PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (**http://bmjopen.bmj.com/site/about/resources/checklist.pdf**) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Learning from healthcare workers' experiences with personal protective equipment during the COVID-19 pandemic in Aotearoa/New Zealand: a thematic analysis and framework for future practice
AUTHORS	Wild, Cervantée; Wells, Hailey; Coetzee, Nicolene; Grant, Cameron; Sullivan, Trudy; Derraik, José; Anderson, Yvonne

VERSION 1 – REVIEW

REVIEWER	Lound, Adam Imperial College London
REVIEW RETURNED	21-Mar-2022

GENERAL COMMENTS	Thank you for asking me to review this timely and informative paper exploring healthcare workers experiences with PPE during the first wave of Covid-19. The paper sets out clear aims and provides rationale for its methods. The findings are in-depth and the strengths-based framework will enable this study to have an impact on clinical practice in New Zealand.

REVIEWER	Sun, Chenyu AMITA Health Saint Joseph Hospital Chicago
REVIEW RETURNED	27-Mar-2022

GENERAL COMMENTS	This is a well-written manuscript. However, minor revisions are needed. The authors investigated the PPE experience from healthcare workers but did not introduce or discuss enough some of the evidence that such PPEs are helpful. For example, wearing masks are very helpful. And there are several meta-analyses about its effectiveness are highly cited. I suggest the authors to read these meta-analyses and discuss them. The following are examples of such meta-analyses . Li Y, Liang M, Gao L, et al. Face masks to prevent transmission of COVID-19: A systematic review and meta-analysis. Am J Infect Control. 2021;49(7):900-906. doi:10.1016/j.ajic.2020.12.007 Liang M, Gao L, Cheng C, et al. Efficacy of face mask in preventing respiratory virus transmission: A systematic review and meta-analysis. Travel Med Infect Dis. 2020;36:101751. doi:10.1016/j.tmaid.2020.101751

REVIEWER	Driessen, Annelieke

	University of Oxford, Nuffield Department of Primary Care Health Sciences
REVIEW RETURNED	22-Jul-2022

GENERAL COMMENTS	This is a clear and comprehensive paper. It outlines four interactive values the authors identified in healthcare workers' experiences with (communications around the availability/scarcity/distribution/acquisition of) personal equipment during the Covid19 pandemic in Aotearoa/New Zealand. In doing so, the paper highlights important issues in this communication, and provides material that can help researchers and leaders reflect on how to improve communications around PPE and its supply and distribution. I have outlined a few suggestions for revision that I think can help strengthen the argument (see attachment).

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1
Mr. Adam Lound, Imperial College London

Comments to the Author:

Thank you for asking me to review this timely and informative paper exploring healthcare workers experiences with PPE during the first wave of Covid-19. The paper sets out clear aims and provides rationale for its methods. The findings are in-depth and the strengths-based framework will enable this study to have an impact on clinical practice in New Zealand.
Response: We thank the reviewer for their feedback.

Reviewer: 2
Dr. Chenyu Sun, AMITA Health Saint Joseph Hospital Chicago

Comments to the Author:

This is a well-written manuscript. However, minor revisions are needed.
The authors investigated the PPE experience from healthcare workers but did not introduce or discuss enough some of the evidence that such PPEs are helpful.
For example, wearing masks are very helpful. And there are several meta-analyses about its effectiveness are highly cited. I suggest the authors to read these meta-analyses and discuss them. The following are examples of such meta-analyses
.
Li Y, Liang M, Gao L, et al. Face masks to prevent transmission of COVID-19: A systematic review and meta-analysis. Am J Infect Control. 2021;49(7):900-906. doi:10.1016/j.ajic.2020.12.007

Liang M, Gao L, Cheng C, et al. Efficacy of face mask in preventing respiratory virus transmission: A systematic review and meta-analysis. Travel Med Infect Dis. 2020;36:101751. PubMed doi:10.1016/j.tmaid.2020.101751

Response: We thank the reviewer for their feedback and suggestions, which we believe have improved the quality of this manuscript. We have included these references as suggested and

have included brief information about the effectiveness of PPE in the introduction. The first paragraph of the introduction now states:
The COVID-19 pandemic has placed a considerable amount of additional pressure on health systems worldwide. In Aotearoa/New Zealand (NZ), the first confirmed COVID-19 case was on 28th February 2020.[1] The country subsequently moved into a stringent[2] lockdown on 25th March with all non-essential businesses closed and workers staying home.[3] This approach resulted in the health system being able to manage the relatively limited number of cases; however, as in other countries, healthcare workers expressed concern that they did not have access to adequate personal protective equipment (PPE) to carry out their work safely.[4] Medical PPE is used to minimise risks to health and safety to healthcare workers, and has previously been shown to be an effective form of infection prevention and control.[5 6] In NZ, concerns about PPE access were reviewed in a report undertaken by the Office of the Auditor-General (OAG) into the way PPE was managed in NZ during the initial outbreak (surge one, from 28/02/2020-08/06/2020[7]). Poor pandemic planning, mismanagement of PPE distribution, and poor communication exacerbated existing complexity issues in the NZ health system.[8] PPE procurement in NZ has previously been the domain of the twenty individual district health boards (DHBs); however, the Ministry of Health has essentially centralised PPE supply following the OAG report.

Reviewer: 3
Dr. Annelieke Driessen, University of Oxford, London School of Hygiene & Tropical Medicine

Comments to the Author:
General comments
This is a clear and comprehensive paper. It outlines four interactive values the authors identified in healthcare workers' experiences with (communications around the availability/scarcity/distribution/acquisition of) personal equipment during the Covid19 pandemic in Aotearoa/New Zealand. In doing so, the paper highlights important issues in this communication, and provides material that can help researchers and leaders reflect on how to improve communications around PPE and its supply and distribution. I have outlined a few suggestions for revision that I think can help strengthen the argument below:
Response: Thank you for your thoughtful comments and suggestions, which have improved the quality of this manuscript.

Abstract
Design: For a discussion of "prominent issues related to health care workers' experiences" I would expect a more detailed, situated account of circumstances, actors, point of views and tensions. I wonder if a tighter framing about 'values' rather than 'issues' might help to give a better summary of what findings the authors present.
Response: Thank you for highlighting this. We have tightened this framing to focus on 'values' rather than the broad term 'issues'.

Conclusions: The argument that "healthcare workers experiences with PPE access have been likened to 'the canary in the coalmine' for existing health system challenges" is repeated in various places but is not worked out clearly in the main body of the text. Can the authors elaborate in the main text which health system challenges they refer to and how these can be better tackled now that we know healthcare workers' experiences? This need not be long, but can for instance be done by adding one or two brief examples.
Response: Thank you for this suggestion. We agree that this needed to be made clearer and have reworked and amended an existing discussion paragraph that we feel had alluded to these challenges, but had not made them explicit. This paragraph now states:

For many healthcare workers, it appears that communication relating to PPE and its supply represented 'the canary in the coalmine' for wider healthcare system challenges. These difficulties surrounding PPE supply and access have occurred against the backdrop of calls for healthcare reform, among a workforce already under stress, burnt out, under-resourced, and facing increasing workplace demands.[14] As a result, the strain and complexity of urgently managing PPE logistics and supply at the commencement were unsurprising. Many of the reported findings relate to wider health systems issues identified in the Health and Disability System Review, and the need to support the workforce to keep New Zealanders well.[14] Reports of bullying and toxic workplace culture have been highlighted within district health boards across NZ prior to the pandemic, and respondents reflected that some of these issues have not been resolved despite some regional health boards working towards addressing them with anti-bullying programmes.[22-25] These challenges appear to have been both illuminated and exacerbated by the pandemic and its associated PPE access and supply issues; the 'Nurture' framework provides several recommendations for change, such as a commitment towards appropriate occupational health and safety standards for all healthcare workers, and inclusion of healthcare workers in decision-making processes with clinical representation at organisational governance level.

Introduction
Clearly written and supported by relevant literature. If this is possible with the survey data, it would be helpful to know how PPE was defined/what kind of PPE is referred to (masks or other equipment too, what kind of masks?). Reference no 7 is a Uk reference, but this is not clear in the text. Were there similar headlines in NZ? If so, the reference can best be adapted, or state more general reach in-text.
Response: Thank you for these suggestions. We have now included our definition of PPE in the methods section, which now states:
In the survey, respondents were asked about their experience of PPE use and their demographic characteristics including age, gender, occupation, region, and place of work. Survey questions included closed and open-text questions (extension, expansion and general open-text questions)[16] about respondents' experiences. PPE was described as equipment 'worn by a person to minimise risks to health and safety. PPE includes masks, eye protection, gloves, gowns, and in the event of aerosol-generating procedures, N95-type filtering face-piece respirators (FFRs)'. Ethnicity data were collected according to NZ Ministry of Health Ethnicity Data protocols, with participants able to select multiple ethnicities.[18] The survey was constructed using Qualtrics software (Qualtrics, Provo, UT, USA) and beta-tested. All respondents provided informed consent electronically, as otherwise they were unable to proceed to the survey.

In the introduction, we have included an additional reference from media reports in New Zealand.

Methods
The methods have been described in detail and seem to be thorough, and I have no comments on this section.
Response: Thank you for this feedback.

Findings
The finding section is interesting and well-structured.
Respondents' positions and analysis
When participants of the survey are listed, it would be helpful to learn more about what kind of healthcare workers took part in the survey (nurses, doctors, physiotherapists) and the sector they worked in at the time of the first COVID surge in NZ (care home sector/hospital/community?).

Please clarify why it is relevant that respondents themselves had contracted Covid19, or remove to avoid confusion.

Response: Covid infection status was originally included as part of the quantitative analysis; we have since removed it from this manuscript to avoid confusion as suggested.

If at all possible within the word count, could relevant characteristics for each individual quoted be listed so as to enable the reader to relate the respondents' concerns to their positionality? These characteristics could then be picked up in the text, which would allow for analysis of e.g. whether the ethnicity, role and/or sector of a particular respondent mattered for the values they put forth, and how respondents felt these were met or not (I am thinking in particular about discussions we've had in the UK around whether racism/inequalities was at play in who did and did not receive PPE early on in the pandemic, see for instance Norton et al "Personal protective equipment and infection prevention and control: a national survey of UK medical students and interim foundation doctors during the COVID-19 pandemic" https://academic.oup.com/jpubhealth/article/43/1/67/5923798 or the BBC documentary "Why is Covid Killing people of Colour", https://www.bbc.co.uk/programmes/m000sv1d). Or whether the role/where people worked and whether/how this mattered for what values were deemed more important/when and where they felt more or less supported.
Response: Thank you for these suggestions. We have added participant characteristics to each quotation, so that each indicates their role, gender, age, and ethnicity.
While we feel that an in-depth analysis of the differences between primary and secondary care was beyond the scope of the paper, there were some differences apparent between professions and areas of care (especially under 'Safety'). We have acknowledged this in the Discussion session and have suggested this as an area for future analysis. This now states:
Our study highlights widespread concerns regarding PPE supply, also reported by healthcare workers elsewhere. A recent study of PPE experiences in the United Kingdom identified concern among healthcare workers when official guidance appeared to downgrade the level of PPE required in certain areas,[12] especially as this appeared to be governed by supply issues rather than level of risk. In NZ, the OAG report noted that there was public confusion about "who should have access to PPE and in what circumstances", and concern from healthcare workers that current guidelines were insufficient for preventing transmission among them.[8] Our survey supports this finding and demonstrates there was concern from some respondents for whom certain types of PPE were deemed unnecessary, and further in-depth exploration of the differences in experiences between primary and secondary care may be warranted. Additionally, it was clear that the vagaries as to which professions and areas of care are supplied from central MOH and/or regional DHB stocks, coupled with the perceived disparities between different professions, added to distress levels. The Ministry of Health have updated its communications regarding this to improve clarity.[26]

We were also interested in considering disparities across the dataset, particularly across ethnicity, though our analysis did not identify considerable differences between participant responses. Our previously published quantitative work also did not find such disparities, although this could have been limited by the number of non-New Zealand European participants. We have included discussion of this in the limitations section. This now states:
Limitations of this study include that not all the qualitative survey data were rich or nuanced; there were thin responses across the dataset. However, this was mitigated, at least in part, by our large sample size, which included a large number of respondents across NZ. The collection of open-text comments,[16] alongside questions that were narrower in scope, was also a strength as it enabled capture of important information and prioritisation of healthcare workers' voices. This enabled the research team to make use of a large, rich qualitative dataset to complement the quantitative data previously analysed.[15] In this analysis, we were unable to identify considerable differences across ethnicity between participant experiences. While this may speak to the apparent universalism of these values which characterised participant experiences, we acknowledge the reasonably low numbers of Māori participants which may have affected our analysis. The transferability of the findings to

countries with higher rates of COVID-19 than NZ is uncertain; however, we contend that these four values would be relevant to healthcare contexts worldwide.

Discussion
The discussion brings the findings together in a convincing manner. As I suggested above, elaborating on how these experiences of being 'the canary in the coal mine' could serve to illuminate wider health system challenges could help strengthen the argument.
Response: Thank you for this feedback. We have elaborated on this argument as suggested above.

I would be interested in tensions within and between the four values explored e.g. How does 'feeling unsafe' link to logics of exposure/rationing PPE (see for instance Graaf, Bal and Bal 2021 https://www.tandfonline.com/doi/pdf/10.1080/13698575.2021.1910210 in which a hospital struggled to align/balance risk assessments with experiences of staff)? Are there examples where transparency is in tension with trust (in other words, if there is trust, would there be such a need for transparency)? Considerations like these could add to the considerations for communication around PPE, possibly other health system challenges.
Response: We thank the reviewer for encouraging us to examine these tensions. We have briefly elaborated on where there were tensions, which, as suggested, were between transparency and trust. This was particularly in regards to knowledge of PPE stock levels, where a small number of participants did not believe information about stock level information was necessary, presenting a challenge for practice recommendations in this area. We have touched on this in the Results section, which now states:
Transparency: "Just be honest, upfront and consistent." (#782 – Midwife, female, 55-64 years, NZ European)
Open and clear communication and honesty around decision-making are critical for fostering a team culture within healthcare organisations. For most respondents, honesty about stock levels and plans to manage potential shortages was preferable to unfounded reassurances:
"Instead of a manager running around removing your PPE and locking it away, it would have been better to explain why there was a necessity to ration it out." – #728 (Laboratory technician, female, 55-64 years, NZ European)
"Communicate, and just not the decisions but the rationale that led to the decisions." – #1161 (Nurse, female, 55-64 years, NZ European)
However, a small portion of participants disagreed, reporting that communication of stock level information would create anxiety, and that staff should trust that they had enough to keep them safe:
"I trust there will be enough. Best avoid creating anxiety." – #1570 (General practitioner, female, 55-64 years, NZ European)
Nevertheless, transparency was considered essential to understanding decision-making rationale, allaying staff concerns and preventing rumours:
"… the hospital propaganda machine has proven it cannot be trusted to give honest information to staff around supply of PPE." – #922 (Anaesthetic technician, male, 45-54 years, Māori)

I look forward to reading the paper in a new iteration/in published form.

VERSION 2 – REVIEW

REVIEWER	Driessen, Annelieke University of Oxford, Nuffield Department of Primary Care Health Sciences
REVIEW RETURNED	10-Aug-2022

GENERAL COMMENTS	The authors have made changes in response to all comments. I am satisfied with the changes and additions, and recommend the article for publication.