

Attitudes towards the mixing of COVID-19 vaccinated and unvaccinated patients in multi-bed hospital rooms

Sylvi Low, Sonya Aum, Luke Nie, Jacob Ward, Khanh Nguyen, Leilani Pereira, Jenny Mi, Jocelyn Soti, Ben Harford, Robert J Hancox, John D Dockerty

ABSTRACT

AIM: To explore patient and staff views about the mixing of COVID-19 vaccinated and unvaccinated patients in multi-bed hospital rooms.

METHODS: We conducted a mixed methods study with paper surveys and structured interviews. Self-administered surveys were undertaken with inpatients on the general medicine, general surgery, orthopaedic and respiratory wards in Dunedin Public Hospital. Face-to-face interviews were conducted with ward staff including consultants, registrars, charge nurses, registered nurses and nurse managers. The study was undertaken in February 2022, at the start of the first New Zealand wave of the Omicron variant.

RESULTS: Of 118 eligible patients, 63 agreed to participate. Sixty (95%) of these patients were vaccinated for COVID-19. Most patients (59%) thought that vaccinated and unvaccinated people should be accommodated in separate hospital rooms. Vaccinated patients felt more comfortable sharing a multi-bed room with others of the same COVID-19 vaccination status as themselves than with unvaccinated patients. Participants who thought that they were at higher risk of severe illness from COVID-19 were more likely to support separation of patients based on vaccination status. Fifteen ward staff were interviewed: most would prefer the hospital to separate patients by vaccination status but were aware this would present practical and ethical problems and thought that current arrangements were adequate.

CONCLUSION: While most vaccinated patients and staff wanted patients to be separated according to their COVID-19 vaccination status, the current precautionary measures for COVID-19 were viewed by most staff members as adequate.

COVID-19 vaccination is the most effective method of providing high protection against severe illness, hospitalisation and death from SARS-CoV2. Despite this, the issue of vaccination has been divisive.¹⁻³ By February 2022, it was mandatory for people working in New Zealand's health and disability sector to be fully vaccinated (two doses of the vaccine) as they were at high risk of being infected with COVID-19 and of passing it to vulnerable people.⁴ Based on the expectation that vaccination would reduce the risk of transmitting infection, most businesses, except for hospitals and other essential services, required adults to show a "vaccine pass" before they could enter to prove they'd been vaccinated to minimise the spread of COVID-19 in the community.⁵

Most New Zealand hospitals, including Dunedin Public Hospital, have multi-bed rooms, which are likely to be shared by both vaccinated and unvaccinated patients. Inpatients do not have the right to know other patients' vaccination status or whether they have a transmissible disease, and

they are not usually given a choice over who they share a room with. Since patients spend most of the day in the same room, the risk of transmission from an unsuspected COVID-19 infection may be substantial.⁶ Previous reports describe a 21–39% risk of transmission to hospital roommates when one of the occupants has COVID-19. These studies suggest using vaccination status to determine bed or room placement, however, the population vaccination rates in these studies were unknown.^{6,7}

Many hospital patients have a high risk of severe illness from COVID-19 due to underlying chronic conditions, immunosuppression, or simply because of older age and frailty.⁸ It is important to assess and manage patients' feelings and expectations about sharing hospital rooms, as failure to address potential concerns can cause anxiety or result in them being reluctant to attend hospital. This study was conducted in February 2022 at the beginning of the first Omicron wave in New Zealand when community case numbers were increasing rapidly across the country (from 202

on 8 February 2022 to 1,160 on 16 February 2022). We aimed to provide a snapshot of patients' and healthcare professionals' views on the mixing of vaccinated and unvaccinated patients in multi-bed hospital rooms. It is hoped that the information will inform policies for future phases of this and other pandemics.

Methods

Community setting and hospital policies at the time of the study

New Zealand adopted an elimination approach during the first wave of COVID-19 in February 2020. Suppressive strategies such as travel restrictions, mandatory self-isolations for those arriving from overseas, bans on public gathering, border closures and national lockdown resulted in substantial reduction in daily cases, and ultimately in elimination of COVID-19 in New Zealand by May 2020.^{9,10} While there were several small outbreaks occurring in other regions afterwards,¹⁰ the Southern District Health Board (DHB) remained free from COVID-19 until 10 February 2022 (the third day of our study), when it confirmed its first case since May 2020. In the general population, 96% of eligible people in New Zealand had had a first dose of a COVID-19 vaccine, 94% had had two doses and 57% had had a booster by 8 February 2022.

By February 2022, it was mandatory for people working in New Zealand's health and disability sector to be fully vaccinated to reduce their risk of being infected with COVID-19 and passing it to vulnerable people. Other measures included mandatory use of surgical masks for all visitors and patients, N95 masks for staff who have patient contact and physical distancing including limiting the number of people in a room and in a lift.

On 13 February 2022, Dunedin Public Hospital announced that all patients were to undergo a COVID-19 PCR test on admission to hospital. On the same day, new visitor policies included limiting each patient to two registered visitors, only one visitor per day, reduced visiting hours from 2–6pm, door screening and no mask exemptions. There was no requirement for visitors to have vaccination passes.

Patient survey

Inclusion criteria: patients admitted to Dunedin Public Hospital in one of four wards—General Medicine, General Surgery, Orthopaedics, or Respiratory—were invited to participate in a

paper-based survey from 8 February 2022 to 16 February 2022, inclusive.

Exclusion criteria: charge nurses were asked to identify patients who were too frail or ill to take part. We also excluded children (and their parents) under 16—because COVID-19 vaccination had only recently been approved for children—patients unable to provide informed consent, where there would be a substantial language barrier (the survey was only available in English), patients under isolation precautions and patient who were absent or unavailable after two attempts to reach them.

Three interviewers (JW, LP, JS) administered the surveys. Participants were offered help interpreting questions if needed. We collected demographic data, education level, COVID-19 vaccination status, their perception of their own risk of illness from COVID-19, whether they were in a multi-bed or a single-bed room and how many roommates they had. Participants were asked to rate how comfortable they were with sharing a room with patients of different, same and unknown vaccination status on a five-point scale from 1 (very uncomfortable) to 5 (very comfortable). Patients were further asked for their opinions (yes/no/don't know) on: whether patients of different COVID-19 vaccination status should be located in separate rooms; whether they have the right to know their roommates' COVID-19 vaccination status; whether their roommates have the right to know their vaccination status; and whether hospital visitors should be required to be fully vaccinated for COVID-19. We also asked for suggestions for the hospital to protect patients against COVID-19 and to address other issues regarding multi-bed hospital rooms (Appendix 1).

Staff interviews

Consultant physicians, medical registrars, registered nurses and charge nurse managers involved in the care of patients on participating wards were invited to participate in a structured face-to-face interview. Interviews were approximately 10 minutes in length and followed a structured, pre-approved template of six questions centred around the staff's views on the mixing of differing vaccination status patients, the risks involved and the current or possible future policy (Appendix 2). All interviews were conducted by SL with LN acting as a scribe.

The study was approved by the University of Otago Human Ethics Committee. Ngāi Tahu Māori research consultation was undertaken via the

University of Otago's research procedure.

Analyses

Descriptive statistics of patient survey data included percentages, means, 95% confidence intervals (CI) and medians. The qualitative aspect of the patient surveys and staff interviews was analysed by LN and SA independently using thematic analysis.¹¹

Results

Sixty-three out of 118 eligible patients (53%) agreed to participate. Most identified as NZ European (81%), with 6% identifying as Māori, 2% Cook Island Māori, and 11% other ethnicities. Most were 55 years old and above. Out of the 63 participants, only one was unvaccinated and two preferred not to say. Only three participants (5%) had been previously tested positive for COVID-19. Fifty-four of the 63 participants were in multi-bed hospital rooms (Table 1).

Overall, 37 (59%) participants thought patients of different vaccination status should be in separate rooms, while 17 (27%) opposed the idea, and 9 (14%) were unsure. Most participants felt comfortable sharing a multi-bed hospital room with patients of the same vaccination status as themselves, with a mean of 4.4 (95% CI, 4.1–4.7) and a median of 5.0 (on a 5-point scale where 5 = very comfortable, 1 = very uncomfortable). Participants felt less comfortable sharing a room with patients of different vaccination status and patients of vaccination status unknown to them (mean 2.6 [95% CI, 2.2–3.0], median 2; mean 2.8 [95% CI, 2.4–3.2], median 2; respectively) (Table 2).

Similar proportions of participants thought that they should or should not have the right to know the COVID-19 vaccination status of other patients sharing a room with them (n=28 (45%) and 25 (40%) respectively). Thirty-four participants (55%) said that other patients sharing a room with them should have the right to know their COVID-19 vaccination status; 23 (37%) opposed. Most participants (n=46 [73%]) thought that hospital visitors should be required to be fully vaccinated for COVID-19, whereas 10 (16%) opposed (Table 2).

Participants who opposed (17 out of 63) separating patients based on their vaccination status felt more comfortable sharing a room with all patients regardless of their vaccination status than participants who supported or were unsure about separation (Table 3). Participants who self-identified as having a higher risk of severe illness from COVID-19

supported the separation of patients based on vaccination status more strongly than those without self-identified high risk (not shown). All participants who were unvaccinated or preferred not to say (3 out of 63) chose “no” for the ideas of separating patients based on their vaccination status, having the right to know each other's vaccination status or making it mandatory for hospital visitors to be fully vaccinated.

Qualitative responses

Table 4 is a summary of patients' free-text responses on the separation of multi-bed hospital rooms based on vaccination status and suggestions for protecting patients from COVID-19. In particular, most patients who favoured the separation of patients by vaccination status commented on minimising the risk to individuals, however, many also acknowledged the practical limitations around maintaining such separation. Resource limitation was a common argument raised against separation by vaccination status, along with ethical considerations such as patient rights and discrimination. Some patient responses were polarised and highly emotive on both sides. One patient commented on the need to “*stop the drama*” while another stated that “*we need to stop this rot in society*”.

Staff interviews

Fifteen staff (of 49 invited to participate) were interviewed. This included six senior medical officers, a registrar, four charge nurse managers, three registered nurses and one director of nursing. A summary of staff attitudes towards the separation of multi-bed rooms by vaccination status is outlined in Table 5.

Protecting the unvaccinated and vulnerable patients and fairness for vaccinated patients were raised by staff in favour of separation. Similar to patient views, practical limitations and ethical issues were some of the arguments against separation. Discrimination and the need for equitable healthcare was a concern raised by staff, particularly regarding ethnic discrepancies:

“There are ethnic groups in NZ with lower vaccination rates, particularly Māori. Even if this wasn't the intention, it could give the appearance of an ethnicity-based policy. It would be unintended but it would still occur—and we don't do that in the healthcare system.”

Other arguments raised against separating patients by vaccination status include vaccination status as a poor indicator of true infection and the increased risk of infection outside the hospital generally. Regardless of viewpoint on separating patients, the right to healthcare and/or the health practitioners' obligation to provide care was universally acknowledged by staff.

A few participants questioned the efficacy of policies and protocols, and a few stated that COVID-19 is a constantly changing situation as new information emerges.

“The current hospital policies seem to change quite quickly, and quite regularly, the response in the first wave was different to the requirements in the Delta wave... And I think that it's difficult to set firm rules and boundaries because the whole knowledge of various mutations of COVID is such that it's a fluid situation and you have to adjust accordingly.”

Discussion

To our knowledge, this is the first study to explore hospital patient and staff perspectives on the mixing of patients of different vaccination status in shared hospital rooms either in New Zealand or internationally. We found that more than half the patients were in favour of separating patients by vaccination status and that most patients felt comfortable sharing a multi-bed hospital room with patients of the same vaccination status as themselves.

Patients and staff who favoured the separation of patients into rooms by vaccination status believed that it would help to reduce the risk of COVID-19 transmission. In contrast, patients and staff who opposed separation thought that doing so would provide insignificant benefit, given the potential for transmission between vaccinated and unvaccinated people due to breakthrough infections.

Vaccination reduces the risk of COVID-19 transmission, infection and severity of infection in people of the same household,^{12,13} and the transmission rate between roommates and between household members may be comparable.^{6,7,14,15} There is little published information on nosocomial transmission in New Zealand, although several hospital outbreaks have occurred with an estimated 30–50% of contacts in multi-bed rooms becoming infected (H McGann, personal communication). This suggests that separating

patients by vaccination status may reduce the spread of an outbreak before diagnosis has taken place. A recently published New Zealand paper by Watson et al.¹⁶ found that despite a large number of breakthrough infections among the vaccinated, unvaccinated individuals are 3.3 times more likely to be infected and 20 times more likely to be hospitalised, hence they have a greater risk of bringing COVID-19 into hospital even if they are admitted for other reasons.¹⁶

In terms of the implementation of separate rooms for vaccinated and unvaccinated patients, some patients and most staff did not see it as practically and/or ethically possible and thought that current practices to reduce risk were adequate. One staff member thought that separation by vaccination status would not work unless staff were also compartmentalised, wherein small groups of staff would have no physical connection to other groups. There is evidence that doing this reduces the risk of transmission,¹⁷ however, this may not be practical given the workforce constraints. Other international studies have described patients and staffs' experiences with social isolation, loneliness and stigma because of physical separation, including having their own room and restricted visitation due to COVID-19 policies.¹⁸ This highlights the balance that needs to be made between theoretical interventions to potentially reduce the risk of infection and the practicalities of running the hospital and looking after patients' wellbeing.

Some patients and staff appeared to consider being unvaccinated as equivalent to being COVID-positive, even though vaccines are not 100% effective and breakthrough infections can still occur.^{16,19} It may be that conceptualising preventive measures designed to reduce spread at a population level (i.e., vaccinating the entire population) and the alternative (not being vaccinated) does not translate well to the perceived risk at an individual level.²⁰

There was no consensus on whether a patient has the right to know their roommates' vaccination status, reflecting the dilemma of weighing up the right to information that might have direct health consequences on oneself versus the right to health information privacy. If patients had no choice but to disclose their vaccination status in order to be admitted, some may choose to not seek healthcare to keep that information private. Patients have a right to keep their health information private and also have the right to healthcare regardless of vaccination status.

Most patients (73%) thought that visitors should be fully vaccinated. Many argued that visitors are, technically, not essential personnel in providing healthcare; thus, they are not included within the “right to healthcare”. By contrast, some staff members argued that visitors played critical roles in patient care and should not be excluded. Three days after the first Omicron COVID-19 case in Dunedin (13 February 2022), Dunedin Public Hospital introduced new policies limiting patients to two registered visitors per patient with only one visitor per day, reducing visiting hours, screening visitors at the door and not allowing face-mask exemptions. Similar policies are widely practiced in other countries, but their impact on COVID-19 control has been unclear.^{21,22} In New Zealand there has been no requirement for hospital visitors to have vaccination passes and introducing such a policy would likely present practical and ethical challenges.

None of the staff we interviewed knew of any ward policies that were in place to reduce the mixing of patients with different vaccination statuses. The main additional measure suggested by the staff was better screening on admission, particularly using more efficient and comprehensive testing. During the conduct of this study (on 13 February 2022), the hospital announced that all patients admitted to wards would undergo a COVID-19 test on admission. This aimed to reduce the risk of transmission by identifying both symptomatic and asymptomatic patients.²³ However, limitations such as false negatives, particularly during the incubation period, and transmission from staff and visitors may still lead to outbreaks in hospitals.²³

Our study provides a snapshot of patient opinions on COVID-19 vaccination status in the middle of the controversy over the government-mandated vaccination in a changing COVID climate and at a time when few people had direct experience of COVID-19 disease. COVID-19 infections have since become widespread and the government mandates for vaccination have been dropped, but transmission of COVID-19 within healthcare settings remains an ongoing concern. At the time of writing, New Zealand is experiencing another uptick of COVID-19 in the community, and it seems likely that we will experience further waves of infection for some time. The likelihood of sharing a hospital room with someone with COVID-19 will reflect the prevalence in the community and we need to better understand the measures that can be taken to minimise nosocomial spread.

Our study, while novel and giving a unique snapshot, had some limitations. Although care was taken to maintain confidentiality of patient’s responses, some patients may have discussed the survey with their roommates, which may have influenced their responses. Many patients were excluded (50%) due to the nature of their illness: most of these were too frail/ill, or were under contact precautions. It is likely that these groups have somewhat different attitudes to those included. Given that 93% of patients had received at least two doses of the COVID-19 vaccine, the results are also unlikely to reflect the views of unvaccinated people. Reflecting the demographic composition of Dunedin, there was limited representation of Māori in our sample, with only 6% of participants identified as Māori compared to 16.7% of the New Zealand population. To recruit staff, we emailed every consultant responsible for the four wards and approached nurses, charge nurses and resident medical officers in-person on the wards opportunistically. A low response rate from consultants to our emails is likely to reflect their very high workload at the time. However, we were able to recruit and interview sufficient numbers in-person to reach data saturation.

Priorities for future research include assessing the risk of transmission of SARS-CoV2 in shared hospital rooms and the extent to which this can be minimised by screening patients on admission. Further exploration around the attitudes about COVID-19 isolation and the feasibility of separation of patients is also required. Since the study was conducted, there have been many changes to government policies around COVID-19, such as the removal of vaccine mandates. Many people now have personal experience of COVID-19 infection. These are likely to have also resulted in changes in public opinion with regard to sharing hospital rooms with unvaccinated people, but similar concerns may arise with other vaccine-preventable infections, such as influenza, that could be transmitted in shared rooms.

Conclusion

In summary, both staff and vaccinated patients would prefer to separate patients by COVID-19 vaccination status but are aware of the practical and ethical problems this would cause. There were mixed views on the actual risks involved in mixing unvaccinated and vaccinated patients among patients and staff members, and a key issue was whether vaccination status gives an accurate

prediction of the true risk of COVID-19 transmission. While many patients are concerned about the risk of infection, most staff viewed current precautionary measures as adequate. However,

both patients and staff agreed that faster and more efficient screening of patients and visitors would reduce these risks.

Table 1: Demographics of survey participants.

Demographic variables	Percentage (count)
Age (years)	
16–24	5% (3)
25–34	3% (2)
35–44	3% (2)
45–54	8% (5)
55–64	19% (12)
65–74	29% (18)
75 and over	30% (19)
No answer	3% (2)
Gender	
Male	59% (37)
Female	41% (26)
Ward	
General Medicine	35% (22)
General Surgery	21% (13)
Orthopaedics	40% (25)
Respiratory	5% (3)
Ethnicity	
NZ European	81% (51)
Māori	6% (4)
Cook Islands Māori	2% (1)
Other Pasifika	0% (0)
Other	11% (7)
Been tested and found positive for COVID-19?	
Yes	5% (3)
No	92% (58)
Prefer not to say	3% (2)
Anyone in the household tested positive for COVID-19?	
Yes	0% (0)
No	98% (62)
Prefer not to say	2% (1)

Table 1 (continued): Demographics of survey participants.

Doses of COVID vaccination	
0	2% (1)
1	2% (1)
2	22% (14)
3	71% (45)
Prefer not to say	3% (2)
Do you know the COVID-19 vaccination status of your roommates?	
Yes	3% (2)
No	83% (52)
No answer	14% (9)
Surveyed after first case of Omicron COVID-19 in Dunedin	
Yes	22% (14) 7
No	8% (49)

Table 2: Patients' attitudes towards various issues around vaccination status in the hospital.

Question	Patients' response; % (count)		
	Yes	No	Don't know
Should patients of different vaccination status be in separate rooms?	59% (37)	27% (17)	14% (9)
Do you think that you have the right to know the COVID-19 vaccination status of other patients sharing a hospital room with you?	45% (28)	40% (25)	15% (9)
Do you think that other patients sharing a hospital room with you have the right to know your COVID-19 vaccination status?	55% (34)	37% (23)	8% (5)
Should hospital visitors be required to be fully vaccinated for COVID-19?	73% (46)	16% (10)	11% (7)
	*Mean (95%CI)		*Median
How do you feel about sharing a multi-bed hospital room with patients of the SAME COVID-19 vaccination status as yourself?	4.4 (4.1-4.7)		5
How do you feel about sharing a multi-bed hospital room with patients of DIFFERENT COVID-19 vaccination status as yourself?	2.6 (2.2-3.0)		2
How do you feel about sharing a multi-bed hospital room with patients when you don't know their COVID-19 vaccination status?	2.8 (2.4-3.2)		2

*Patient comfort level was measured on a scale of 1 (very uncomfortable) to 5 (very comfortable).

Table 3: Patients' opinion on whether patients of different vaccination statuses should be in separate rooms, and their comfort level when sharing a multi-bed hospital room.

	How do you feel about sharing a multi-bed hospital room with patients of the SAME COVID-19 vaccination status as yourself?		How do you feel about sharing a multi-bed hospital room with patients of the DIFFERENT COVID-19 vaccination status as yourself?		How do you feel about sharing a multi-bed hospital room with patients when you don't know their COVID-19 vaccination status?	
	Mean (95% CI)	Median	Mean (95% CI)	Median	Mean (95% CI)	Median
Should patients of different vaccination status be in separate rooms?						
Yes (n=37)	4.4 (3.9–4.8)	5	2.1 (1.7–2.5)	2	2.3 (1.8–2.7)	2
No (n=17)	4.4 (3.9–5.0)	5	3.6 (2.9–4.3)	4	3.8 (3.1–4.4)	4
Don't know (n=9)	4.4 (3.9–5.0)	5	2.5 (1.3–3.7)	2	2.7 (1.6–3.8)	2

Patient comfort level was measured on a scale of 1 (very uncomfortable) to 5 (very comfortable).

Table 4: Patient responses based on themes and respective representative quotes.

Should patients be separated by vaccination status?	
Arguments raised in favour	Examples
Minimise risk (to both vaccinated and unvaccinated individuals, including patients and staffs)	“Minimise the risk of unvaccinated becoming infected.” “Have them in different areas—make sure staff’s looked after. No staff = no hospital.”
Arguments raised against	Examples
Resource limitation (space availability, staffing issues and the practicality of maintaining the separation)	“I have no trouble with it. The nurses have enough to do than worrying about patients’ vac status.” “I doubt there would be enough beds to separate patients.”
Discriminatory to separate/right to healthcare	“They should continue to do their jobs and treat all people no matter of vaccinated status... This is one place everyone should be treated equal.” “My opinion—hospital (should) be neutral.”
Right to be vaccinated or not	“We have the right to choose to be vaccinated or not...The hospital must respect this right.”
Breakthrough infection in vaccinated people	“It doesn’t matter what status you are; you could still catch it.”
Other strategies/existing strategies in place	“So long as patients have had a COVID test on admission and are not symptomatic I do not see any problem.” “I feel that strategies are in place. Consider RATs for unvacc.”
Suggestions for hospitals to protect patients from COVID-19	
No suggestion.	“They appear to be doing a great job at present.”
Mask wearing, barcode scanning, RAT testing, visual reminders of policies in the hospital	“Why can the scanning bar codes not [be] used, they are used everywhere else in NZ, so why not on hospital admissions.”

Table 4 (continued): Patient responses based on themes and respective representative quotes.

Learn from other countries	“It seems as if countries other than NZ are letting them mix and are not as fussed about it as they were. Perhaps it is one way of finally getting used to it or perhaps getting rid of it.”
Infrastructure (i.e., better ventilation system, build isolation hospital, room separation based on vaccination status, more single rooms)	“Building the new hospital to include greater capacity to instigate these ideas.”
Policies around visitors (i.e., limit to only vaccinated, limit to one visitor per patient, screen visitors, wear masks, rapid antigen testing before entry)	“Prevent unvaccinated visitors from access.”
Stop worrying about COVID-19	“Stop the drama—people are more likely to die of all the stress with masks, testing etc. than actually dying of or catching COVID.”

Table 5: Staff responses based on themes and respective representative quotes.

Should patients be separated by vaccination status?	
Arguments raised in favour	Examples
Fairness for vaccinated patients	“...vaccinated patients have played their part in the community response to COVID—should they be subject to potentially more risk of catching COVID by being put into a bay with unvaccinated patients?”
Protecting unvaccinated patients	“...the risk of having an unvaccinated person in rooms with vaccinated, they’re at risk but also the person who is unvaccinated is at risk as well.”
Protecting vulnerable patients	“...a separation would be important for those people with risk factors to not be exposed to unvaccinated people. So, your patients who are elderly, or who have the recognised comorbidities or immunosuppressed conditions, should be separated by vaccination.”
Arguments raised against	Examples
Practical issues	“...we already have no beds and no staff, so someone else would have to manage where the unvaccinated people go.”
Limited bed space	“...secondly, just from the pure logistics scenario, we don’t have adequate beds available for medical admissions without any COVID in the community.”
Issues with patient flow	“...even currently without taking into account vaccination status it can be hard to get patients around the ward, so having a specific vaccinated/unvaccinated room would make flow worse.”
Same healthcare providers in contact	‘Personally, I don’t think there are any issues, because the same nurse is going to be looking after those patients. If the same nurse is going to the vaccinated and the unvaccinated patients, it doesn’t matter if they’re in different rooms or not, because the risk is still there.’
Ethnic disparity	“Secondly there are ethnic groups in NZ with lower vaccination rates, particularly Māori. Even if this wasn’t the intention, it could give the appearance of an ethnicity-based policy. It would be unintended but it would still occur—we don’t do that in the healthcare system.”
Risk of transmission elsewhere	“I think overall the risk is so small at this point, I think the risk is so much so much greater from catching COVID from everywhere I think it wouldn’t worry be that I was mistreating a vaccinated patient by putting them in a bay with an unvaccinated, I wouldn’t think I was significantly increasing their risk.”

Table 5 (continued): Staff responses based on themes and respective representative quotes.

Should patients and healthcare providers have the right to know the vaccination status of other patients?	
Arguments raised in favour	Examples
Patients deserve to be informed	“Maybe there’s a transplanted immunosuppressed patient, and they’re in a room with vaccinated and unvaccinated patients, do they have a right to know?”
Staff have no right to privacy	“We don’t have the right to keep this to ourselves.”
Vaccination requirements elsewhere	“Can I say yes and no? I mean probably not, but if it was me, if I was, with the vaccine passports if you go places, you’ve got the choice to go places where you know other people are vaccinated, so it would be natural to have that option here.”
Arguments raised against	Examples
Right to privacy	“No, I do not. It’s private health information to the individual. That would be such a slippery slope, we’ve been here many times in history, HIV for example. It’s unacceptable, even with COVID. I think health information, unless it serves a purpose, you have to protect it.”
Themes generated regarding visitors	Examples
Visitors as controllable risk	“Because while I think all patients should be treated regardless of their vaccination status, visitors are usually, they’re not... an essential part of the picture.”
Visitors as part of patient care	“However, I do understand there might be some concerns if a non-vaccinated family has a family member who is very unwell and possibly going to pass away that refusing access to their family members would be... I think a poor decision.”
Themes generated regarding hospital policy	Examples
Constantly changing situation	“The current hospital policies seem to change quite quickly, and quite regularly... And I think that it’s difficult to set firm rules and boundaries because the whole knowledge and various mutations of COVID is such that it’s a fluid situation and you must adjust accordingly.”
Lack of data	“I think it’s probably a complicated topic that, if you wanted to be evidence based in your approach, would probably take a lot of thought.”
Issues with protocols	“I think this comes probably from my role in trying to develop the response to COVID on the wards with lots of other people but there is a wish to over protocolise a lot of things related to COVID, when actually by creating more and more protocols, we actually make life really challenging for us.”

Table 5 (continued): Staff responses based on themes and respective representative quotes.

Themes generated regarding COVID-19 transmission risks	Examples
Vaccination status as poor proxy for true infection	“What you’re really asking is am I likely to get infected by someone else, and we’re using vaccination status as a surrogate for that risk.”
Overall risk more important than vaccination status	“I don’t think it should be distinguished so much on vaccinated vs unvaccinated, but on risk vs no risk.”
Risk of transmission from vaccinated individuals	“You would expect as many breakthrough infections to be occurring in the vaccinated group as you would infections happening in the unvaccinated group. Because it’s much bigger.”
Personal or staff risk	“As healthcare workers I’m not too concerned about the risk to us, we’re all double vaxxed and boosted, and because we’re the COVID ward we practise the PPE a lot, so I’m not too concerned about the risk.” “Yes, I do, because it puts me at risk, looking after unvaccinated, it is concerning.”
Difficulty quantifying risk	“Humans are bad at understanding risk. We do fear, but we don’t do risk very well. Everyone’s like ‘oh no there’s a case in Dunedin’, but does one case in 100,000 people make you anymore at risk than yesterday?”
Miscellaneous themes	Examples
Right to equitable healthcare	“I think, currently, well overall it’s important that we have a principle of equity of care for patients. So, all patients need to be treated the same, so have the same access to what I hope is good medical care.”
Duty of care	“I think I would say that as a disease COVID doesn’t, isn’t the only disease where people have made, what I would perceive as people making suboptimal decisions in their lives. The guy with lung cancer, or the person breaking their leg biking... We don’t have the luxury in the healthcare setting to choose who we look after; part of the job is to look after everyone regardless of whatever choice they have made in life.”

COMPETING INTERESTS

Nil.

AUTHOR INFORMATION

Sylvi Low, joint first author : Trainee Intern, Department of Preventive & Social Medicine, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand.

Sonya Aum, joint first author: Trainee Intern, Department of Preventive & Social Medicine, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand.

Luke Nie: Trainee Intern, Department of Preventive & Social Medicine, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand.

Jacob Ward: Trainee Intern, Department of Preventive & Social Medicine, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand.

Khanh Nguyen: Trainee Intern, Department of Preventive & Social Medicine, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand.

Leilani Pereira: Trainee Intern, Department of Preventive & Social Medicine, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand.

Jenny Mi: Trainee Intern, Department of Preventive & Social Medicine, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand.

Jocelyn Soti: Trainee Intern, Department of Preventive & Social Medicine, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand.

Ben Harford: Trainee Intern, Department of Preventive & Social Medicine, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand.

Robert J Hancox: Professor, Department of Preventive & Social Medicine, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand.

John D Dockerty: Associate Professor, Department of Preventive & Social Medicine, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand.

CORRESPONDING AUTHORS

Robert J Hancox: Professor, Department of Preventive & Social Medicine, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand. E: bob.hancox@otago.ac.nz

John D Dockerty: Associate Professor, Department of Preventive & Social Medicine, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand. E: john.dockerty@otago.ac.nz

REFERENCES

- Lopez Bernal J, Andrews N, Gower C, et al. Effectiveness of Covid-19 Vaccines against the B.1.617.2 (Delta) Variant. *New Engl J Med.* 2021;385(7):585-94. doi: 10.1056/NEJMoa2108891.
- Haas EJ, Angulo FJ, McLaughlin JM, et al. Impact and effectiveness of mRNA BNT162b2 vaccine against SARS-CoV-2 infections and COVID-19 cases, hospitalisations, and deaths following a nationwide vaccination campaign in Israel: an observational study using national surveillance data. *Lancet.* 2021;397(10287):1819-29. doi: 10.1016/S0140-6736(21)00947-8.
- Garcia-Beltran WF, St. Denis KJ, Hoelzemer A, et al. mRNA-based COVID-19 vaccine boosters induce neutralizing immunity against SARS-CoV-2 Omicron variant. *Cell.* 2022;185(3):457-466.e4. doi: 10.1016/j.cell.2021.12.033.
- Manatū Hauora – Ministry of Health. COVID-19: Mandatory vaccinations [Internet]. 2022 Apr 8 [cited 2022 May 7]. Available from: <https://www.health.govt.nz/covid-19-novel-coronavirus/covid-19-response-planning/covid-19-mandatory-vaccinations>.
- Hipkins HC. Vaccine pass ready for a Kiwi summer [Internet]. *Beehive*; 2021 Nov 17 [cited 2022 May 8]. Available from: <https://www.beehive.govt.nz/release/vaccine-pass-ready-kiwi-summer>.
- Trannel AM, Kobayashi T, Dains A, et al. Coronavirus disease 2019 (COVID-19) incidence after exposures in shared patient rooms in a tertiary-care center in Iowa, July 2020-May 2021. *Infect Control Hosp Epidemiol.* 2022 Dec;43(12):1910-1913. doi: 10.1017/ice.2021.313.
- Karan A, Klompas M, Tucker R, et al. The Risk of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Transmission from Patients With Undiagnosed Coronavirus Disease 2019 (COVID-19) to Roommates in a Large Academic Medical Center. *Clin Infect Dis* 2022;74(6):1097-1100. doi: 10.1093/cid/ciab564.
- Unite against COVID-19 People at higher risk of severe illness from COVID-19 [Internet]. *New Zealand Government*; 2023 [cited 2022 Feb 12]. Available from: <https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-information-specific-audiences/covid-19-higher-risk-people>.
- Jefferies S, French N, Gilkison C, et al. COVID-19 in New Zealand and the impact of the national response: a descriptive epidemiological study. *Lancet Public Health.* 2020;5(11):e612-e623. doi: 10.1016/S2468-2667(20)30225-5.
- Douglas J, Winter D, McNeill A, et al. Tracing the international arrivals of SARS-CoV-2 Omicron variants after Aotearoa New Zealand reopened its border. *Nat Commun.* 2022;13(1):6484. doi: 10.1038/s41467-022-34186-9.

11. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3(2):77-101. doi: 10.1191/1478088706qp0630a.
12. Shah ASV, Gribben C, Bishop J, et al. Effect of Vaccination on Transmission of SARS-CoV-2. *New Engl J Med*. 2021;385(18):1718-20. doi: 10.1056/NEJMc2106757.
13. Eyre DW, Taylor D, Purver M, et al. Effect of Covid-19 Vaccination on Transmission of Alpha and Delta Variants. *New Engl J Med*. 2022;386(8):744-56. doi: 10.1056/NEJMoa2116597.
14. Madewell ZJ, Yang Y, Longini IM Jr, et al. Household Transmission of SARS-CoV-2: A Systematic Review and Meta-analysis. *JAMA Netw Open*. 2020;3(12):e2031756. doi: 10.1001/jamanetworkopen.2020.31756.
15. Wu J, Huang Y, Tu C, et al. Household Transmission of SARS-CoV-2, Zhuhai, China, 2020. *Clin Infect Dis*. 2020;71(16):2099-108. doi: 10.1093/cid/ciaa557.
16. Watson LM. Simulating the impact of vaccination rates on the initial stages of a COVID-19 outbreak in Aotearoa New Zealand with a stochastic model. *N Z Med J*. 2022;135(1552):66-76.
17. Rolland Y, Lacoste MH, de Mauleon A, et al. Guidance for the Prevention of the COVID-19 Epidemic in Long-Term Care Facilities: A Short-Term Prospective Study. *J Nutr Health Aging*. 2020;24(8):812-6. doi: 10.1007/s12603-020-1440-2.
18. Wasilewski MB, Szigeti Z, Sheppard CL, et al. Infection prevention and control across the continuum of COVID-19 care: A qualitative study of patients', caregivers' and providers' experiences. *Health Expect*. 2022;25(5):2431-9. doi: 10.1111/hex.13558.
19. Bergwerk M, Gonen T, Lustig Y, et al. Covid-19 Breakthrough Infections in Vaccinated Health Care Workers. *New Engl J Med*. 2021;385(16):1474-84. doi: 10.1056/NEJMoa2109072.
20. Wong JCS, Yang JZ. Comparative Risk: Dread and Unknown Characteristics of the COVID-19 Pandemic Versus COVID-19 Vaccines. *Risk Anal*. 2022 Oct;42(10):2214-2230. doi: 10.1111/risa.13852.
21. Lo AX, Wedel LK, Liu SW, et al. COVID-19 hospital and emergency department visitor policies in the United States. *J Am Coll Emerg Physicians Open*. 2022;3(1):e12622. doi: 10.1002/emp2.12622.
22. Wee LE, Conceicao EP, Sim JX, et al. The impact of visitor restrictions on health care-associated respiratory viral infections during the COVID-19 pandemic: Experience of a tertiary hospital in Singapore. *Am J Infect Control*. 2021;49(1):134-5. doi: 10.1016/j.ajic.2020.11.006.
23. Krüger S, Leskien M, Schuller P, et al. Performance and feasibility of universal PCR admission screening for SARS-CoV-2 in a German tertiary care hospital. *J Med Virol*. 2021;93(5):2890-8. doi: 10.1002/jmv.26770.

Appendices

Appendix 1

Patient Questionnaire

This questionnaire is not about exposure to people who have COVID-19, but about sharing rooms with patients of different vaccination status.

A. Patient demographics	
1. What is your age?	<input type="radio"/>
2. What is your gender?	<input type="radio"/> Male
	<input type="radio"/> Female
	<input type="radio"/> Another gender please state:
3. What is your ethnicity?	<input type="radio"/> New Zealand European
	<input type="radio"/> Māori
	<input type="radio"/> Samoan
	<input type="radio"/> Cook Islands Maori
	<input type="radio"/> Tongan
	<input type="radio"/> Niuean
	<input type="radio"/> Chinese
	<input type="radio"/> Indian
	<input type="radio"/> Other e.g., Dutch, Japanese, Tokelauan please state:
4. What is your highest completed qualification?	<input type="radio"/> Level 1 Certificate
	<input type="radio"/> Level 2 Certificate
	<input type="radio"/> Level 3 Certificate
	<input type="radio"/> Level 4 Certificate
	<input type="radio"/> Level 5 Diploma
	<input type="radio"/> Level 6 Diploma
	<input type="radio"/> Bachelor's Degree or Level 7 Qualification
	<input type="radio"/> Bachelor Honours Degree or Postgraduate Certificate/ Diploma
	<input type="radio"/> Master's Degree
	<input type="radio"/> PhD
	<input type="radio"/> Other qualification please state:

5. Do you think you are at higher risk of severe illness from COVID-19?	<input type="radio"/> Yes please state why you are at increased risk:
	<input type="radio"/> No
	<input type="radio"/> Don't know
6. Which ward are you currently on?	<input type="radio"/> Respiratory
	<input type="radio"/> General Medicine
	<input type="radio"/> Orthopaedic Surgery
	<input type="radio"/> General Surgery
7. What is the reason for your current admission to hospital?	<input type="radio"/> Other

B. COVID-19 vaccination status	
8. What is your COVID-19 vaccination status?	<input type="radio"/> Have not had the vaccine
	<input type="radio"/> 1st dose only
	<input type="radio"/> 1st and 2nd doses only
	<input type="radio"/> 1st, 2nd, and 3rd (booster) doses
	<input type="radio"/> Prefer not to say
	<input type="radio"/> Don't know
9. Have you ever tested positive for COVID-19?	<input type="radio"/> Yes
	<input type="radio"/> No
	<input type="radio"/> Prefer not to say
	<input type="radio"/> Don't know
10. Has anyone in your household ever tested positive for COVID-19?	<input type="radio"/>
	<input type="radio"/>
	<input type="radio"/>
	<input type="radio"/>

Please only answer this section if you are staying in a **MULTI-BED ROOM**

C. Sharing multi-bed hospital rooms	
11. Currently, how many patients are in your hospital room including yourself?	<input type="radio"/> 1
	<input type="radio"/> 2
	<input type="radio"/> 3
	<input type="radio"/> 4
	<input type="radio"/> Don't know
	<input type="radio"/> Other, please specify:
12. Do you know the COVID-19 vaccination status of any other patients in your room?	<input type="radio"/> Yes
	<input type="radio"/> No
	<input type="radio"/> Don't know
	<input type="radio"/> Not applicable

Please only answer this section if you are staying in a **MULTI-BED ROOM**

D. Please circle the number that corresponds to your view on the following statements					
	Very uncomfortable		Neutral	Very uncomfortable	
13. How do you feel about sharing a multibed-hospital room with patients of the same COVID-19 vaccination status as yourself?	1	2	3	4	5
14. How do you feel about sharing a multibed hospital room with patients of a different COVID-19 vaccination status to yourself?	1	2	3	4	5
15. How do you feel about sharing a multibed hospital room with patients when you don't know their COVID-19 vaccination status?	1	2	3	4	5

16. In your opinion, should patients of different COVID-19 vaccination status be located in separate rooms?	<input type="radio"/> Yes
	<input type="radio"/> No
	<input type="radio"/> Don't know
17. Do you think that you have the right to know the COVID-19 vaccination status of other patients in your room?	<input type="radio"/> Yes
	<input type="radio"/> No
	<input type="radio"/> Don't know
18. Do you think that other patients in your room have the right to know your COVID-19 vaccination status?	<input type="radio"/> Yes
	<input type="radio"/> No
	<input type="radio"/> Don't know
19. In your opinion, should hospital visitors be required to be fully vaccinated for COVID-19?	<input type="radio"/> Yes
	<input type="radio"/> No
	<input type="radio"/> Don't know

Please only answer this section if you are staying in a **SINGLE ROOM**

E. Please circle the number that corresponds to your view on the following statements					
	Very uncomfortable		Neutral	Very uncomfortable	
20. How would you feel about sharing a multi-bed hospital room with patients of the same COVID-19 vaccination status as yourself?	1	2	3	4	5
21. How would you feel about sharing a multi-bed hospital room with patients of a different COVID-19 vaccination status to yourself?	1	2	3	4	5
22. How would you feel about sharing a multi-bed hospital room with patients when you don't know their COVID-19 vaccination status?	1	2	3	4	5

23. In your opinion, should patients of different COVID-19 vaccination status be located in separate rooms?	<input type="radio"/> Yes
	<input type="radio"/> No
	<input type="radio"/> Don't know
24. If at any stage you have to share a room with other patients, do you think that you have the right to know their COVID-19 vaccination status?	<input type="radio"/> Yes
	<input type="radio"/> No
	<input type="radio"/> Don't know
25. If at any stage you have to share a room with other patients, do you think that they have the right to know your COVID-19 vaccination status?	<input type="radio"/> Yes
	<input type="radio"/> No
	<input type="radio"/> Don't know
26. In your opinion, should hospital visitors be required to be fully vaccinated for COVID-19?	<input type="radio"/> Yes
	<input type="radio"/> No
	<input type="radio"/> Don't know

F. Please comment on the following questions

27. What do you think the hospital should be doing (if anything) in relation to the mixing of vaccinated and unvaccinated persons?

28. Please list any other suggestions you might have for hospitals to protect patients from COVID-19.

29. Besides COVID-19 considerations, is there anything else hospitals should consider about patients sharing multi-bed hospital rooms?

Appendix 2

Clinician Interview

The interview will include questions about policies on your ward, how risks are mitigated; and your general views about COVID-19, vaccination policies and ward accommodation for patients of differing vaccination statuses.

1. What is your work role?
2. What is your gender?
3. What are your views on mixing vaccinated and unvaccinated patients in the same multi-bed hospital room?
(Prompt) Do you think vaccinated and unvaccinated patients should be in separate rooms?
4. What are your views on providing care to a mix of both vaccinated and unvaccinated patients?
(Prompt) Please include any concerns about risks to both patients and healthcare workers
5. Do you think that patients in a multi-bed hospital room have a right to know the COVID-19 vaccination status of the other patients sharing the same room?
Yes/No/Don't know
6. Does your ward have a policy on the mixing of vaccinated and unvaccinated patients in multi-bed hospital rooms?
 - (i) If yes, what is the policy?
 - (ii) If not, to your knowledge, what is currently being done to reduce the risks (if any) from mixing vaccinated and unvaccinated patients on your ward/s?
 - (iii) If there is no policy or if you think more should be done, what would you suggest?
7. In your opinion, should hospital visitors be fully vaccinated against COVID-19?
8. Do you have any further comments?