showering facilities and break rooms, often did not meet the increased need to physically distance, decontaminate and relax, and in some cases further spaces were found or built.^{43 45 46} The materiality of COVID-19 care spaces within the hospital also enhanced the sense of risk in these environments: 'You were continuously exposed, closed spaces fully covered with patients with COVID-19, where invasive techniques were conducted, there were aerosols, vomits'.⁴¹ This sense of risk extended to homes as well, which became sites of potential contagion that put those cohabiting with healthcare workers at risk.⁴⁶ One study described healthcare workers managing this risk by creating 'hot and cold zones' within their homes or even residing in hotels, thus isolating themselves from families and loved ones.⁴⁷

In addition to the materiality and spatial layout of healthcare environments, logistical adaptations in the day-to-day running of hospitals further impacted the ways in which bodies travelled and interacted with each other. Some services and modes of care were prioritised as essential, leading non-essential services to be conducted remotely (see the section Theme 2: virtual care spaces).⁴⁸ The changes to hospital zoning highlighted the need for adequate staff to ensure healthcare workers were not moving between zones, thus impacting infection control measures.³⁶ Spatial limitations in the hospital further impacted communication between healthcare workers. Material barriers within the hospital built environment required the implementation of different technologies and procedural changes, such as the use of baby monitors or whiteboards, in order for healthcare workers to communicate with each other and with patients.^{46 49} These spatial barriers to face-to-face communication impacted the quality of care as communication and emotional connection were compromised: 'Typically, when a trauma patient comes in we're in the room first thing and we're sort of hearing the story. [...] And now we're not in the room because of PPE. [...] we're getting a lot of information from these very sick patients secondhand'.⁴⁹

While the transformations outlined previously largely point to adaptative changes implemented in response to evolving healthcare needs, hospital environments also underwent atmospheric transformations that produced affective engagements with the care space. Participants in the literature employed the metaphor of the healthcare worker as a 'soldier' fighting a war and described the hospital environment as a 'war zone' or 'battlefield'.^{41 45 50-54} 'It was like that scene on ET, all that plastic.... So, there's all this plastic and, I get it, but just walking into this other world, there was just mayhem, pandemonium. People running around, alarms going off.... it was like a war zone'.⁴⁵ Care practices were also understood as generating affects that could resonate through the care

environment. One study highlighted a (variably defined) distinction between triaging care and 'rationing', where the latter was described as a 'taboo'.³⁹ This led in some cases to care being provided beyond what was considered normal or beneficial clinical practice: 'because of the sensitivity, the concern that people are going to be withholding care and this institution doesn't want to be seen like that'.³⁹

Events of high emotion and trauma haunted spaces in the hospital environment: 'Even now, when I am on duty, when I enter some room(s), I see patients who could not breathe, in bed, who died suddenly. I still have these flashes that still shock me, especially when I enter two rooms in particular'.⁵⁵ One study connected these local affects in the hospital space to global atmospheres that are generated in the pandemic and travel through media networks: 'I just had this moment of those pictures that you see from the New York Times or whatever, of hospitals in America flashing up in your brain and going, 'This is not dissimilar. Are we going where they're going?''⁵⁴ As with the other transformations highlighted in this section, these atmospheric transformations were produced in and through the materiality of sites of COVID-19 care, across time and space.

Theme 2: virtual care spaces

The use of virtual spaces in healthcare has significantly expanded during the COVID-19 pandemic. As physical touch and interaction between bodies became understood as 'risky', contact between bodies was mediated in healthcare environments via technologies enabling remote care, including telephones, tablets and online services.^{54 56} In addition to reducing the risk of SARS-CoV-2 transmission, remote consultation services were identified as having the capacity to increase healthcare access by reducing barriers relating to travel, geographical location, time, disability and resources^{57 58}: 'Patients could make appointments and communicate with GPs online, then they were offered guidance on healthcare and psychological support, and purchased drugs online under the instructions of doctors, which may be a new way of work for GPs'.⁵⁹ However, the digital divide was identified as an issue affecting both healthcare workers and patients, as digital literacy and internet access varied from person to person and region to region.^{57 60} Already-vulnerable patients could thus be made more vulnerable: 'When reopening begins, those who have suffered as a result of these disparities will return to our care sicker and with deeper social needs'.⁶⁰

Quality of care in virtual care environments was a common concern in the literature. Studies highlighted the practical implications of healthcare workers not being in the same room as patients, which could lead them to miss symptoms or changes in patients, misread body language or non-verbal communication, or experience increased language and intercultural communication barriers.^{57 61}: 'Patients keep requesting for physical examination. [...] How will I prescribe without being sure...'.⁵⁷

One study also highlighted a ‘ripple’ effect’ from the lack of physical assessment, where patients requiring general treatment were referred to emergency, thus increasing the burden placed on the emergency department.³⁶

One way that consultations were adapted to navigate concerns about infection control and quality of care was through the development of hybrid systems in which nurses or trainee doctors provided patient care in-person, with doctors and consultants using remote technologies to observe patients and support care without entering the ward.⁴⁸ This required the healthcare workers providing in-person care to embody the authority and expertise of the doctor, while also observing the patient: ‘The consultant was probably heavily relying on the nurses and the doctors there, rather than himself, to look at smaller behaviours ... little things like facial reactions, body language, things like that’.⁴⁸ In these ways, virtual and hybrid environments not only enacted changes in the individual care encounter between patient and healthcare worker but also transformed the bedside as a site of care and produced extended effects in the care journey and other care practices and experiences in the healthcare environment.

Fully remote care systems also presented practical challenges when it came to monitoring and administering medication.^{57 62} The lack of face-to-face interactions (between both patients and doctors, and patients and their families) also produced barriers to emotional and social care^{56 61 63}: ‘the most important part of caring is PRESENCE. Touch, intimate conversation, allowing the patient to sit close, face-to-face interaction’.⁵⁶ This was signalled as being particularly problematic in the context of COVID-19 given the heightened need for this kind of support; for example, one study emphasised the need for some patients with mental health issues to experience simple moments of physical contact: ‘I think that some people just need the power of touch or a hug or a face-to-face human person to ensure that they’re kept safe and okay’.⁶¹ Telehealth was framed as a compromised form of care that traded (but would ‘never be able to replace’) ‘physical touch and presence’ for safety.⁵⁶

Yet one study also identified a potential for increased emotional support through remote care for patients who were already in isolation.⁵⁸ Participants identified technologies of remote care as enabling new forms of interpersonal connection, fostering modes of care that emphasised thoughtful verbal communication as an intentional practice of care: ‘The rediscovered importance of words, of a telephone conversation that becomes an essential connection, and which is able to concentrate all the possible humanity, closeness and help’.⁵⁸ The study also reconceptualised virtual care as taking place not ‘remotely’, but rather ‘in the home’, allowing a new and different form of intimacy to that produced through face-to-face care in the hospital setting: ‘Every day I called them, I entered their homes, I saw their eyes, I evaluated their breathing. [...] I have been living with them for these 20 days’.⁵⁸

While remote care had the capacity to enable healthcare workers to ‘enter the homes’ of patients, so too did it bring the healthcare environment into the homes of participants who worked remotely. Some studies found working from home gave participants greater flexibility in work, limited workplace distractions, and reduced fears of becoming infected or sick.^{38 43} However, for others, working from home presented several challenges including technological issues (eg, internet speed), distractions from other occupants in the house, and insufficient or inappropriate physical space.^{43 60}

Many healthcare workers reported difficulties in establishing boundaries between professional and personal space, especially when the broader pandemic context introduced additional home responsibilities (eg, home-schooling).^{43 48 56 60 64} Working from home brought colleagues and patients (virtually) into the personal spaces of healthcare workers in ways that challenged comfort and privacy^{56 64}: ‘Something I found hard was the room I work in is also my bedroom. It can be a lot to have these difficult conversations in your own room where your bed is, not having that space’.⁶⁴ There were other practical implications to this decrease in privacy as well; for example, one study noted the difficulty of conducting confidential conversations when working in a shared living space.⁴⁸

The erosion of boundaries between work and home also dissolved temporal markers of ‘worktime.’ As homes became workplaces, other aspects of homelife (such as childcare) became folded into the workday, thus disrupting work and family routines.^{56 60} More rigid scheduling in virtual environments limited opportunities for informal discussions and debriefs, and the absence of a daily commute (which previously operated as a temporal boundary of worktime) caused the workday to stretch beyond regular hours.^{48 60} Such spillage of worktime created a sense of pressure to always be available and ‘at work’^{48 60}: ‘Working from home means that I am never ‘not working’.’⁶⁰ These challenges produced an increase in burnout, guilt, uncertainty in decision-making and feelings of being underappreciated.^{38 43 48 60 61}

Virtual care spaces were also produced through the engagement of healthcare workers with social media platforms. Studies described social media use as a practice of knowledge sharing, enabling healthcare workers to access rapidly emerging information about the pandemic through informal networks and put this emergent information into practice.^{52 54 65} These networks were identified as constituting experiential evidence that could be disseminated and accessed more rapidly than traditional evidence through official channels: ‘our colleagues who are in the hot areas [...] send out some of their experiences, how they are managing it, on Facebook or WhatsApp. So, we are just reading to see if we can incorporate their experience and then go from there’.⁶⁵ However, these modes of knowledge sharing were also conceptualised as risky, with the potential to amplify misinformation and produce uncertainty through conflicting accounts of

successful COVID-19 care practices.^{52 54} Accessing information through social media also led some participants to feel overwhelmed and anxious, particularly due to the circulation of news of patient and healthcare worker deaths.^{54 59 66}

Social media furthermore produced spaces of connection between healthcare workers and the public. These spaces enabled the circulation of viral images (such as photos of healthcare workers with sores from extended PPE use) and allowed healthcare workers to disseminate information and share their personal experiences of working during the pandemic.⁶⁶ They also created opportunities for both displays of gratitude and support from the public and occasionally negative comments and abuse.^{52 65} These virtual spaces of public engagement thus constituted potential sites of psychosocial support or anxiety for healthcare workers.

Theme 3: objects of care

Material objects formed a central mechanism of COVID-19 care across the literature. The most prominent object of care identified in the literature was PPE; studies described shortages of PPE (particularly at the beginning of the pandemic) as a barrier to both the safety of healthcare workers and their capacity to deliver care, with inadequate PPE supplies causing anxiety and prompting participants to limit patient interactions and reuse and/or share PPE.^{38 42 43 45 46 49 52 58 65 67 68} ‘I have the same N95 since March. We also are only allowed one surgical mask for 1 week. We still are rationing PPE’.⁴² Several studies also identified inequities in PPE distribution, with lower-waged and non-acute care roles being more likely to experience shortages.^{38 43 46 51 62} Guidance around PPE use was often unclear, inconsistent or changed from day to day, producing anxiety in healthcare workers around the proper use of PPE.^{36 42–46 67–69} Some studies also noted problems related to the size and fit of PPE, especially for women and people with facial hair (including people who do not shave for religious reasons).^{46 50 66 67}

When PPE was available, its use presented a barrier to everyday practices of care. Interactions with patients and their families were made more difficult as PPE obscured faces, muffled voices and obstructed body language, thus impacting communication and emotional connection.^{36 46 48 49 51 55 70 71} ‘I think arriving in full PPE, you’re a bit like an alien or a person from a nuclear reactor or something, and I think it’s hard to build a rapport with that’.⁴⁸ Communication with colleagues was also affected by PPE use, especially between newer team members, impacting professional relationships and increasing the risk of miscommunication in care practice.^{36 46 49 63 71} Attempts to bridge these emotional and communication gaps included individually decorating PPE or attaching disposable photos of staff faces to gowns, which also had the practical benefit of allowing patients and colleagues to differentiate between healthcare workers.^{46 63} The literature also described PPE as limiting healthcare workers’ senses (eg, through the fogging of

glasses and face shields) and dexterity, producing challenges with some patient procedures and increasing the risk of healthcare workers missing important health signs in patients.^{40 46 48 55 62 63 67 69} ‘I had to rely on the anatomical location to find the femoral artery because I could not feel the pulsation when performing the arterial blood taken for gas analysis’.⁶⁷ Healthcare workers additionally raised concerns about protocols in emergency situations, where the time taken to don and doff PPE could leave patients waiting longer for vital support.^{46 48 69}

The wearing of PPE took a significant physical and emotional toll on healthcare workers. PPE was described as exhausting, uncomfortable, hot, difficult to breathe in, and produced skin damage such as bruising and dermatitis.^{38 40 42 43 46 61 63 65 67–69 71} ‘Wearing the whole set of PPEs is very uncomfortable. I have difficulty breathing and feel very hot and my heart rate speeds up. We keep on sweating and the clothes are soaked’.⁴⁰ Adhering to infection control protocols (eg, correctly donning and doffing PPE) took a considerable amount of time and impacted how long healthcare workers could spend with patients and their families.^{36 46 68 69} Healthcare workers adopted different techniques to combat this issue. Some participants reported that shifts and processes were reorganised so that care delivery could be clustered, allowing healthcare workers to visit more patients in one go.^{36 68}

However, studies also described healthcare workers skipping breaks, not drinking water or using the toilet, and wearing adult diapers in an effort to avoid donning and doffing (and possibly disposing of) PPE.^{38 43 45 46 67 68}

In addition to PPE shortages, the literature also revealed shortages of other essential material objects of care (as well as the human resources necessary to use them), including ventilators, dialysis machines, isolation and critical care beds, testing equipment, cleaning supplies and body bags.^{38 39 42 47 51 55 57 58} Triage became an important part of the allocation of limited resources; however, this required healthcare workers to make ethical decisions about which patients were in most need of equipment such as ventilators (which sometimes meant adapting guidelines on a case by case basis).^{39 53 55 57} ‘I had to decide if the 88year old grandma on dialysis gets the ventilator or the 44year old [in full code]. And even just the weight that you have to carry if that’s your decision right? That you just condemned this person to die and not this person’.⁵³

Studies described changes to practice and other innovations that enabled healthcare workers to adapt to these resource challenges. Patients on ventilators who would normally receive one-on-one care had nurses working between them, and some patients were put on travel ventilators.³⁹ Staff at one hospital developed ‘grab bags’ of equipment to help with clustered care and created a portable ‘resus trolley’ so that patients did not need to be moved to a dedicated resuscitation area (which also helped limit virus transmission).³⁶ One study even described a healthcare worker’s son using a three-dimensional printer to make face shields and connections

for a dialysis machine.³⁹ Across the literature, however, resource limitations were described as leading to compromised care: ‘Everybody gets a little bit of bad care’.³⁹

In addition to concerns regarding access to necessary material resources for providing care, much of the literature also described uncertainties around the appropriateness of the therapies themselves when it came to the acute care of patients with COVID-19^{40 42 53 55 59 63 65 71}: ‘The fact that a medication wasn’t proven. We didn’t have good data. [...] If you’re going to do something that’s unproven, you should do it within a trial. We could really be doing more harm than good’.⁵³ Studies described an absence of evidence-based treatment for COVID-19 though often did not make clear distinctions between pharmaceutical drugs and other clinical interventions when referring to treatment. Similarly, there was an implied but usually unarticulated distinction between ‘good data’⁵³ and informal knowledge sharing between healthcare professionals. In the absence of ‘proven’ pharmaceutical interventions, some studies reported an increase in supportive care, which often involved higher patient contact and emotional work, and disproportionately impacted nurses (including via increased risk of infection).^{50 70 72 73}

A notable motif throughout the literature was the affecting presence of pandemic death, which came to be known through the materiality of objects of care such as body bags and beds. Many healthcare workers had no experience handling dead bodies prior to the pandemic and this lack of knowledge, along with changes to processes for managing death in the hospital, meant that bodies were often not prepared in accordance with the religious or cultural beliefs of patients.^{37 51 55 71} Several studies described the affects generated through the object of the body bag or the physical preparation of dead bodies in accordance with infection control measures^{40 42 55 63}: ‘When a patient with an infectious disease dies, the body is wrapped in several layers of cloth, packed into two bags, which are sprayed with disinfectant... It is a little hard to accept this form of death’.⁴⁰ One study also described the emotional labour of a participant who spent multiple full shifts transporting bodies from hospital beds to the morgue.³⁸ However, an *absence* of bodies could also enact the presence of death in the hospital; one study described the experience of dealing with a shortage of beds 1 day and arriving at work the next day to see ‘rows of empty beds’.³⁸ Pandemic death thus distinctively emerged in the literature through its material relations with/in the COVID-19 context.

DISCUSSION

This synthesis demonstrates how material objects, spaces, bodies and affects entangle in care environments to facilitate the doing of healthcare. Because the materiality of the healthcare environment shapes care practices, transformations in the environment (both intentional and unanticipated) afford differing care experiences, which

become ‘good’, ‘bad’, ‘compromised’ or ‘good-enough’ care. This accentuates the importance of considering the material environment as critical to shaping the quality and delivery of care, especially in times of emergency and disruption. A systemic approach to care delivery not only sees adaptation as a means of working around the constraints of the material environment but also demands a need for adaptable environments to enable ‘good care’ to be done. There is a tendency to focus on healthcare workers, and their attitudes and practices, as the locus and focus of change, rather than on the material environments which constrain or potentiate the care that healthcare workers provide. Our analysis, which has relevance for healthcare delivery beyond situations of emergency, pushes us towards a more systemic adaptation and change, from attitudes to materials, from individuals to environments.

Materially bounded care environments

The studies examined in this qualitative synthesis were conducted within a range of healthcare delivery settings including hospitals, clinics, hospices, health centres, continuing care facilities, community or field settings, patient homes and other out-of-hospital environments. Across these settings, healthcare was delivered within in-person, virtual and hybrid environments. Though these healthcare delivery contexts were typically defined through architectural (eg, the hospital building) and technological (eg, telephone conferencing) mechanisms, such definitions inadequately encompass the spaces in which healthcare was done. Rather, we find that the boundaries of healthcare environments are neither solid nor fixed, as care extends in relations between and beyond these spaces.

Virtual environments brought healthcare into virtual spaces, but also into the homes of patients and healthcare workers. Virtual care facilitated new and altered ways of travelling with and to patients and produced (sometimes unwanted) intimacies: the healthcare worker was able to ‘enter the homes’ of patients and develop a different kind of proximity to that which takes place in a hospital or clinic, but so too could patients and colleagues enter the homes of healthcare professionals working from home. The latter was conceptualised as an undesirable intimacy, which was not understood as facilitating ‘better’ care. Changes in the care encounter also resulted in new care paths and journeys in ways that were both enabling and produced capacities for harm. A virtual healthcare consult, for example, could improve healthcare access for some patients but produced risks of overlooked symptoms and postponed healthcare procedures, thus resulting in delayed yet intensified healthcare needs.

While our analysis reveals the ways in which the spaces of healthcare have spilled out beyond healthcare settings, it also identifies more localised spaces and encounters as sites of care. Restrictions on visitors and healthcare practices drew attention to sites such as the bedside, which is normatively understood as a place where care happens.

In this context, the bedside is a site of *touch* and *presence*, both of which were conceptualised in the literature as modes of care practice that also facilitated certainty (eg, physical examinations as a way of ‘being sure’ in care decisions). Negotiating the materiality of the healthcare environment thus became a crucial part of adapted care practice in the pandemic context. Barriers to touch and presence, produced via alterations in zoning, PPE, care schedules and modes of communication, simultaneously enabled and constrained ‘good’ and ‘safe’ care. As touch between bodies became ‘risky,’ barriers to touch and presence, such as PPE and zoning, enabled care to be done. However, these adaptations in the care environment generated new risks, as they were also understood as producing ‘compromised’ care. Virtual care environments, communication technologies (eg, whiteboards and radios), hybrid consultations and other material innovations (eg, decorated PPE) produced new proximities between healthcare worker and patient, thus enabling care to be done differently.

Extending relations of care

Our analysis shows that spatial and temporal constraints in healthcare systems are both created by and navigated through adaptive material practices, which produce ‘rippling effects’ beyond the individual care encounter. For example, hospital infection control protocols led to changes in hospital zoning, which revealed constraints in the resourcing of staff, PPE and other equipment. Individual adaptations in response to these constraints included healthcare workers reusing PPE, skipping breaks and spending less time with patients. In contrast, adaptations that attended to the spatial or temporal features of the material environment allowed for differing ways of doing care. Examples included creating schedules to facilitate care clustering, developing hybrid consult systems and implementing the use of objects such as grab bags, trolleys and radios. These adaptations allowed for altered ways of moving and relating within the hospital, in turn producing new care spaces and care journeys.

Our mapping of the extending relations of the COVID-19 care environment allows us to understand the ways through which local care practices—and how these are shaped by the materiality of care environments—are themselves located in, and shaped by, broader health systems and ecologies. We saw this, for instance, in how the rippling effects of virtual care encounters impacted on hospital emergency departments, and how ‘experiential evidence’ from geographically distant COVID-19 ‘hot areas’ was shared through informal virtual networks and tested in local care environments. Our analysis also points to the ways in which healthcare workers mediated their experiences and knowledge of COVID-19 care through engagement with a global pandemic imaginary. For example, a site of emotional trauma in a hospital might be enclosed by the four walls of a ward and tied to a single event, but this trauma became known through its relations with broader temporal and global pandemic

uncertainties. The affects generated in and through the care environment facilitated other forms of knowing as well; (double) body bags, empty beds, social media posts, news media images and practices of infection control in corpse management all enacted a knowing of pandemic death, distinct from other forms of death in healthcare work. These findings highlight how locally materialised affects and experiences of care connect with broader, as well as global, affects and adaptations generated by pandemic.

Implications for future research and practice

A pervasive orientation in the literature is emphasising what is absent, or deficient, in care environments. Our analysis, however, testifies to a responsiveness and ingenuity in how healthcare workers and services have adapted within constraining and disruptive care relations to make care environments work in the face of emergency. In turn, our findings emphasise a need for care environments themselves to be made more adaptable and malleable, such that these adaptive potentials can come together to enable good care in times of uncertainty and change. The insights produced through this synthesis thus explicate how and why we might better attend to the material spaces, objects, practices and affects through which healthcare environments are made (and made differently). This has practical implications for the building of resilient, responsive and enabling care environments. We highlight five implications:

- ▶ While the COVID-19 context calls attention to the consequences of insufficiently flexible healthcare systems, the materiality of care environments is always in the process of adapting what care is made possible. This gives us insights to build on, including for considering how good care is made possible, even in situations of risk and constraint.
- ▶ Interventions for optimising good and better care delivery need to move beyond a focus on individual practices and better attend to the effects of the material environment and how this enables or constrains care.
- ▶ Interventions can capitalise on the fluid boundaries of care environments which extend beyond local spaces and buildings to connect with more distant as well as virtual care experiences.
- ▶ Optimising the material care environment to deliver good care, especially in times of emergency, requires learning from everyday adaptive practices in healthcare experience while making material environments more adaptable.
- ▶ Mapping how the material effects of healthcare ‘ripple out’ beyond individual encounters and beyond particular healthcare environments is an important first step to designing a more systemic and ecological approach to care.

Thus, in addition to synthesising material adaptations in care environments from within the specific context of the early COVID-19 pandemic and demonstrating the

importance of noticing these material adaptations, our analysis models interpretive methods which can be used in future research and appraisal of healthcare systems, during times of emergency and beyond.

Strengths and limitations

The approach we have developed for CIS (adapted from that proposed by Dixon-Woods *et al*³⁰) has produced a versatile yet readily comprehensible method for reviewing complex, diverse and emerging data. We suggest that this method be taken up in the development of future protocols for qualitative review. Given the CIS approach of our review, this paper is not intended as an exhaustive account of the literature. The strengths of CIS lie in its capacity to undertake complex analyses of diverse qualitative data, develop insights that move beyond the goals of the original studies, and generate theory that has applicability to both research and practice. Our purposive sampling strategy facilitates these goals through a highly critical and iterative approach to inclusion. It is possible that relevant literature could be missed within this strategy; however, our more flexible and inclusive approach to literature searching in the earlier phases of sampling also makes it more likely that papers have been captured that would be missed in conventional systematic review methods. The resulting sample may therefore reflect a broader and more diverse range of experiences.

Given the practical orientation of this synthesis, the insights generated through our mapping of the literature offer a starting point for the development of further theoretical work. While the studies included in this synthesis documented material adaptations in the environment, critical analysis of the material effects of these adaptations was in most cases limited. Future research can contribute to new materialist scholarship investigating how care environments are made through their materials and spaces, and the effects of their making in care knowledges and practices,^{20 21 23 25–27 74 75} by extending our interpretive approach to noticing how care environments adapt (are *remade*) in the face of uncertainty and in times of emergency.

There were also some logistical limitations in this synthesis. The global health emergency context of the COVID-19 pandemic resulted in rapid publication of studies across different temporal, geographical and professional contexts in 2020 and 2021. Though the prominent concerns addressed in this synthesis were found across health contexts, more specific and contextual insights may have been missed. While many publishers have expedited COVID-19-focused studies since the beginning of the pandemic, due to the timing of our writing, the studies included in this synthesis were conducted within the first 18 months of the pandemic (with the majority of data collected in the first 6 months of 2020) and employed methods that could be implemented rapidly, often at a distance and without producing unnecessary further burden on already-stressed healthcare systems. This resulted in a lack of longitudinal and ethnographic

methods (though some papers were linked to larger studies that may include data from such methods). This means that the data assembled through this synthesis were generated via context-specific participant interpretations of the care environment, which have been interpolated by the study authors and via our analysis. Additionally, we have exclusively included studies published in English, as this is the only shared language between the authors.

A final limitation of this synthesis relates to the complexity of defining COVID-19 care. Much of the literature did not distinguish between findings related to COVID-19-specific and non-COVID-19 care, and terms such as ‘treatment’, ‘therapies’ and ‘care’ were employed inconsistently in the literature, often without definitions of what these words meant in practice. Many studies implicitly established distinctions between curative medical treatment and symptom management, with the latter framed as care done in the absence of, or while waiting for, ‘effective’ treatment options. Such a framing presents several issues. First, it delimits the efficacy of supportive care *as care*, and obscures relations between symptom monitoring or management and health outcomes. Second, it sits at odds with descriptions of informal knowledge sharing networks, which themselves enact an efficacy in their shared care practices, however limited, incomplete or uncertain. Put another way, framing symptom management practices against *lacking* or *unknown* care practices de-emphasises what care *is already being done* in these contexts. Finally, reinforcing distinctions between types of care may not make sense in the provision of care but instead may reveal an artificial separation in clinical practice.

CONCLUSIONS

This paper is the first to synthesise qualitative research investigating healthcare workers’ experiences during the COVID-19 pandemic with an aim to explicate how the materiality of the healthcare environment shapes care delivery. The findings of this paper demonstrate how the healthcare environment can enable and constrain good care and how changes in this environment produce complex and rippling health effects. The insights generated through this synthesis are valuable in supporting healthcare workers, managers and organisations in developing enabling care environments and adapting care practices through an attention to the materiality of the environment itself.

Acknowledgements The Centre for Social Research in Health at the University of New South Wales (UNSW) is supported by a grant from the Australian Government Department of Health. We are grateful for support from the UNSW Scientia (Associate Professor Kari Lancaster) and SHARP (Professor Tim Rhodes) schemes.

Contributors MH conceptualised and designed the review in consultation with TR and KL; conducted the literature search, screening, full-text review and data collection; identified emerging themes; was responsible for data analysis, which was refined through discussion with TR and KL; and drafted the manuscript. TR and KL contributed to the further development of themes and a synthesising argument was generated through discussion among all authors. All authors critically revised

the manuscript and approved the final version. MH is responsible for the overall content as guarantor.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, conduct, reporting or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as supplementary information.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID ID

Mia Harrison <http://orcid.org/0000-0001-8629-9901>

REFERENCES

- Vindrola-Padros C, Andrews L, Dowrick A, *et al*. Perceptions and experiences of healthcare workers during the COVID-19 pandemic in the UK. *BMJ Open* 2020;10:e040503.
- Jayasekara JHPRU, Siriwardana CSA, Amaratunga D. Redesigning and Repurposing Healthcare Facilities for the New Normal, COVID-19: A Review on New Approaches in Hospital Systems. In: Dissanayake R, Mendis P, Weerasekera K, eds. *ICSBE 2020*. Singapore: Springer, 2022: Vol. 174. 211–34.
- Barach P, Fisher SD, Adams MJ, *et al*. Disruption of healthcare: will the COVID pandemic worsen non-COVID outcomes and disease outbreaks? *Prog Pediatr Cardiol* 2020;59:101254.
- Langran C, Mantzourani E, Hughes L, *et al*. "I'm at breaking point"; Exploring pharmacists' resilience, coping and burnout during the COVID-19 pandemic. *Explor Res Clin Soc Pharm* 2022;5:100104.
- Sheraton M, Deo N, Dutt T, *et al*. Psychological effects of the COVID 19 pandemic on healthcare workers globally: a systematic review. *Psychiatry Res* 2020;292:113360.
- Koontalay A, Suksatan W, Prabsangob K, *et al*. Healthcare workers' burdens during the COVID-19 pandemic: a qualitative systematic review. *J Multidiscip Healthc* 2021;14:3015–25.
- Joo JY, Liu MF. Nurses' barriers to caring for patients with COVID-19: a qualitative systematic review. *Int Nurs Rev* 2021;68:202–13.
- Whear R, Abbott RA, Bethel A, *et al*. Impact of COVID-19 and other infectious conditions requiring isolation on the provision of and adaptations to fundamental nursing care in hospital in terms of overall patient experience, care quality, functional ability, and treatment outcomes: systematic review. *J Adv Nurs* 2022;78:78–108.
- Danesh MK, Garosi E, Golmohamadpour H. The COVID-19 pandemic and nursing challenges: a review of the early literature. *Work* 2021;69:23–36.
- Turner S, Botero-Tovar N, Herrera MA, *et al*. Systematic review of experiences and perceptions of key actors and organisations at multiple levels within health systems internationally in responding to COVID-19. *Implement Sci* 2021;16:50.
- Xu H, Stjernswärd S, Glasdam S. Psychosocial experiences of frontline nurses working in hospital-based settings during the COVID-19 pandemic - A qualitative systematic review. *Int J Nurs Stud Adv* 2021;3:100037.
- Aydogdu ALF. Ethical dilemmas experienced by nurses while caring for patients during the COVID-19 pandemic: an integrative review of qualitative studies. *J Nurs Manag* 2022. doi:10.1111/jonm.13585. [Epub ahead of print: 10 Mar 2022].
- Billings J, Ching BCF, Gkofa V, *et al*. Experiences of frontline healthcare workers and their views about support during COVID-19 and previous pandemics: a systematic review and qualitative meta-synthesis. *BMC Health Serv Res* 2021;21:923.
- Glasdam S, Sandberg H, Stjernswärd S, *et al*. Nurses' use of social media during the COVID-19 pandemic-A scoping review. *PLoS One* 2022;17:e0263502.
- Huerta-González S, Selva-Medrano D, López-Espuela F, *et al*. The psychological impact of COVID-19 on front line nurses: a synthesis of qualitative evidence. *Int J Environ Res Public Health* 2021;18:12975.
- Riedel P-L, Kreh A, Kulcar V, *et al*. A scoping review of moral stressors, moral distress and moral injury in healthcare workers during COVID-19. *Int J Environ Res Public Health* 2022;19:1666.
- Troglio da Silva FC, Neto MLR. Psychiatric disorders in health professionals during the COVID-19 pandemic: a systematic review with meta-analysis. *J Psychiatry Res* 2021;140:474–87.
- Vera San Juan N, Clark SE, Camilleri M, *et al*. Training and redeployment of healthcare workers to intensive care units (ICUs) during the COVID-19 pandemic: a systematic review. *BMJ Open* 2022;12:e050038.
- Sigahi TFAC, Kawasaki BC, Bolis I, *et al*. A systematic review on the impacts of Covid-19 on work: contributions and a path forward from the perspectives of ergonomics and psychodynamics of work. *Hum Factors Ergon Manuf* 2021;31:375–88. doi:10.1002/hfm.20889
- Buse C, Martin D, Nettleton S. Conceptualising 'materialities of care': making visible mundane material culture in health and social care contexts. *Sociol Health Illn* 2018;40:243–55.
- Latimer J. Afterword: materialities, care, 'ordinary affects', power and politics. *Sociol Health Illn* 2018;40:379–91.
- Puig de la Bellacasa M. *Matters of care: Speculative ethics in more than human worlds*. Minneapolis (MN): U of Minnesota Press, 2017.
- Broom A, Doron A. Resistant bugs, porous borders and ecologies of care in India. *Soc Sci Med* 2022;292:114520.
- Fox NJ, Alldred P. *Sociology and the new materialism: theory, research, action*. London (GB): SAGE Publications, 2016.
- Martin D, Nettleton S, Buse C, *et al*. Architecture and health care: a place for sociology. *Sociol Health Illn* 2015;37:1007–22.
- Brown N, Buse C, Lewis A, *et al*. Air care: an 'aerography' of breath, buildings and bugs in the cystic fibrosis clinic. *Sociol Health Illn* 2020;42:972–86.
- Pink S, Duque M, Sumartojo S, *et al*. Making spaces for staff breaks: a design anthropology approach. *HERD* 2020;13:243–55.
- Duff C. Exploring the role of 'enabling places' in promoting recovery from mental illness: a qualitative test of a relational model. *Health Place* 2012;18:1388–95.
- Fox NJ, Powell K. Non-Human matter, health disparities and a thousand tiny dis/advantages. *Sociol Health Illn* 2021;43:779–795. doi:10.1111/1467-9566.13265
- Dixon-Woods M, Cavers D, Agarwal S, *et al*. Conducting a critical interpretive synthesis of the literature on access to healthcare by vulnerable groups. *BMC Med Res Methodol* 2006;6:35.
- Booth A, Energies H. Harnessing energies, resolving tensions: Acknowledging a dual heritage for qualitative evidence synthesis. *Qual Health Res* 2019;29:18–31.
- Booth A, Carroll C, Iltis I, *et al*. Desperately seeking dissonance: identifying the disconfirming case in qualitative evidence synthesis. *Qual Health Res* 2013;23:126–41.
- Barnett-Page E, Thomas J. Methods for the synthesis of qualitative research: a critical review. *BMC Med Res Methodol* 2009;9:59.
- Greenhalgh T, Peacock R. Effectiveness and efficiency of search methods in systematic reviews of complex evidence: audit of primary sources. *BMJ* 2005;331:1064–5.
- Thomas J, Harden A. Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Med Res Methodol* 2008;8:45.
- Conlon C, McDonnell T, Barrett M, *et al*. The impact of the COVID-19 pandemic on child health and the provision of care in paediatric emergency departments: a qualitative study of frontline emergency care staff. *BMC Health Serv Res* 2021;21:279.
- Al Ghafri T, Al Ajmi F, Anwar H, *et al*. The experiences and perceptions of health-care workers during the COVID-19 pandemic in Muscat, Oman: a qualitative study. *J Prim Care Community Health* 2020;11:2150132720967514.
- Blake H, Gupta A, Javed M, *et al*. COVID-Well study: qualitative evaluation of supported wellbeing centres and psychological first aid for healthcare workers during the COVID-19 pandemic. *Int J Environ Res Public Health* 2021;18:3626.
- Butler CR, Wong SPY, Wightman AG, *et al*. US clinicians' experiences and perspectives on resource limitation and patient care during the COVID-19 pandemic. *JAMA Netw Open* 2020;3:e2027315.
- Liu Q, Luo D, Haase JE, *et al*. The experiences of health-care providers during the COVID-19 crisis in China: a qualitative study. *Lancet Glob Health* 2020;8:e790–8.
- Palacios-Ceña D, Fernández-de-Las-Peñas C, Palacios-Ceña M, *et al*. Working on the Frontlines of the COVID-19 pandemic: a

- qualitative study of physical therapists' experience in Spain. *Phys Ther* 2021;101:pzab025. doi:10.1093/ptj/pzab025
- 42 Arnetz JE, Goetz CM, Arnetz BB, *et al.* Nurse reports of stressful situations during the COVID-19 pandemic: qualitative analysis of survey responses. *Int J Environ Res Public Health* 2020;17:8126.
- 43 Digby R, Winton-Brown T, Finlayson F, *et al.* Hospital staff well-being during the first wave of COVID-19: staff perspectives. *Int J Ment Health Nurs* 2021;30:440–50.
- 44 Newman KL, Jevé Y, Majumder P. Experiences and emotional strain of NHS frontline workers during the peak of the COVID-19 pandemic. *Int J Soc Psychiatry* 2022;68:783–90. doi:10.1177/00207640211006153
- 45 Baldwin S, George J. Qualitative study of UK health professionals' experiences of working at the point of care during the COVID-19 pandemic. *BMJ Open* 2021;11:e054377. doi:10.1136/bmjopen-2021-054377
- 46 Hoernke K, Djellouli N, Andrews L, *et al.* Frontline healthcare workers' experiences with personal protective equipment during the COVID-19 pandemic in the UK: a rapid qualitative appraisal. *BMJ Open* 2021;11:e046199.
- 47 Parsons Leigh J, Kemp LG, de Grood C, *et al.* A qualitative study of physician perceptions and experiences of caring for critically ill patients in the context of resource strain during the first wave of the COVID-19 pandemic. *BMC Health Serv Res* 2021;21:374.
- 48 Liberati E, Richards N, Willars J, *et al.* A qualitative study of experiences of NHS mental healthcare workers during the Covid-19 pandemic. *BMC Psychiatry* 2021;21:250.
- 49 Hayirli TC, Stark N, Bhanja A, *et al.* Masked and distanced: a qualitative study of how personal protective equipment and distancing affect teamwork in emergency care. *Int J Qual Health Care* 2021;33:mzab069. doi:10.1093/intqhc/mzab069
- 50 Saleem J, Ishaq M, Zakar R, *et al.* Experiences of frontline Pakistani migrant physicians combating COVID-19 in the United Kingdom: a qualitative phenomenological analysis. *BMC Health Serv Res* 2021;21:291.
- 51 Chandler-Jeanville S, Nohra RG, Loizeau V, *et al.* Perceptions and experiences of the COVID-19 pandemic amongst frontline nurses and their relatives in France in six paradoxes: a qualitative study. *Int J Environ Res Public Health* 2021;18:6977.
- 52 Deliktas Demirci A, Oruc M, Kabukcuoglu K. 'It was difficult, but our struggle to touch lives gave us strength': the experience of nurses working on COVID-19 wards. *J Clin Nurs* 2021;30:732–41.
- 53 Rao H, Mancini D, Tong A, *et al.* Frontline interdisciplinary clinician perspectives on caring for patients with COVID-19: a qualitative study. *BMJ Open* 2021;11:e048712.
- 54 Williams Veazey L, Broom A, Kenny K, *et al.* Entanglements of affect, space, and evidence in pandemic healthcare: an analysis of Australian healthcare workers' experiences of COVID-19. *Health Place* 2021;72:102693.
- 55 Testoni I, Franco C, Gallo Stampino E, *et al.* Facing COVID-19 between sensory and Psychoemotional stress, and instrumental deprivation: a qualitative study of unmanageable critical incidents with doctors and nurses in two hospitals in northern Italy. *Front Psychol* 2021;12:1–13.
- 56 Pastrana T, De Lima L, Pettus K, *et al.* The impact of COVID-19 on palliative care workers across the world: a qualitative analysis of responses to open-ended questions. *Palliat Support Care* 2021;19:1–6.
- 57 Banerjee D, Vajawat B, Varshney P, *et al.* Perceptions, experiences, and challenges of physicians involved in dementia care during the COVID-19 Lockdown in India: a qualitative study. *Front Psychiatry* 2020;11:615758.
- 58 Kurotschka PK, Serafini A, Demontis M, *et al.* General practitioners' experiences during the first phase of the COVID-19 pandemic in Italy: a critical incident technique study. *Front Public Health* 2021;9:623904.
- 59 Yip Y-C, Yip K-H, Tsui W-K. The transformational experience of junior nurses resulting from providing care to COVID-19 patients: from facing hurdles to achieving psychological growth. *Int J Environ Res Public Health* 2021;18:7383.
- 60 Ross AM, Schneider S, Muneton-Castano YF, *et al.* "You never stop being a social worker." Experiences of pediatric hospital social workers during the acute phase of the COVID-19 pandemic. *Soc Work Health Care* 2021;60:8–29.
- 61 Aughterson H, McKinlay AR, Fancourt D, *et al.* Psychosocial impact on frontline health and social care professionals in the UK during the COVID-19 pandemic: a qualitative interview study. *BMJ Open* 2021;11:e047353.
- 62 Cheong MWL. "To be or not to be in the ward": The impact of COVID-19 on the role of hospital-based clinical pharmacists-A qualitative study. *J Am Coll Clin Pharm* 2020;3:1458–63.
- 63 Montgomery CM, Humphreys S, McCulloch C, *et al.* Critical care work during COVID-19: a qualitative study of staff experiences in the UK. *BMJ Open* 2021;11:e048124.
- 64 Billings J, Biggs C, Ching BCF, *et al.* Experiences of mental health professionals supporting front-line health and social care workers during COVID-19: qualitative study. *BJPsych Open* 2021;7:e70.
- 65 Norful AA, Rosenfeld A, Schroeder K, *et al.* Primary drivers and psychological manifestations of stress in frontline healthcare workforce during the initial COVID-19 outbreak in the United States. *Gen Hosp Psychiatry* 2021;69:20–6.
- 66 Rees N, Smythe L, Hogan C, *et al.* Paramedic experiences of providing care in Wales (UK) during the 2020 COVID-19 pandemic (PECC-19): a qualitative study using evolved grounded theory. *BMJ Open* 2021;11:e048677.
- 67 Chen F, Zang Y, Liu Y, *et al.* Dispatched nurses' experience of wearing full GEAR personal protective equipment to care for COVID-19 patients in China-A descriptive qualitative study. *J Clin Nurs* 2021;30:2001–14.
- 68 Crowe S, Howard AF, Vanderspank-Wright B, *et al.* The effect of COVID-19 pandemic on the mental health of Canadian critical care nurses providing patient care during the early phase pandemic: a mixed method study. *Intensive Crit Care Nurs* 2021;63:102999.
- 69 Ness MM, Saylor J, Di Fusco LA, *et al.* Healthcare providers' challenges during the coronavirus disease (COVID-19) pandemic: a qualitative approach. *Nurs Health Sci* 2021;23:389–97.
- 70 Fernández-Castillo R-J, González-Caro M-D, Fernández-García E, *et al.* Intensive care nurses' experiences during the COVID-19 pandemic: a qualitative study. *Nurs Crit Care* 2021;26:397–406. doi:10.1111/nicc.12589
- 71 Galehdar N, Kamran A, Toulabi T, *et al.* Exploring nurses' experiences of psychological distress during care of patients with COVID-19: a qualitative study. *BMC Psychiatry* 2020;20:489.
- 72 Sheng Q, Zhang X, Wang X, *et al.* The influence of experiences of involvement in the COVID-19 rescue task on the professional identity among Chinese nurses: a qualitative study. *J Nurs Manag* 2020;28:1662–9.
- 73 Jia Y, Chen O, Xiao Z, *et al.* Nurses' ethical challenges caring for people with COVID-19: a qualitative study. *Nurs Ethics* 2021;28:33–45.
- 74 Hooker C, Hor S, Wyer M, *et al.* Trajectories of hospital infection control: using non-representational theory to understand and improve infection prevention and control. *Soc Sci Med* 2020;256:113023.
- 75 Pink S, Morgan J, Dainty A. The safe hand: gels, water, gloves and the materiality of tactile knowing. *J Mater Cult* 2014;19:425–42. doi:10.1177/1359183514555053