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| Review of Management of Variants of Concern of COVID-19 in Hotel Quarantine Settings |
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| Review of Management of Variants of Concern of COVID-19 in Hotel Quarantine SettingsThe Review was chaired by Professor Allen Cheng (Deputy Chief Health Officer at Victorian Department of Health and Professor of Infectious Diseases Epidemiology at Monash University and Director of the Infection Prevention and Healthcare Epidemiology Unit at Alfred Health) alongside an independent expert panel comprised of:A/Professor Deb Friedman – Deputy Public Health Commander and Medical Director at Victorian Department of Health, Infectious Diseases Specialist at Barwon Health and Associate Professor at Deakin University,A/Professor Philip Russo– Director of Nursing Research, Cabrini Health and Associate Professor, Faculty of Medicine, Nursing and Health Sciences, Monash University, President of the Australasian College for Infection Prevention and Control (ACIPC).Professor Malcolm Sim AM – Professor, Head of the Centre for Occupational & Environmental Health in the School of Public Health & Preventive Medicine at Monash University, President of the Australasian Faculty of Occupational and Environmental Medicine, Royal Australasian College of Physicians. |
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# Abbreviations

AHPPC Australian Health Protection Principal Committee

CALD Culturally and linguistically diverse

CBD Central business district

CCTV Closed-circuit television

COVID-19 Coronavirus disease 2019

CQI Continuous Quality Improvement

CQV COVID-19 Quarantine Victoria

DH Department of Health, previously Department of Health and Human Services (DHHS)

DJCS Department of Justice and Community Services

DPC Department of Premier and Cabinet

EMD Electronic monitoring device

HCA Healthcare Australia

HEPA High efficiency particulate absorbing

HVAC Heating, ventilation and air conditioning

IPC Infection prevention and control

MoU Memorandum of Understanding

PAPR Powered air purifying respirator

PPE Personal Protective Equipment

QR code Quick Response code

SCV Safer Care Victoria

UV Ultraviolet

VHHSBA Victorian Health and Human Services Building Authority

VoC Variant of Concern

VUI Variants under investigation

# Executive Summary

## Context

1. This confidential Review of Management of Variants of Concern of COVID-19 in Hotel Quarantine Settings (the Review) was commissioned by the State Controller of Health.
2. This Review takes into account the epidemiology and characteristics of variants of concern (VoC) and draws upon recent reports, best practice models and interviews with experts to consider their implications on current quarantine arrangements.
3. Safer Care Victoria (SCV) has provided additional analysis on quarantine arrangements in Victoria based on recent COVID-19 transmission events, as has a Department of Premier and Cabinet review into alternative models of quarantine.
4. The Review provides recommendations on the management of hotel quarantine and the key features of quarantine models that minimise the risk of COVID-19 VoC transmission both in hotels and out to the community.

## Aims and methods

1. This review aimed to answer the following questions:

* Given the epidemiology of COVID-19 and VoCs, to what extent will hotel quarantine be able to reduce the risk of transmission in-hotels and out to the community?
* What would be the features of the most effective model of quarantine for VoC in Victoria?

1. To consider the principles and desired outcomes of a high-quality quarantine system, methods included both interviews with key informants and reviews of literature and previous reports on the standards and operations of current quarantine models, alternative models and enhancements.

## Main messages

1. The hotel quarantine system has reduced the risk of importation of SARS-CoV-2 into the Australian community with continuous improvements and refinements implemented over time. As a result, the escape of a highly transmissible respiratory pathogen from hotel quarantine is a low-probability (but high-consequence) event.
2. VoCs have emerged worldwide. They appear to be more transmissible and associated with higher viral loads. Additionally, vaccines may not be as effective against VoCs as they are against wild-type strains. However, other features of these variants appear to be similar, including the incubation period and modes of transmission.
3. The impact of VoCs has changed since they were first reported in Victoria in December 2020. Since early February 2021, all COVID-19 cases reported in hotel quarantine have been due to VoCs.
4. Some form of quarantine will probably be required until COVID-19 is no longer an issue of major public health significance in Victoria (at least until the end of 2021, unless there are major advances in treatment or prevention). The required capacity and future quarantine policies after that time are difficult to predict at this stage.

The rollout of vaccination to hotel quarantine workers, followed by international arrivals and the broader community, is likely to reduce the need for an ongoing quarantine program and the risk to the community.

It is not possible to eliminate risk completely from any quarantine system, but the hierarchy of controls is an established framework to consider hazard controls. Additional controls, including vaccination, engineering (particularly ventilation) and administrative controls as recommended in the review undertaken by SCV should reduce the risk of transmission of SARS-CoV-2 within hotel quarantine and from hotel quarantine to the community.

As effective controls have largely reduced transmission by other pathways, recent interest has focused on the controls required to mitigate aerosol transmission.

Organisational factors, including governance, accountability, a culture prioritising safety, continuous quality improvement, monitoring, evaluation and reporting are vital to ensuring safety.

If properly designed, alternative quarantine arrangements could improve several aspects of quarantine, including resident and staff health and wellbeing, infection prevention and control, clinical care, and security. However, these arrangements will take some time to implement.

## Findings

* Many reports and guidelines have reviewed hotel quarantine arrangements in Australia and Victoria. Themes across most reports, reinforced by interviews with key informants, have included the:
  + importance of strong governance, leadership and management
  + need to employ the full hierarchy of controls, particularly engineering controls, to reduce the potential for aerosol transmission
  + importance of systems that facilitate continuous improvement, including monitoring, evaluation and reporting in reviewing and refining hazard controls
  + need to address health needs of residents and enhance their experience more broadly, such as their mental health and wellbeing.
* Many aspects of the hotel environment are not ideal for accommodating residents, particularly infection prevention and control, and resident wellbeing.
* Vaccination of staff and the higher tiers of the hierarchy of controls are likely to be the most effective measures to prevent the incursion of COVID-19 into the community.
* Hazard controls need to be supported by organizational factors that promote their implementation, including strong governance, a safety culture, continuous quality improvement and robust monitoring and evaluation.
* While a detailed examination of the management and culture of COVID-19 Quarantine Victoria (CQV) was not within the scope of this review, informants noted that, as a new agency, CQV needs time to establish all the appropriate systems and processes and develop a culture focused on health and safety. CQV drawing upon existing guidance and policy documentation, and utilising expertise from acute health services and public health units will facilitate this.
* A range of alternatives to the current hotels may be feasible for selected cohorts, including home quarantine, other existing facility types (such as serviced apartments) and purpose-built quarantine facilities.
* Alternative quarantine arrangements could improve aspects of quarantine, including resident and staff health and wellbeing, infection prevention and control, clinical care and security if properly designed.
* The Howard Springs Quarantine Facility might be regarded as a reference standard model; although the infrastructure and environment presents many advantages for resident wellbeing and the prevention of transmission, some limitations have been identified that should be considered in future purpose-built facilities.
* Differing models of quarantine based on different levels of risk would introduce over time.

## Recommendations

1. That hotel quarantine can resume safely once the following key priority areas have been addressed:
   1. At least the first dose of vaccine is provided to resident-facing hotel quarantine workers
   2. CQV have responded to each engineering and operational recommendation of the SCV report, where necessary with advice from appropriate experts
   3. CQV have advised on a phased timetable allowing for the completion of the above actions and operational considerations.
2. That CQV:

* Develop responses to the other recommendations of the interim SCV report focused on governance and culture with monitoring of progress against implementation
* Ensure that the occupational health service comprehensively supports worker health and safety
* Ensure clarity in delineating the roles and responsibilities of CQV and the Department of Health in the Memorandum of Understanding, and clearly identify designated decision makers and that where the appropriate expertise exists, the Department of Health will provide timely and appropriate advice.
* Perform a review of the governance of CQV, specifically accountability mechanisms that facilitate consideration of strategy, risks, monitoring and evaluation and strengthen a culture of safety.

1. That the Victorian Government consider the three options for future quarantine arrangements:

* Option 1: Strengthen existing hotel model
* Option 2: Hybrid model of hotel and other types of accommodation
* Option 3: Quarantine in purpose-built facilities or other identified fit-for-purpose facilities. These should be based on the following principles in formulating the design specifications of purpose-built facilities:
  + Protection of the community from the spread of infectious diseases from infectious persons coming to Australia from overseas, taking into account VoCs that appear to be more infectious.
  + Ensuring the health and well-being, and mitigating the impacts of quarantine on residents.
  + Ensuring resident and worker safety from infections and other hazards.
  + Meeting the requirements of Victorian Charter of Human Rights

1. That a permanent system be put in place to ensure that safe, effective quarantine can be provided into the future, even if the need to quarantine for COVID-19 ceases. This functional capacity could be managed by CQV in its current form or by another governmental agency or department with health and logistical expertise.

# Introduction

Since the first reports of a new respiratory infection emerged in late 2019, the COVID-19 pandemic has spread quickly throughout the world. Victoria has experienced two major waves of COVID-19; the first was mainly due to returning Australians who had acquired infection overseas and their close contacts; the second occurred after a failure of hotel quarantine resulted in widespread community transmission. In recent months, community transmission has been largely absent throughout Australia with quarantine systems in all jurisdictions mostly successful in preventing incursion of SARS-CoV-2 into the community. However, several failures have occurred in hotel quarantine in jurisdictions across Australia resulting in small community outbreaks.

Increasingly, international arrivals to Victoria are testing positive with variants of SARS-CoV-2, which have genetic changes in the viral sequence of virological, immunological, clinical or epidemiological significance. While the evidence base is still emerging on the epidemiological characteristics of these variants of concern (VoC), overseas evidence suggests that they are more infectious and therefore are likely to spread more rapidly in an outbreak.

Within Australia, there have been several instances where the COVID-19 virus has been transferred to workers and to other travellers in hotel quarantine and triggered outbreak management arrangements, including a recent case in Victoria requiring a five day statewide lockdown.

## Context of this review

Following the emergence of VoC and the recent outbreak in Victoria stemming from hotel quarantine, the State Controller of Health, Professor Euan Wallace, commissioned this confidential rapid review that commenced on 22 February 2021 and was completed on 12 March 2021. It provides additional information to complement two concurrent reviews conducted by Safer Care Victoria (SCV) and the Department of Premier and Cabinet (DPC).

Safer Care Victoria have undertaken a rapid review[[1]](#endnote-2) to:

* Understand what has been learned from recent transmission events in COVID-19 Quarantine Victoria (CQV)
* Identify strengths (as opportunities for further promulgation/scaling) and improvement opportunities (requiring immediate action) in infection prevention and control for CQV
* Identify and prioritise aspects of CQV systems and processes that require more in-depth review and analysis.

At the time of writing, interim recommendations had been submitted, but there were ongoing discussions with CQV regarding their feasibility and relevance.

DPC are investigating alternative models of mandatory quarantine, including a purpose-built accommodation hub outside of the Central Business District (CBD), to address the changing threat of new infectious, fast-moving strains of coronavirus. The project will:

1. Identify and assess suitable sites to locate and construct alternative quarantine accommodation.
2. Develop specifications, cost estimates and delivery timelines.
3. Consider whether alternative quarantine accommodation should be used in conjunction with hotel quarantine locations in the CBD, or as a stand-alone facility.
4. Consider options to scale down and/or repurpose the alternative quarantine accommodation in the long term.
5. Provide advice about the feasibility, benefits and value for money of alternative quarantine accommodation.

## Terms of Reference

The Review addresses two questions:

* Given the epidemiology of COVID-19 and VoCs, to what extent will hotel quarantine be able to reduce the risk of transmission in-hotel and out to the community?
* What would be the features of the most effective model of quarantine for VoC in Victoria?

Key issues to be considered:

* What lessons can be drawn from best practice examples of quarantine?
* What are the infrastructure, staffing, process, environmental, infection prevention and control or other measures that mitigate the risks of an escape of COVID-19 from quarantine?
* What do the epidemiological characteristics of the variant strains of COVID-19 mean for the quarantine model?
* How will vaccination, initially of those working in the quarantine system, and later of international arrivals, likely impact on quarantine arrangements in the medium term, and longer should quarantine continue to be required for COVID-19 or other respiratory infectious diseases?
* What would ‘best practice’ quarantine provision look like in Victoria?

### Approach

The review was guided by a panel of experts and conducted through analysis of available evidence and interviews with key informants. It draws on best practice examples from interstate and overseas as well as considering existing quarantine reviews and guidelines.

The full Terms of Reference and an outline of the Methods are provided in Appendix B and Appendix C respectively.

### Limitations

Apart from a field visit by a Panel member to Howard Springs, this was primarily a desktop exercise supplemented by interviews with key informants. In the limited time available to perform this review, several important aspects could not be considered. Apart from one informant who had spent time in quarantine, the Panel was not able to speak to former or current residents of hotel quarantine. The Panel was not able to interview staff or explore the governance, culture or other organisational aspects of CQV in depth. As SCV has performed a rapid review of infection prevention and control measures, specific practices and incident reviews were not explored in this review. Quarantine, as a public health intervention, should also consider the cost-effectiveness of the hotel model and its alternatives, and this was not considered in this review.

# Background

## Current hotel quarantine arrangements in Victoria

In Victoria, following the Coate Inquiry[[2]](#endnote-3) a single agency was established to oversee the mandatory hotel quarantine program. This agency, CQV, is accountable to the Minister for Police, and is supported by several departments and agencies, including the Department of Health, Department of Justice and Community Safety (DJCS), Victoria Police and Alfred Health. The establishment of CQV has allowed for a single governance structure including an infection prevention committee (with membership of all agencies), a single set of guidelines for staff of all agencies and a contact tracing team (New Case and Contact Team, NCCT).

Arriving passengers are transported to hotel accommodation. Cases, people with symptoms compatible with COVID-19 and people with complex medical needs are accommodated in ‘health hotels' operated by Alfred Health. Passengers who are well are accommodated in quarantine hotels where a post-arrival testing schedule has been implemented to identify asymptomatic cases in addition to active surveillance for clinical illness. While all hotels are the responsibility of CQV, there is a distinction between the ‘health hotels' primarily staffed and operated by Alfred Health with the support of other agencies, and the quarantine hotels directly operated by CQV. Governance structures allow for the exchange of infection control recommendations, policies and audits across all hotels and agencies.

There is a focus on staff protection, with standardised training for all staff on commencement, and regular refreshers. Regular audits of hand hygiene, cleaning/disinfection, environment (such as the placement of personal protective equipment and hand rub) have been implemented. A zoning system is used to define personal protective equipment (PPE) requirements. In the ‘health hotels’, engineering reviews of the air handling system was performed by Alfred Health engineers[[3]](#endnote-4); changes were made to increase fresh air intake, the rate of airflow and to separate the intake from the outlet ducts.

There is a risk that staff working in hotel quarantine may become infected through contact with returned travellers. To reduce the risk of spread from hotel workers to the community staff are not permitted to work in other places, and on completion of contracts or secondments, staff cannot return to employment in sensitive settings (such as hospitals) for two weeks. Staff are tested frequently (weekly nose-throat swabs and daily saliva testing) to identify infection early to limit community exposure. Proactive contact mapping of staff has been implemented to identify household contacts who may attend high risk sites.

## Local transmission in Victoria

### From hotel quarantine to the community

Grout et al[[4]](#endnote-5) (unpublished data) reviewed the epidemiology of hotel quarantine failure in Australia and New Zealand (NZ) to 11 January 2021. He reported that New Zealand had identified seven cases in from 514 active cases in 96,510 travellers, a failure rate of 13.6 per 1,000 cases in quarantine. Australia had reported six failures from 3,024 active cases in 194,791 returned travellers, a failure rate of 2.0 per 1,000 positive cases in quarantine In Victoria, 17,032 people entered hotel quarantine between 7 December 2020 and 21 February 2021. This includes returned international travellers, voluntary support people, airline crew, arrivals related to the Australian Open and interstate travellers entering Victoria from red zones, but excludes those who entered community accommodation, emergency accommodation and frontline worker accommodation. Of these, 2,001 (11.7 per cent) were children (under 18 years of age) and 122 (less than 1 per cent) were more than 75 years of age. The weekly number of arrivals has varied from a high of 2,957 (week of 11 January 2021) to a low of 606 (15 February 2021) following a pause in international arrivals (Figure 1). During this time, 91 cases of COVID-19 have been reported in hotel quarantine, which represents 0.53 per cent of residents. The incidence of new cases has decreased since the implementation of pre-flight testing. During this time, Queensland (n=1), New South Wales (NSW) (n=3), South Australia (n=1) and Victoria (n=1) had reported failures, where Western Australia (WA), Tasmania, Australian Capital Territory (ACT) and Northern Territory (NT) had not reported any cases. Since that time, WA and Victoria have reported further quarantine failures.

It is noted that the risk profile of arriving passengers and potential incursion is likely to change following vaccination of hotel quarantine staff, arriving passengers and community.

***Figure 1: Number of arrivals and proportion with COVID-19, by week since 7 December, 2020***

Chart, line chart

Description automatically generated

### Within hotel quarantine

Since the resumption of hotel quarantine in December 2020, three transmission events have been reported from residents to other residents and from residents to staff. All three have been managed as outbreaks. All three outbreaks involved cases identified to belong to the B 1.1.7 VoC.

At the Park Royal Hotel,genomic analyses suggest a transmission event from a family with five cases (index family) to a resident staying in the room opposite. CCTV (closed-circuit television) footage identified that there was a significant period when the door to the family’s room was open while staff located in the corridor swabbed all family members. The resident in the room opposite was seen in the CCTV footage to open and close their door during this time. Doors may also have been opened simultaneously to collect meals. No further transmission events to the community were identified.

At the Grand Hyatt Hotel, genomic analyses suggest a transmission event between a resident and a staff member. The resident was accommodated in a room adjacent to the staff member’s central ‘station’ on the floor. It was reported that the resident may have exited the room to empty a bin at the central station. No further transmission events to the community were identified.

At the Holiday Inn Hotel, a total of 24 cases (including three index cases who were residents) resulted in transmission from residents to staff and other residents in the hotel setting. It was hypothesised that one staff member acquired infection in the foyer of the hotel during the process of transfer of known cases to the health hotel. An incident with a nebuliser was investigated as a likely source of infection for six other cases associated with this outbreak in the hotel setting.

## Variants of concern

### Global epidemiology

SARS-CoV-2, the virus that causes COVID-19, is constantly changing by mutation over time. Genetic variants may become more common because they spread in a population where transmission is more efficient or because they have characteristics that provide a selective advantage.

There are currently 3 main SARS-CoV-2 VoCs circulating worldwide[[5]](#endnote-6):

* 501Y.V1, or lineage B.1.1.7, first detected in the UK and now reported in 86 countries
* 501Y.V2, or lineage B.1.351, first detected in South Africa, now reported in 44 countries
* P.1, or lineage B.1.1.28.1, first detected in travellers from Brazil and reported in 15 countries

Public Health England[[6]](#endnote-7) has recently noted an additional VoC within the B.1.1.7 lineage (VoC 202102/02 defined by E484K), first detected in South West England. There are also several variants under investigation (VUIs).

VoCs have several epidemiological characteristics that are of concern. They appear[[7]](#endnote-8) to be more transmissible, based on the finding that [secondary attack rate](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/959360/Variant_of_Concern_VOC_202012_01_Technical_Briefing_3.pdf) are higher where index cases have infection with VoCs compared to those with wild-type infection. This may be due to both higher viral loads and a prolonged duration of infection. Early data also suggests that variants may be associated with more severe infection although this has not been found in other studies.

As a result of the greater infectivity and possibly severity of disease, the consequences of outbreaks with these variants are increased. They first came to attention in the United Kingdom (UK) where outbreaks continued to spread~~,~~ despite moderately strong public health controls that would have been sufficient to contain the spread of the wild-type virus. Modelling has suggested that variants are associated with an effective reproductive number (Reff) of up to 56 percent - higher than wild type[[8]](#endnote-9), implying that a greater proportion of transmissions need to be prevented to control outbreaks.

Immunological studies and early data from clinical trials suggest that vaccines may not be as effective in preventing infection due to two variants, B1.351 and P.1. Serum from people who were immunised appeared to have a lower neutralising activity against variants compared to wild-type virus[[9]](#endnote-10), although the overall response is considered to be protective. Clinical trials of the AstraZeneca/Oxford[[10]](#endnote-11) and Novavax[[11]](#endnote-12) vaccines in South Africa found impaired protection against the B.1.351 variant, although the estimates were associated with considerable uncertainty. The AstraZeneca/Oxford vaccine appears to be effective against the B.1.1.7 variant in clinical trials[[12]](#endnote-13).

Other epidemiological characteristics of infection from the new variants appear to be similar to wild-type infection. There are no data to suggest that the incubation periods are different. The shorter serial interval seen in the recent Victorian outbreak is likely to reflect a strong public health response with early case identification and isolation. It is likely that the mode of transmission is similar and therefore the measures required to prevent infection will be similar. While early reports in the UK suggested that the B.1.1.7 variant may be more infectious for children, further studies suggest that this may not be the case.

### Incidence in Australia

In Australia, 93 cases due to B.1.1.7 and 18 cases due to B.1.351 were [reported](https://www1.health.gov.au/internet/main/publishing.nsf/Content/1D03BCB527F40C8BCA258503000302EB/$File/covid_19_australia_epidemiology_report_35_reporting_period_ending_14_february_2021.pdf)[[13]](#endnote-14) between 30 November 2020 and 14 February 2021. No cases of the P.1 variant have been reported in Australia.

On 11 December 2020, the first case found to belong to a variant of concern was diagnosed in Victoria in hotel quarantine. Since then, a total of 59 notifiable cases of COVID-19 with a VoC have been reported to the Department of Health. These cases have been identified as overseas acquired infections, due to transmission within hotel quarantine and as a result of community acquisition. Of these 59 VoC cases, 58 were due to B.1.1.7 and one due to B.1.351.

Between 11 December 2020 and 26 February 2021, 138 cases of COVID-19 have been notified in Victoria (Figure 2). Of these, 91 cases were international travellers in hotel quarantine, 44 of which were due to a VoC. Concerningly, five of the 44 cases due to VoCs are believed to have acquired their infection whilst in quarantine. Since 3 February 2021, all cases in hotel quarantine have been associated with a VoC.[[14]](#endnote-15)

Of the 47 cases were identified in the Victorian community outside of hotel quarantine, 15 cases were due to a VoC and were associated with hotel quarantine outbreaks (Holiday Inn and Grand Hyatt), 29 cases were closely related to publicly available sequences from NSW cases (including those associated with the Black Rock outbreak). The remaining three cases are either pending sequencing or had a sample that failed sequencing.

***Figure 2: Variant of Concern status for all cases of COVID-19 notified in Victoria since 11 December 2020 by diagnosis date (Source: MDU COVID-19 genomics report)***

Chart, bar chart

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## Future quarantine requirements

Major determinants of the risk of community incursion are factors external to the hotel quarantine system. This includes the number of arriving passengers and the epidemiology of COVID-19 in their countries of origin. The global epidemiology is changing rapidly, reflecting improved public health control (such as population-level restrictions on movement), the rollout of vaccines in some countries, and possibly seasonal factors in the northern hemisphere.

Several key unknowns remain, particularly the impact of vaccines on transmission and the spread of the variants of concern. It is likely that vaccination coverage will vary between countries, and that vaccines will be found to reduce but not eliminate transmission. Vaccines may also vary in effectiveness depending on the type, and the epidemiology of VoC.

Several scenarios are possible that may affect the ongoing requirement for quarantine. It is possible that quarantine or other public health measures may not be required if widespread vaccination in the Australian population reduces the morbidity and mortality of COVID-19 to a low level. This would be unlikely before the end of 2021, barring a major advance in treatment or prevention. Conversely, if vaccine protection against new variants of concern is limited and these variants become the dominant strain, ongoing quarantine for all arrivals may continue to be required to prevent the importation of these variants.

It is likely that some quarantine will be required for as long as COVID-19 remains a significant threat to public health. However, the stratification of arriving populations based on risk or other factors may be possible, and that different models of quarantine may be deemed appropriate for different levels of risk or the type of population. It is noted that this may be difficult to implement and adapt in rapidly changing circumstances.

For example, stratification to home quarantine (or even no quarantine) may be possible for those who are vaccinated (and which can be demonstrated by­ ‘vaccine passports’). Although concerns have been expressed about the effectiveness of vaccines against transmission, emerging evidence suggests that there is an overall reduction in the risk of infection, and breakthrough infections are associated with a lower viral load and therefore reduced infectivity. However, this would require the co-operation of international governments, require a mechanism to verify vaccination type and status and be free from external manipulation.

The current ‘green' and ‘red’ zoned countries may be stratified into high, medium and low risk countries. Such alternative arrangements have been proposed for seasonal agricultural workers from Pacific Island countries and territories (except Papua New Guinea), where the risk of COVID-19 in most countries is felt to be low. For example, ‘on-farm' quarantine has been implemented for seasonal agricultural workers in some jurisdictions.[[15]](#endnote-16) More recently, 'in country' quarantine (in hotels in the country of origin, with monitoring by Australian officials) has been proposed but not supported. However, concerns remain about the potential for undetected changes in epidemiology as surveillance capacity is weak in this region.

Stratification may be based on other cohort definitions. Sportspeople and their support staff participating in the Australian Open were accommodated in hotel quarantine with some limited modifications to permit training and was funded by Tennis Australia. Special arrangements were [proposed](https://www.abc.net.au/news/2020-06-18/international-uni-students-could-return-to-canberra-proposal/12366876) in June 2020 for international students to quarantine in Canberra hotels funded by two ACT universities[[16]](#endnote-17), but this trial was cancelled following the resurgence of cases in Victoria.

Stratification to different models of quarantine may also be based on special needs. These could include families with small children (who may require more space, self-contained facilities with kitchen/laundry and outdoor space), people with complex health needs and/or disabilities (currently accommodated in a ‘health hotel’), people with mental health issues and people with other vulnerabilities (such as potential domestic violence and food allergies).

A discussion about the challenges of maintaining different models of quarantine is outlined below.

***Table 1: Potential cohorts***

|  |  |  |
| --- | --- | --- |
| Cohort | Definition | Comments |
| Vaccination | 'Vaccine passports’ | Currently uncertain if vaccines prevent transmission |
| Country of origin | High, medium or low risk countries reflecting current epidemiology in country of origin or transit | NZ (except Auckland) currently green, not requiring quarantine. Most Pacific Island nations probably low/medium risk but epidemiology may change rapidly |
| Worker/student type | Seasonal agricultural workers  International students  Professional sportspeople or artists  Flight crew | Potential for Charter challenge if no public health basis for different measures for different cohorts  Existing exemption for Victorian resident flight crew to quarantine at home |
| Special requirements | Families  Medical or mental health issues  Disabilities  Other vulnerable populations | Existing Victorian model includes ‘health hotel' for those with complex needs.  NSW has special arrangements for families and people with mental health issues |

# Best practice in quarantine programs

Several systematic reviews capturing research on quarantine in the context of COVID-19 were published at the end of 2020[[17]](#endnote-18),[[18]](#endnote-19),[[19]](#endnote-20),[[20]](#endnote-21),[[21]](#endnote-22) and a number of studies are currently underway or ready for publication[[22]](#endnote-23), however none consider the effectiveness of factors intrinsic to quarantine programs that facilitate or hinder successful reduction of viral transmission. While quarantine was found to be ‘important in reducing incidence and mortality during the COVID‐19 pandemic’ and ‘early implementation of quarantine and combining quarantine with other public health measures is important to ensure effectiveness’ we were unable to find any published research to inform design of quarantine facilities or delivery of quarantine programs.

In the absence of evidence from research, the recommendations from existing reviews of quarantine have been collated and integrated with findings from interviews conducted for this review with key informants who have knowledge and understanding of current quarantine practices across Australia to establish a set of criteria for best practice in quarantine programs.

A preliminary frameworkhas been developed to present the findings in a structured way and to identify where there may be gaps in evidence or understanding of best practice in some aspects of quarantine programs (Figure 3).

***Figure 3. Considerations for design and delivery of ‘best practice’ in a quarantine program***

Text

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The components are drawn from frameworks in other health settings. The ethical framework and generic organisational factors have been adapted from an evidence-based framework for decision-making,[[23]](#endnote-24) the health and wellbeing factors have been taken from the Operation Soteria Plan,[[24]](#endnote-25)  and the hierarchy of controls are from a recent COVID-19 context in Australia. As more is learnt about the factors contributing to effectiveness of quarantine programs this framework could be revised for future use.

## 1. Underpinning principles

### Legislative framework

Quarantine is addressed in both Commonwealth and State legislation. All decisions and actions related to quarantine must be conducted within this framework. A summary of the legal basis for quarantine and exemptions in Australian is provided in the Halton Review Appendix H.

### Ethical framework

The ethical principles within the evidence-based framework for decision-making relevant to quarantine include justice, fairness, equity, access, legality, honesty and privacy. These are detailed in Appendix D.

#### Human rights

It is fundamental that all persons in mandatory quarantine should be treated with dignity and respect.

Policies and practices guiding decisions made about people in mandatory quarantine in Victoria must consider the Victorian Charter of Human Rights and Responsibilities25 as summarised in Appendix P.

The Victorian *Charter of Human Rights and Responsibilities Act 2006* (the Charter) contains twenty basic rights that promote and protect the values of freedom, respect, equality and dignity.[[25]](#endnote-26) The Charter requires the Victorian Government (state and local) to consider human rights when they make decisions about people.

While some of these rights may be restricted for quarantined people, consideration of these rights must underlie all decisions in relation to people in mandatory detention.

The Charter rights likely to be engaged include:

1. equality before the law
2. right to life
3. protection from cruel, inhuman or degrading treatment
4. freedom of movement
5. privacy
6. freedom of thought, conscience, religion and belief
7. peaceful assembly and freedom of association
8. protection of families and children
9. cultural rights
10. right to liberty and security of person
11. humane treatment when deprived of liberty

Section 19(2) outlines the distinct cultural rights of Aboriginal persons.

#### Diversity

Consideration should be given to the special needs of Aboriginal and Torres Strait Islander peoples, people from culturally and linguistically diverse (CALD) backgrounds; lesbian, gay, bisexual, trans, gender diverse and intersex people; people with disabilities, and others.

Further details of screening for, and meeting the needs of, people with disability, language or cultural differences, and Aboriginal or Torres Strait Islander heritage are provided in the Operation Soteria Plan.

### National and international standards

The need for auditing and quality improvement are raised in reports and interviews as high priorities for improving current quarantine programs. However, the lack of agreed definitions, a national minimum dataset and national standards are barriers to using monitoring and evaluation for benchmarking, research and learning from other jurisdictions.

### ‘Safety’ culture

The importance of a culture of safety is one of the strongest messages from the reviews and interviews. This is described as a culture that prioritises safety and safe practices, and facilitates feedback on potential improvements from all staff within the organisation.

The Coate Inquiry and Grand Chancellor Report[[26]](#endnote-27) both recommended creating cultures of safety and ‘speaking up’ in quarantine hotels. This should include open discussion around mistakes, training to speak up assertively, and team-based quality improvement. By creating a culture where people feel comfortable to raise concerns, the safety of staff and the community could be improved.

Several informants noted that safety cultures existed within the "health hotels” in NSW and Victoria and that no transmissions had occurred from these facilities despite the high-risk nature of the residents. ‘Health hotels' are overseen and operated by acute health services where considerations of safety, and awareness of infection and other health risks, underpin all activities. These factors may not be as familiar to quarantine staff who have not worked in healthcare facilities.

## 2. Strategic factors

### Strategic planning

Current quarantine infrastructure, systems and processes have been developed in response to the urgency of a global pandemic. Due to necessity, decisions have been reactive to needs and problems as they emerged. While understandable in this context, high operational demands may not have allowed for strategic thinking and forward planning.

Commissioning of the three current reviews by the Victorian government is a first step in developing a proactive, strategic approach. As the quarantine structures and processes mature, problems are resolved and best practice is embedded, strategic planning activities should be integrated into the decision-making systems.

### Shared data and information

In a situation where there is no evidence to guide and direct strategic decision-making, being able to learn from others is vital. Sharing information with the national and international community by publishing assessments, decisions, project initiatives and research activities would facilitate learning and avoid duplication of effort and repetition of mistakes. The Australian Health Protection Principal Committee (AHPPC) guidelines has recommended a ‘community of practice' to facilitate sharing of lessons learned.[[27]](#endnote-28) This can be found summarised in Appendix E.

### Risk analysis

Risk assessment is being carried out regularly at an operational level in current quarantine programs. However, as priorities change and more proactive decisions can be made about the nature and delivery of quarantine, risk analysis can be factored into strategic planning.

The standard four-step approach is to identify hazards that could cause harm; assess risk to understand the nature, seriousness, and likelihood of it happening; control risk by implementing effective control measures; and review hazards and control measures to ensure they are working as planned. These steps could be undertaken as part of strategic deliberations to determine risk in the quarantine program as a whole and inform future policy decisions.

## 3. Health and welfare factors

Looking after the health, mental health and wellbeing of returned travellers was a recurring theme from the reports and inquiries. The Operation Soteria Plan contains a full set of standards for health and welfare including screening and follow up of risk factors, provision of health and welfare services, health promotion and preventive care and security of medical records.

All care provided during hotel quarantine should be accessible, culturally sensitive, timely and regular. All information provided to individuals should ensure understanding, be easy to access, be easy to read and should be available in other languages to cater for linguistically diverse guests.

Regarding general health, all quarantine hotels should have plans and protocols in place for providing care to individuals with complex medical needs. Regarding mental health, all quarantine hotels should have psychosocial supports available and should conduct wellbeing checks regularly in a proactive manner.

In regard to general wellbeing, hotel quarantine facilities should facilitate safe entertainment activities (such as social interactions, games, music, trivia), exercise for visitors and fresh air breaks. One study recommended that exercise and smoking areas be individual and not shared between different users, to eliminate mixing of cohorts.

## 4. Organisational factors

### Governance

The evidence-based framework for decision-making includes transparency, accountability, authority, enforcement/compliance, sound management and quality improvement. Application of these principles are outlined in Appendix D.

#### Transparency, accountability and authority

The AHPPC, SCV CQV Report, Coate Inquiry, and Halton Report all recommend that hotel quarantine be conducted in a manner where accountability and lines of authority are well-defined and there is clear delineation of roles and responsibilities. These can be found in Appendices E, F, G and H respectively. The Coate Inquiry recommended that in Victoria, hotel quarantine be operated by a single government department, which would take ultimate responsibility for the task, with other departments being used for support as necessary.

#### Compliance

In the quarantine context, this can be related to compliance of people in quarantine to the restrictions imposed upon them or to staff working in quarantine facilities. Compliance of people in mandatory quarantine is addressed in the relevant legislation (above) usually in the Public Health Directions. Many strong messages regarding compliance of staff are reported, all related to infection and control practices which are discussed in detail below. Training is a key component influencing staff compliance and is discussed in the Hierarchy of Controls below.

#### Continuous quality improvement

Continuous quality improvement (CQI) had been identified from multiple sources as crucial to the success of quarantine. There is a need to learn from current practice, emerging evidence and the experience of others to improve programs and services. Ongoing review of safety systems in light of new and emerging evidence is one particular example noted.

CQI is closely linked to several other topics of recommendations discussed herein – monitoring and evaluation, reporting, data and information sharing, access and utilisation of evidence, benchmarking, training, etc.

Quality assurance has also been highlighted and recommendations include the need for end-to-end assurance mechanisms embedded into hotel quarantine practices.

### Structure

The elements of structure are a systematic approach, integration and alignment, monitoring and evaluation, and reporting. Application of these principles are outlined in Appendix D.

#### Integration and alignment

The Halton review notes that a lack of integrated data within many jurisdictions is an issue. The absence of a single view of people in quarantine can result in preventable errors, particularly in follow up and testing, but also with resident’s experiences in the quarantine journey.

#### Monitoring, evaluation and reporting

Along with governance and CQI, the need for ongoing monitoring, evaluation and reporting is highlighted as a key requirement for effective quarantine. A robust auditing process is proposed to underpin this. Most auditing has been focused on some aspects of infection prevention and control measures, but respondents note the need for auditing of all aspects of quarantine, preferably based on national standards.

### Process

The elements of process from the framework for decision-making are explicit criteria, use of intelligence, consistency, appeals and complaints, and communication. Application of these principles are outlined in Appendix D.

#### Use of intelligence

Rigorous, trustworthy and accessible processes for use of local data, public health data, research and other publications, resident and staff feedback, etc are necessary to enable evidence-informed decisions and continuous quality improvement.

Quarantine decision-makers need clear lines of communication with sources of epidemiological and genomic data such as public health units, public health labs, researchers, other government departments, etc. Emerging evidence, such as the strengthening evidence supporting aerosol transmission and its controls, needs to be incorporated into guidelines.

#### Consistency

Victorian respondents have highlighted problems with inconsistent advice from multiple sources and lack of clarity around the appropriate authorising authority on certain matters. It is important that policies, procedures and guidelines are clearly documented, readily accessible and internally and externally consistent.

#### Appeals and complaints

Mechanisms need to be in place for people in quarantine to appeal decisions made regarding their detention, exemptions, etc and to address infringements of their rights.

Processes for assessing satisfaction and receiving and addressing complaints should also be established. A feedback and complaints process can provide unique information about the needs of quarantined persons and the quality of care provided. Openly discussing feedback and concerns helps staff to understand strengths in their service, potential problems, and how to make improvements.

Timely decision-making, review processes and complaints mechanisms should also be made available for staff for the purpose of escalating concerns and issues.

These factors also inform continuous quality improvement.

### Stakeholder involvement, Resources and Enablers

Stakeholder involvement includes engagement with staff, residents, experts and others who can inform all aspects of the quarantine process. Additionally, support from relevant agencies and departments is required and may need to be formalised by contracts or memoranda of understanding.

Resources required for a successful and sustainable program are funding, time, expertise, information, methods and tools.

Enablers noted in the evidence-based framework for decision-making are leadership, commitment, influence, support, readiness for change and a favourable environment. The need for strong leadership has been stressed by informants, as well as support from other departments and agencies.

## 5. Hierarchy of controls

Short of completely sealing the international borders, no human system can completely eliminate the risk of SARS-CoV- 2 escaping from quarantine. All humans make errors. However, risks can be mitigated by putting in place layers of protections, which reduce risks by ensuring that if one layer of protection fails through a weak point, further layers of protection will stop an adverse event, unless weak points in all layers of protection line up. This is the so-called ‘Swiss cheese’ model of risk mitigation first proposed by psychologist [James Reason](https://pubmed.ncbi.nlm.nih.gov/10720363/)[[28]](#endnote-29) and which has been adapted for health systems including the context of COVID-19 (Figure 4).[[29]](#endnote-30)

***Figure 4: Illustration of the "swiss cheese" model of protections and the hierarchy of controls***

Diagram

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A commonly cited model which adopts this approach for reducing risks is the hierarchy of hazard controls, where risks can be controlled by a combination of measures that eliminate or reduce the hazard at the source; reduce the risk through substitution, isolation or engineering; using administrative controls such as safe systems of work; and using appropriate personal protective equipment. Employing multiple layers of control, even if each is imperfect, results in an overall safer system.

Protections higher in the hierarchy of controls are more likely to be effective, and recent reports have focused on ventilation and airflow. It is imperative that there is an ongoing process of review of these protections in light of new evidence, and monitoring and evaluation of current protections.

A list of other potential controls is detailed below.

***Table 2: Existing and potential controls to prevent transmission of SARS-CoV-2 in hotel quarantine***

|  |  |  |
| --- | --- | --- |
| **Level** | **Existing controls** | **Potential future enhancements or models** |
| **Elimination** | Pre-flight testing  Limits on arrival numbers  Frequent testing of staff  Frequent testing of residents | Further limits on arrival numbers  Vaccine passports (if effective) |
| **Substitution** |  | Home quarantine with apps to ensure compliance  Biomonitors to reduce staff contact |
| **Engineering** | Ventilation and airflow  Separation of cases into separate hotel  Separation of staff zones from resident zones  ‘Buffers’ around cases | Air filtration devices  Purpose built facilities |
| **Administrative** | Workflows to limit contact with other staff and residents  Workplace bubbles  Training and education  Auditing and quality improvement | Additional auditing and feedback  Staffing number and skill mix |
| **Personal protection** | Personal protective equipment  Fit-testing and fit-checking | Vaccination |

### Elimination

Examples of controls for elimination of hazards include limiting arrival numbers and pre-departure testing and/or vaccinations. Further discussion of these factors is beyond the scope of this review.

#### Testing strategy for staff and residents

Several of the reports and inquiries discussed testing strategy, including the types of tests used, testing timing and testing frequency.

The general consensus was that pre-departure (or pre-arrival) testing could reduce the risk of COVID-19 importation but not fully eliminate it. While national directions mandate testing no more than 72 hours before departure, there is still a window of time in which an individual could begin shedding the virus, without testing positive.

In regard to post-arrival testing, it was identified that the timing of testing has an impact on the risk of COVID-19 going undetected. The Burnet Institute Report[[30]](#endnote-31) recommends optimising the testing regime with an enhanced testing strategy to minimise this risk. A summary of this report can be found in Appendix L. This enhanced strategy should include two tests near the end of quarantine regardless of the duration of quarantine. Similar to the Burnet Institute recommendations, Safer Care Victoria recommends increasing the frequency of testing on arrival, as well as further testing on days 3, 7, 11 and 14.

In regard to staff testing, the Coate Inquiry and Estimating Failure Risk study[[31]](#endnote-32) (summarised in Appendix I) recommended that all on-site staff and personnel undergo daily saliva testing and weekly nasal swab testing. The Coate Inquiry also recommended that family and household members of these personnel be given support to access voluntary testing on a weekly basis.

### Substitution

Home quarantine, where interactions with other staff are minimised, might be regarded as a form of control by substitution. This model of quarantine has been recommended by a number of reports, including the Halton report and the Coate Inquiry. However, this may also require technological enhancements to ensure compliance, and may not eliminate risk.

#### Biomonitors and trackers

Biomonitors allow for remote monitoring, substituting for face-to-face contact to measure observations. One type, “Bioformas” is used in the Howard Springs Quarantine Facility with high uptake.

SCV and others recommended reviewing QR code and Bluetooth technology to track staff movement which could then be mapped and analysed to reduce infection risk. One study suggested that Bluetooth tracking be mandated for all staff members and that the government should review the use of these applications for travelers (to be used in evacuations from facilities). Technologies already exist for use of staff movement in health care facilities to monitor hand hygiene and other biomonitoring projects are in development.

### Engineering

A number of recommendations were made in regard to the design and engineering of hotel quarantine facilities, most of these focused on ventilation. A large number of recommendations on ventilation and airflow stemmed from the hotel case inquiries. These include the Peppers Waymouth Reportsummarised in Appendix K[[32]](#endnote-33), Grand Chancellor Report summarised in Appendix J, and the SCV CQV Report summarised in Appendix F.

These recommendations included:

1. Developing and implementing a minimum engineering and ventilation standard for all hotels, supported by necessary building upgrades and facilities management training.
2. Changing the Building Management System setting to run the outside air supply 24/7.
3. Improving air flow from the corridor room into the hotel room and ensuring all guest rooms have adequate seals and building exhaust fans are set to high.
4. Undertaking regular maintenance of hotel heating, ventilation and air conditioning (HVAC) systems.
5. Recommending hotel rooms do not use fans or blow heaters.
6. Leaving rooms vacant as ‘buffers’ around hotel rooms housing more than three residents.
7. Use carbon dioxide (CO2) sensors for simple assessments of air exchange in hotel rooms. Readings over 1,000ppm (parts per million) indicate insufficient air movement and should trigger an immediate review of the ventilation in that room.

Informants identified that hotel selection and assessment processes would be valuable. An airflow engineer felt that in room air filtration could reduce the risk of aerosol transmission significantly, based on work on mitigation strategies in hospitals. Ventilation systems at a building level was important, but localised scenarios that disrupt airflow may be more amenable to localized in-room filtration strategies. Several factors needed consideration, including the size of the room, and the number, type and placement of air purifiers in each room, as well as position of the air intake in the unit. Other practical issues to consider include noise, the potential for residents to interfere with their operation, and requirements for filter changes and cleaning of units. These are being actively considered in several jurisdictions with hotel quarantine programs, including in Victoria.

Informants also noted that limitations of the hotel environment related to space. Large families could not always be separated (e.g. single parent families) and children required additional space to play. Alfred Health has found it challenging to implement recommendations in response to the variants of concern to reduce the density of residents. Additionally, several areas were required for staff activities, including handover, agency meetings, entry point screening, fit testing and vaccination. There would be some value in being able to observe guests without having to enter the room (e.g. to check on sleeping unaccompanied children or elderly residents with dementia).

### Factors with implications across levels of control

#### Infection prevention and control

There were several recurring themes in relation to infection prevention and control (IPC) in hotel quarantine. These included IPC management, process level changes, compliance and workforce management, training and culture (which is discussed separately below).

##### IPC management

The AHPPC guidelines and Coate Inquiry both recommend establishing dedicated IPC units within each hotel, that understand the hotels themselves as well as IPC best practice.

##### IPC Process

Process level recommendations arising from outbreaks in SA, Queensland, and Victoria include:

* Increasing cleaning of surfaces and high-touch points outside of guests’ rooms (such as elevator buttons and guest door handles).
* Improving the use of clean trolleys when delivering/collecting food, and reducing the mix of dirty and clean items.
* Reviewing cleaning procedures (including deep-cleaning initiation) and adopting consistent procedures across all quarantine hotels.
* Implementing environmental surveillance post deep-clean, including supervision, monitoring, auditing and environmental sampling.
* Commencement of N95 respiratory fit-testing.

##### Compliance

Compliance with IPC measures by staff and travellers was also a recurring theme for reports into hotel outbreaks.

* PPE be distributed with clear and accessible directions, and that adherence be monitored strictly.
* For resident-facing staff, fit-testing should be undertaken to ensure that PPE is safe and appropriate to use.
* CCTV be installed in hotel quarantine facilities to track movements on guest floors and in other critical areas.
* CCTV be used as a measure to minimise staff presence on quarantine floors.
* Information and signage for guests should be clear, and the requirement for guests to wear masks when opening their doors should be enforced.
* Unannounced audits of activities be undertaken to ensure compliance with IPC processes and process level changes.

#### Technology

Technology is a broad theme arising from the reviews. Biomonitors are discussed in the Substitution section, building/facility technologies (such as HVAC) are in the Engineering section, and infection control technologies (such as PPE) are in the Infection prevention and control (IPC) section.

In addition to engineering controls discussed above, informants also noted the use of CCTV both in monitoring compliance, as well as in reviewing incidents.

#### Staff issues

Staffing issues were also common themes across the reviews and interview responses. These themes also relate to a ‘safety culture’ and the ability to comply with requirements, particularly IPC practices.

##### Training

Staff training was identified as being crucial to safe hotel quarantine. Large numbers of new staff are employed with no experience in infection control. Many of the recommendations focused on staff training in regard to IPC, in particular mandatory training, creating staff bubbles (staff cohorts that limit the number of close contacts), and using individuals with IPC qualifications to train their peers.

##### Recruitment, retention and workforce fatigue

Several informants noted limitations related to staffing. As a new organisation, challenges have been experienced in resident-facing staffing as well as ‘back office' functions, but the recent pause in arrivals has allowed for some stability.

There are considerable challenges to recruitment as large numbers of new staff are required, often to perform technical skills that they may not have, within a potentially dangerous environment where infection is possible. Ongoing adverse publicity about quarantine staff activities is also likely to create stress. A high turnover of staff has also been noted.

Fatigue was identified as a risk to safe hotel quarantine. SCV recommended conducting fatigue risk assessments and taking actions to formally reduce risk. The Estimating Failure Risk study recommended improving working conditions to minimise the risk of overwork and fatigue, which may increase the risk of PPE failures and infection control breaches. Suitable shift work schedules have also been proposed. Having an adequate and well-trained workforce to minimise fatigue will improve the safety of hotel quarantine for staff, travellers and the community.

Staff health, safety and wellbeing could be optimised by enhancing occupational health services for these staff.

# Question 1: Given the epidemiology of COVID-19 and variants of concern, to what extent will hotel quarantine be able to reduce the risk of transmission in-hotel and out to the community?

## Analyses, considerations and risks of current hotel quarantine practices

### Governance and other organizational issues

An in-depth exploration of the organisational aspects of the quarantine system was not possible in the brief time available for this report, but the importance of governance was highlighted in several reports and by many informants. These include:

* Clear lines of accountability and delineation of roles and responsibilities
* A culture that prioritises safety and safe practices, and facilitates feedback on potential improvements from all staff within the organisation
* Monitoring and evaluation of existing protections to inform continuous quality improvement
* Ongoing review of safety systems in light of new and emerging evidence

The lack of quarantine escape from the ‘health hotels’ in Victoria and NSW, where the risk is presumably the highest, is striking and suggests that the reduction of risk to a low level is possible. There are likely to be several reasons for this, including training and experience in infection control practices and personal protective equipment. Health hotels accommodating the smaller subset of cases and residents with complex medical needs allows for focussing of resources and staff. It is also likely that a strong organisational focus on safety and mature systems of governance and continuous quality improvement are crucial factors in preventing transmission.

### Additional protections

The recent SCV report highlights several recommendations relating to ventilation and operations as critical, requiring immediate attention (Box 1).

***Box 1: SCV recommendations regarding ventilation and operations***

|  |
| --- |
| * Develop and implement a minimum engineering and ventilation standard for all Program sites, supported by necessary building upgrades and facilities management staff training. * Develop and implement HVAC system settings, resident density, and monitoring and maintenance regimes, that are optimised for infection prevention and control at all Program sites. * Operational recommendations   4.13 Screen residents in Program sites operated by CQV for prohibited medical devices known to create aerosolisation.  4.4 Leave rooms vacant as ‘buffers’ around hotel rooms housing more than three residents. This has already been actioned at the Park Royal Hotel we have been advised it has been implemented at other Program sites operated by CQV.  4.5 Stagger meal deliveries and other operational activities to further reduce the risk of residents opening their room doors simultaneously. This has already been actioned at the Park Royal Hotel site and should be promulgated at all Program sites operated by CQV.  4.15 IPC Steering Committee to reconsider the IPC risks associated with the current process for COVID-19 testing residents in the open doorway of their room. We recommend this be done inside the resident’s room with the door closed.  4.6 Explore options to optimise compliance with the policy of residents wearing masks before opening their door.  4.8 Reconsider the resident check-in process by exploring lessons learned at Program sites operated by Alfred Health on behalf of CQV with view to preventing or further limiting hotel reception staff from having direct contact with residents.  4.1 Extend the existing staff cohorting approach used for staff break rooms and offices to include allocation of the same staff cohorts to the same residential hotel floor. This will further limit staff to staff contact and simplify contact tracing when required.  4.2 IPC Steering Committee to reconsider implementing additional evidence-based measures in the cleaning process for onsite staff, for example use of UV markers to audit effectiveness of cleaning. This should be undertaken uniformly across all Program sites.  4.14 Hotel reception staff must wear Tier 3 PPE when in the proximity of arriving residents. |

Protections higher in the hierarchy of protections are more likely to be effective, and recent reports have focused on ventilation and airflow. It is imperative that there is an ongoing process of review of these protections in light of new evidence, and monitoring and evaluation of current protections. A list of other potential controls is detailed below.

***Table 3: Selected existing and potential controls to prevent transmission of SARS-CoV-2 in hotel quarantine***

|  |  |  |
| --- | --- | --- |
| Level | Existing controls | Potential future enhancements or models |
| Elimination | Pre-flight testing  Limits on arrival numbers  Frequent testing of staff  Frequent testing of residents | Further limits on arrival numbers  Vaccine passports (if effective) |
| Substitution |  | Home quarantine with apps to ensure compliance  Biomonitors to reduce staff contact |
| Engineering | Ventilation and airflow  Separation of cases into separate hotel  Separation of staff zones from resident zones  “Buffers” around cases | Air filtration devices  Purpose built facilities |
| Administrative | Workflows to limit contact with other staff and residents  Workplace bubbles  Training and education  Auditing and quality improvement | Additional auditing and feedback  Staffing number and skill mix |
| Personal protection | Personal protective equipment  Fit-testing and fit-checking | Vaccination |

### Examples of recent changes to best practice controls

Two examples are provided below of recent changes to protections in health services and in health hotels. Both focus on ventilation and other engineering controls in response to strengthening evidence on the role of aerosol transmission of SARS-CoV-2, particularly that other modes of transmission appear to have been well mitigated by other measures.

#### Ventilation Standards

While the infrastructure and environment of hospitals and hotels are clearly different, two draft Victorian reports provide some guidance and could be adapted to assess ventilation standards in hotels.

The Victorian Health and Human Services Building Authority (VHHSBA) has drafted assessment criteria based on key HVAC design considerations for pandemic patient wards, including the provision of outside air, the rate of air change, air filtration, consideration of air pathways and the air balance on the ward (Box 2).

***Box 2: VHHSBA assessment criteria for patient wards***

|  |
| --- |
| * Air change rates * Outside air supply * Duty/standby system (single point of failure) * Dedicated exhaust to the ward * HEPA filtered exhaust or minimum 10m/s discharge velocity * Dedicated spill system for the ward * Fully ducted spill system from patient areas to the risers * Fully enclosed rooms for 1-bed and 2-bed wards. |

The Department of Health’s Coronavirus (COVID-19) Policy: Infection control measures to optimise ventilation and reduce transmission of COVID-19 in acute healthcare settings provides guidance to healthcare facilities in Victoria on HVAC systems in hospitals to optimise air flow to assist in reducing the risk of transmission of COVID-19.[[33]](#endnote-34) It notes that ventilation cannot be considered as a sole infection control measure but should be used in conjunction with other infection control strategies.

#### Alfred Hospital recommendations

In response to reports of VOCs, Alfred Health reviewed infection control procedures and implemented changes at the Health Hotels (Box 3).

***Box 3: Alfred Health recommendations for infection control in response to variants of concern***

|  |
| --- |
| * Review current location of floor monitors and confirm location is favourable from air handling perspective * Increase frequency of testing to Day 0, Day 3, Day 7, and Day 11 among COVID-19 negative residents to reduce duration of undiagnosed asymptomatic residents. * When a newly diagnosed confirmed COVID-19 resident is transferred from a Quarantine Hotel to Health Hotel, people who they share the room will not accompany them. Exceptions considered in scenarios involving dependents. * Where a confirmed COVID-19 resident exits a room prior to medical clearance (e.g. transfer to hospital, to a different hotel, or a different room), leave room to rest for 2 hours prior to entry by cleaners or any other staff * Request that residents wear a mask for 30 minutes prior to times that the door to their room will be opened * Reinforce principle of limiting the number of occasions of door opening * Limit number of people entering room to minimum required. Additional staff can consider standing at threshold as an alternative to entering the room. * Aim for one positive resident per room; Two positives could be accepted where one is caring for the other * If one resident in a multi-resident room tests positive for COVID-19, the strong recommendation is that they separate from the COVID-19 negative residents. Discordant residents can remain together only by exception. * Review hotel evacuation process to ensure that emergency resident exit is controlled |

## Conclusions and Recommendations

The hotel quarantine system has reduced the risk of importation of SARS-CoV-2 into the Australian community with continuous improvements and refinements implemented over time. As a result, the escape of a highly transmissible respiratory pathogen from hotel quarantine is a low-probability but high-consequence event.

VoCs have emerged worldwide. They appear to be more transmissible and associated with higher viral loads. Additionally, vaccines may not be as effective against variants of concern as against wild-type strains. However, other features of these variants appear to be similar, including the incubation period and modes of transmission. The epidemiology of the variants of concern is changing since infection associated with VoCs was first reported in Victoria in December 2020. Since early February 2021, VoCs have become universal among COVID-19 cases in hotel quarantine.

The rollout of vaccination to hotel quarantine workers followed by international arrivals and the broader community is likely to reduce the impact on the need for an ongoing quarantine program and the risk to the community. It is not possible to eliminate risk completely from any quarantine system, but additional controls, including vaccination, engineering (particularly ventilation) and administrative controls as recommended in the review undertaken by SCV should reduce the risk of transmission of SARS-CoV-2 from hotel quarantine to the community.

Organisational factors, including governance, a culture that prioritises safety, continuous quality improvement, monitoring, evaluation and reporting are vital to ensuring safety. Apart from vaccination, the most effective measures to prevent the incursion of COVID-19 into the community are the higher tiers of the hierarchy of controls. While a detailed examination of the management and culture of CQV was not possible in the limited time available, as a newly established agency, it would be expected that systems and processes will need time to be refined.

**That hotel quarantine can resume safely once the following key priority areas have been addressed:**

**a. At least the first dose of vaccine is provided to resident-facing hotel quarantine workers**

Vaccination of hotel quarantine workers is likely to provide strong protection from infection, particularly when used in combination with other controls. It is essential that at least the first vaccine dose is delivered to all workers at risk of exposure prior to commencement or resumption of quarantine, with the second dose delivered at the appropriate interval to maximise protection. The immunity generated by vaccination commences around 10-12 days after the first dose, and a second dose (for the Pfizer vaccine, administered between three and six weeks) is required for maximum effectiveness. Further protection against community incursion will be provided by vaccination of household contacts of hotel quarantine workers.

The recommendation to vaccinate resident facing roles recognises that not all staff are at risk of exposure. Resident facing role means those staff who may come into direct contact with residents, and would include those who enter red zones (including those who may enter unexpectedly or in emergencies) and require tier 3 PPE. Additionally, given the incidence of infection in cleaners elsewhere in Australia, this group should also be vaccinated.

However, there are several key unknowns. Whether individuals who are vaccinated can still be infective is not yet known. The epidemiology of the variants of concern, and vaccine protection against different variants will be important to monitor. Additionally, the duration of protection and any subgroups in whom protection may be attenuated (e.g immunocompromised workers) are not yet defined.

**b. CQV have responded to each engineering and operational recommendation of the SCV report, where necessary with advice from appropriate experts**

Hotel quarantine should not resume until CQV have considered and responded to key priority areas, particularly engineering controls in hotels (Table 2). Several of the recommendations made by SCV are critical and require immediate action. At the time of writing, engineering assessments were being performed at hotels based on Department of Health guidelines (“Coronavirus (COVID-19) Policy: Infection control measures to optimise ventilation and reduce transmission of COVID-19 in acute healthcare settings (February 2021)”).

It is acknowledged that ventilation standards in hospitals cannot be easily applied to the hotel setting. However, we are recommending that the SCV draft recommendations are responded to, not necessarily implemented – if recommendations 3.7 and 3.9 are not felt to be appropriate or feasible in non-hospital settings, the reasons for this should be documented.

In subsequent discussions with CQV, a process was outlined where assessments and, where required, a rectification plan was brought to a Ventilation Reference Group with the relevant expertise. This would seem to be an appropriate process and highlights the need for systems and processes to respond to emerging issues, evidence and guidelines.

If engineering and ventilation assessments have not been performed on all program hotels, a staged return could be considered using hotels where these assessments have been completed. If some recommendations are not felt feasible or necessary following further consultation, this should be made clear. Consideration should be given to a trial of in-room air filters in consultation with relevant experts.

**c. CQV have advised on a phased timetable allowing for the completion of the above actions and operational considerations**

In addition to the delivery of vaccine to workers and engineering assessments, staffing and other operational constraints may also impact on the capacity of CQV to safely accommodate residents.

**That CQV:**

**a. Develop responses to the other recommendations of the interim SCV report, with monitoring of progress against implementation.**

Many of the recommendations made by SCV relate to governance and processes and include:

* Embed systems-based continuous improvement practices into day-to-day operations.
* Optimise process planning, role and responsibility allocation and staff movement management at all Program sites to minimise the risk of transmission through coincident activity and environmental exposure.
* Develop a fit-for-purpose, standardised, systems-based approach to incident action plans and transmission event reviews and align this with the Department of Health IPC Advice and Response site visit report structure.
* Consider opportunities to learn from reviews in other jurisdictions.

A plan to address these issues and a mechanism to ensure accountability for their completion is required.

**b. Ensure that the occupational health service comprehensively supports worker health and safety**

Quarantine is a hazardous environment, not only from the point of view of risk of infection, but also as a high stress environment. A large workforce with a high turnover would benefit from an occupational health service, noting there is a current vacancy for the Director of Workplace Safety. This service could perform pre-employment assessments, provide input to training, advise on suitable shift work arrangements, deal with occupational health issues which arise, such as injuries, near misses, mental health problems in staff and assist with compensation claims and return to work issues. Occupational health input should also be included in the infection prevention and control committee.

An OH&S Service, including occupational and environmental physician input, should perform pre-employment assessments, worksite and environmental assessments, provide input to training, advise on suitable shift work arrangements, deal with occupational health issues which arise, such as injuries, near misses, fatigue and mental health problems in staff and assist with compensation claims and return to work issues. Occupational health input should also be included in the infection prevention and control committee.

**c. Ensure clarity in delineating the roles and responsibilities of CQV and the Department of Health in the Memorandum of Understanding, and clearly identify designated decision makers and that where the appropriate expertise exists, the Department of Health will provide timely and appropriate advice.**

Governance issues are highlighted in the area of infection prevention and control, where systems and processes to formulate policy are not clear. While a broad range of expertise is available to CQV and should be drawn upon, clarity is required in defining the authority for making decisions, with transparency and consistency in the decision making process, from whom advice is sought, and who is ultimately accountable for the policy. There needs to be a clear line of demarcation in formulating IPC and other related policies, such as mental health and well-being, and the systems that operationalise the policy.

While in NSW there is a clear separation between the health hotels (run by the Sydney Local Health District) and the police hotels, the police hotels have drawn on expertise from the NSW Clinical Excellence Commission as a ‘single source of truth' for health-related issues.

Accountabilities for decisions and provision of advice should be clarified in the Memorandum of Understanding (MoU) to ensure decision makers can most effectively draw upon multidisciplinary capability in other agencies. A closer working relationship between Alfred Health, which has operational experience and expertise in the health hotels and in managing infectious patients in health services, and those formulating policy and practice in the quarantine hotels is needed to exchange information and policies to avoid duplication and inconsistency.

A possible governance framework that supports this might have three tiers:

* An advisory board or corporate board that oversights strategic decisions, analyses risks and their controls, including those relating to infection prevention
* The IPC committee (with a broad representation of skills and expertise) that oversights policies, performance, and incident reports
* Working groups and an informal ‘community of practice' with site managers across all hotels (CQV and Alfred IPC) to exchange ideas, policies and approaches to IPC issues that arise, and help formulate policies for endorsement by the IPC committee

As an example, a current issue relates to the safety of exercise equipment in hotels. This may potentially pose risks due to aerosolization, but also may improve the health and wellbeing of residents. In this governance framework, the issue might be first identified from residents and staff at hotels, who could raise this at a community of practice. The Director of Infection Prevention and Control at CQV could explore whether existing policies have been developed at Alfred Health or in other jurisdictions, and if required seek expert advice from the Department of Health, external consultants (such as airflow engineers and independent infection prevention consultants) or Alfred Health. A decision would then be made by Deputy State Controller of Health Management on the basis of expert advice, resident well-being and other considerations, and endorsed by the IPC committee. The role of a strategic advisory board might be to consider other measures that might be required to improve resident health and wellbeing, and to ensure controls are in place to mitigate potential risks.

**d. Perform a review of the governance of CQV, and specifically accountability mechanisms that facilitate consideration of strategy, risks, monitoring and evaluation and strengthen a culture of safety.**

While preserving the principle that there should be a single line of accountability to the CEO of CQV and the Minister for Police, a mechanism is required to ensure the recommendations of previous reports are implemented, or to consider why they may no longer be relevant, necessary or feasible. Additionally, as the risk environment changes, a high-level group is needed to consider strategic changes in quarantine arrangements as well as the nature of risk mitigation measures.

Currently, governance and accountability should ideally reflect the complex nature of the quarantine program, and therefore include oversight of its logistics, compliance and health dimensions. In the short term, formalisation of the MoU between CQV and the Department of Health is required to clearly delineate the roles and responsibilities of each partner. In the longer term, a formal strategic committee could be in the form of a Board that includes the Secretary of Health, the Chief Health Officer, the Secretary for DJCS; however, other governance arrangements may also be possible that achieve the same governance objectives, such as an advisory board or independent/external expert members. Consideration might also be given to the inclusion of a representative from another jurisdictional quarantine program.

Elements that should be considered in such a review should include:

* Strategic planning and implementation
* Sharing of information within agencies and with other jurisdictional quarantine programs (through the “communities of practice” proposed by AHPPC). This should include the development of national standards, definitions and reporting, and where possible, similar policies.
* Risk analysis and controls
* Governance, including transparency, accountability, authority, program performance
* Management processes and policies, including monitoring and evaluation, reporting, quality assurance, staff performance
* Systems and processes including the development and review of policies and procedures, data and intelligence

# Question 2: What would be the features of the most effective model of quarantine for variants of concern in Victoria?

## Different models of quarantine being used

Hotel accommodation is used in the majority of jurisdictions in Australia and in other countries. Alternative models have been recommended in several previous reports. These fell largely into two categories: home quarantine, and purpose-built quarantine facilities.

### Mining camps

In addition to the Howard Springs Quarantine Facility, Queensland is currently examining the use of mining camps in regional towns as quarantine facilities. A more detailed description of the Howard Springs Quarantine Facility is outlined below.

### Caravan Parks

In February 2020, quarantine facilities were established at the Whangaparāoa Military Base for around 160 New Zealanders repatriated from Wuhan.[[34]](#endnote-35) They were housed in campervans and collected food from a central location at designated times. It was reported that the location was chosen due to its size, location and access to medical facilities. Food was provided by commercial contractors and communications infrastructure was installed. The New Zealand government later established several quarantine facilities in Auckland, Wellington and Christchurch using campervans. The capacity of these was small (a total of around 600 campervans across the three sites) and they were ultimately not used.[[35]](#endnote-36)

### Home quarantine

Previous reports have suggested that home quarantine may be a viable option for travellers returning from very low- to moderate-risk countries. As mentioned in the Testing strategy section of this briefing, testing should be a mandatory aspect of any agreement to quarantine at home. The Halton Report recommended any new models of quarantine (such as home quarantine) should be developed for consideration by National Cabinet, with a thorough risk assessment of these options and an analysis of traveller suitability.

Home quarantine has not been used recently for international arrivals in Australia (with some exceptions), but has been used extensively for close contacts in community settings. Of 101 close household contacts (in community-based outbreaks) since December 2020, 50 subsequently tested positive, of which six were in hotel quarantine and 44 were in home quarantine. However in the context of international travellers, home quarantine would only be suitable for those with suitable domestic accommodation where they are able to isolate from other household members.

[Singapore](https://www.abc.net.au/news/2021-02-14/what-can-we-learn-about-hotel-quarantine-from-around-the-world/13143546) has used home quarantine for selected arriving passengers from low-risk countries. Compliance is enhanced by technological enhancements such as electronic tracking wristbands. It has been [reported](https://www.channelnewsasia.com/news/singapore/covid-19-shn-quarantine-order-breach-crime-mha-14094458) that to 25 January 2021, there have been 367 breaches in 308,442 stay-at-home orders.

### Other facilities

As noted above, ‘on-farm’ quarantine has been implemented for seasonal agricultural workers in some [jurisidictions](https://www.abc.net.au/news/rural/2020-11-20/tongan-seasonal-workers-emerald-complete-on-farm-quarantine/12897008). Additionally, ‘in country’ quarantine (in hotels in the country of origin, with monitoring by Australian officials) has recently been proposed.

NSW reports using serviced apartments (in the ‘health hotel' model) for large families, those with mental health issues and other needs that cannot easily be accommodated in standard hotel accommodation. Victoria has previously used serviced apartments but had experienced issues with availability.

### Other purpose-built facilities

Purpose-built quarantine facilities such as rural military bases or camps with discrete units were suggested by some reports. These noted the success of the Howard Springs facility and benefits of purpose-built facilities. Benefits included natural ventilation and the lack of shared spaces. Some have suggested that high-risk travellers be quarantined in regional cities or rural areas to reduce the risk of transmission into a heavily populated city.

It is worth noting that the Halton Report recommended that the Australian Government consider the establishment of a permanent national facility for quarantine, to be used for emergency situations and emergency evacuations. Although the Howard Springs Quarantine Facility is administered by the Commonwealth, it has limited capacity compared to the hotel quarantine facilities in other jurisdictions. More information on Howards Springs Quarantine Facility is below and in Appendix O.

Hong Kong began development of the Penny’s Bay Quarantine Centre in February 2020. It is a purpose-built quarantine facility with a capacity of 3,500 individuals. As of 25 February 2021, there were reported to be 423 individuals at the facility.

Singapore developed specialised ‘Community Care Facilities’ to house low-risk COVID-19 cases. These were developed in hotels, convention centres, university dormitories and shopping centres.

As highlighted above (‘Future quarantine requirements'), stratification on the basis of different criteria is possible. Issues relating to the challenges associated with multiple quarantine models are discussed below (‘Option 2: hybrid model of hotel and other types of accommodation')

## Technological enhancements

Several technological applications have been used elsewhere in quarantine settings that may reduce the risk of transmission. In particular, electronic monitoring devices and mobile apps that allow for virtual quarantine checks may help ensure compliance for residents in home quarantine.

***Table 4: Technological enhancements used elsewhere to reduce risk***

|  |  |
| --- | --- |
| Application | Description |
| Digital contact tracing applications | Contact tracing that relies on digital tracking systems, most often through applications on mobile devices. COVIDSafe (Australia), NZ COVID Tracer (NZ), Immuni (Italy), others |
| Compliance applications | Compliance and enforcement initiatives developed by the Western Australia Police Force. G2G Pass (digital border pass for entry); G2G Now (virtual quarantine checks for individuals in hotel or self-quarantine) |
| Electronic monitoring devices | Bracelets to detect if travellers have left their home quarantine location. Forms include GPS devices that connect to a cellular network; Bluetooth devices that connect to a ‘gateway’ device in the home. Used in Hong Kong, Singapore, South Korea home quarantine |
| Physiological monitoring devices | These are devices that measure physiological parameters such as temperature, heart rate and oxygen saturation. One type (‘Bioformas’) is used at the Howard Springs Quarantine Facility. They allow remote monitoring, reducing staff-resident contact. However, as most cases of SARS-CoV-2 infection in this setting is asymptomatic, they have limited capacity to detect COVID-19. |
| Powered Air Purifying Respirators (PAPRs) | Respirators that purify air by using a powered blower to force air through filter cartridges or canisters. Require extensive training and probably only feasible in closely supervised staff in hospital settings. |

## Other considerations to be taken into account

Previous reports have noted considerations relevant to quarantine arrangements other than those related to reduction of the risk of transmission.

**Health, mental health and wellbeing**

Looking after the health, mental health and wellbeing of returned travellers was a recurring theme from the reports and inquiries.

All care provided during hotel quarantine should be accessible, culturally sensitive, timely and regular. All information provided to individuals should ensure understanding, be easy to access, be easy to read and should be available in other languages to cater for linguistically diverse guests.

Regarding general health, all quarantine hotels should have plans and protocols in place for providing care to individuals with complex medical needs. Regarding mental health, all quarantine hotels should have psychosocial supports available and should conduct wellbeing checks regularly in a proactive manner.

In regard to general wellbeing, hotel quarantine facilities should facilitate safe entertainment activities (such as social interactions, games, music, trivia), exercise for visitors and fresh air breaks. The quality of food has been mentioned as a focus by some informants. One study recommended that exercise and smoking areas be individual and not shared between different users, to eliminate mixing of cohorts.

**Exemptions and temporary leave**

The Halton Report recommends that exemptions to mandatory quarantine be considered for low-risk cohorts, such as travellers from New Zealand. Note that this recommendation subsequently led to the development of a New Zealand safe travel zone.

The Burnet Institute Report identified 14-day quarantine as more effective than shorter-duration quarantine. However, it also identified that a shorter duration of quarantine was possible where the probability of infection on arrival was very low, low or moderate.

The Coate Inquiry addressed the processes for exemptions and temporary leave from hotel quarantine. It recommended that a clear request process should be made available to all returned travellers, with clear criteria upon which requests are assessed. Any assessments stemming from these requests should be made in a timely manner and communicated clearly to the requestor. Individuals with exemptions should be educated on how to manage the risk of transmission of COVID-19 and should be monitored for compliance.

## The Howard Springs Quarantine Facility

The Howard Springs Quarantine facilities is a disused workers camp that is divided into an international and a domestic quarantine facility which are currently independently operated by the Commonwealth and NT Governments respectively.

The international side has a capacity of around 850 people divided into five discrete blocks. Each block is used for a separate flight, with one block allocated to positive cases, close contacts and suspected cases from all other blocks. One unit within each block has been converted into a medical clinic. The Commonwealth has recently announced plans to expand its capacity to 2,000 residents.

Each unit houses four residents in rooms designed for a single adult occupant. The units are all hard surfaced and considered easy to clean. Each room has a single bed, small desk, bar fridge, reverse cycle air conditioner and has a covered veranda area. The climate is conducive to residents remaining inside or on the veranda.

Although there is no purpose-built staff area for operations, some residential units have been converted to staff areas for meal breaks and administrative areas. Staff areas are clearly segregated from residential areas. There is a large commercial kitchen for food preparation and a significant capacity for food storage areas (including cool stores and freezers).

The international facility is staffed by Australian Medical Assistance Teams, who have extensive experience in logistics with an emergency management and health focus. There is a high degree of central control and oversight. Features of this organisation include a high degree of central oversight, multidisciplinary involvement, and a deeply ingrained safety culture.

The workforce is solely employed at the facility, but most do not live on site. Staff ‘bubble’ arrangements are in place separating staff from different blocks, and there are no formal staff breakout areas. Staff take meal breaks by themselves in the converted rooms mentioned above. A staff laundry is located on site and staff are discouraged from wearing their uniforms outside of the facility.

Prior to arrival, a significant amount of personal, demographic and health data are collected on each individual. This informs logistics and preparedness for arrival such as appropriate placement within the facility and health and dietary needs. There is an established workflow for arriving passengers. Testing is performed at the airport, and then they are transported in cohorts to the facility. Residents are provided with an arrival pack, an iPad and a mobile SIM card if required.

Infection control procedures are standardised and specified in operational documents. The precautionary principle underlies all IPC practices. Workflows have been designed around minimising interactions between the staff and residents, and where required, as much as possible performed outside. Staff do not enter residential units at all during 14 day quarantine period. Residents are not permitted to leave their rooms/verandas at all except to visit the laundry. All residents are permitted to visit the laundry once a day, one at a time, and only under escort. A separate laundry is provided for residents in isolation.

Auditing of PPE is supported by technology (photo of staff member sent for review, and day to day activities are documented by photos). There are regular audits of PPE and cleaning. Video auditing is undertaken of PPE donning procedure for staff working in the isolation zone. Videos are reviewed and audited for compliance. Cleaning audits are undertaken via visual inspection only.

Security is maintained by foot patrols, complemented by limited CCTV. Police are encouraged to take a ‘community’ rather than ‘enforcement’ approach. It was noted that visibility is good in outside areas but limited within units.

Significant effort has been put into maintaining resident morale and wellbeing. This includes:

* High quality food, including catering for dietary requirements (e.g. vegetarian, vegan, Halal, etc) where possible
* Daily telehealth calls to check wellbeing and identify any issues including maintenance issues.
* Provision of an iPad for telehealth appointments that are pre-loaded with entertainment activities.
* Special packs provided for birthdays, public holidays and other special occasions
* Age-appropriate education packs provided for children
* Social media to encourages a sense of community
* Verandas considered a critical contributor to mental wellbeing. Residents can observe wildlife/weather, get fresh air and interact with neighbours (with appropriate distancing)

A medical monitoring device is used in up to 80 per cent of residents to identify changes in physiological parameters and to reduce the need for staff-resident interactions. This was originally implemented to detect early onset of COVID-19 however it is reported the device has failed to predict residents who subsequently test positive for COVID-19.

There is a psychiatrist on site and a counselling service available. Patients requiring specialist care are sent to an acute health service, or require specialists visiting the facility from the hospital.

### Features that facilitate effective infection control

No staff enter resident rooms; catering staff leave food parcels on the veranda, resident swabbing takes place on veranda (in good weather) and cleaning of rooms is only performed when resident moves out.

Uniformity in PPE use. All staff are required to wear full PPE, with the exception of catering and cleaning staff not required to wear eye protection. Whilst the use of this level of PPE use cannot be justified on a risk basis, it allows for streamlining of education and auditing activities, and eliminates confusion amongst staff on PPE requirements.

Strong planning and streamlining of processes, somewhat assisted by low traffic (~approximately 4 flights/week). This provides time between flights to prepare. An example is that if families with young children were on the flight, prior to arrival it was arranged that they would be accommodated in separate areas to prevent incidental contact between children.

The facilities and environment means that residents spend a lot of time on their verandas with natural outdoor ventilation, (however this does increase the frequency of residents in adjacent rooms being in close proximity with each other. There is no shared ventilation between units. Simple hard surfaces facilitate effective cleaning

### Features that meet other aims of quarantine

It appears that the resident experience is very positive. The catering facilities have been reported by residents as remarkable. A large onsite kitchen with very engaged staff caters for a variety of cultural needs. Where requirements cannot be met it is not unusual for a staff member to visit a local supermarket. There is a resident Facebook site that is used to enhance a sense of community, and here a large amount of commentary is made complimenting the catering.

The verandas are clearly another major factor. Whilst it is possible that residents could come in to contact with each other, the general sense was that most are very compliant. The ability to socialise with nearby residents from your own veranda was thought to be a significant factor in resident satisfaction, good mental health and therefore compliance. Whilst this works well in warm climates, there may be challenges in cooler climate of Melbourne, but also opportunities to provide some closed in verandas that would also prevent direct contact with a neighbour.

Whilst residents responded positively to being able to wash their own laundry, this is also seen as a potential weak point where transmission could occur.

The single level construction facilitates good line of vision for security and compliance checking. This results in fewer staffing numbers reducing staff and resident interactions.

### Limitations

Issues that have been identified include:

* Lack of undercover walkways to protect staff in PPE during inclement weather. This resulted in concerns about staff health and often led to delays in testing processes.
* Potential for close contact between residents on the verandas and environmental contamination in the common laundry facilities
* Although the auditing process seemed comprehensive, the use of WhatsApp to share images of attire, and the delayed viewing of videos for auditing seems inadequate. Whilst it was commented that spotters are always around, there appeared to be no formal program in place for spotting.
* The facilities are unable to suitably accommodate couples or families, they are one person dwellings. This meant families and couples would walk out and around to see each other, or the barriers between the dwellings on the verandas were removed.
* Cannot accommodate people with significant disabilities
* Frequent relocation of residents. Resident are located in zones according to their status (I.e. presence of signs and symptoms, or positive test results). For example if a resident returns a positive swab, they are relocated to the isolation zone. This is required due to the close proximity of each resident’s unit (I.e 4 in one block). If units were physically separated frequent relocation would not be necessary.
* Another limitation is the inability to provide routine procedural care. While set up for a resuscitation or acute emergencies, residents requiring routine procedures, prenatal care and other appointments were all taken to an acute facility. Staff expressed a desire for a short stay unit or like where these residents could receive care.
* Only visible inspections of cleaning are conducted. This was justified by the fact that all surfaces are hard and therefore it is easy to see if they are clean.
* Access to specialist care (e.g. obstetrics, complex medical conditions) is limited
* Infrastructure may not be suitable for residents with challenging behaviours
* Bioformas (biomonitor) allows remote monitoring of physiological observations without direct contact, but most cases of COVID-19 are asymptomatic

## Conclusions and Recommendations

A range of alternatives to the current hotels may be feasible for selected cohorts, including home quarantine, other existing facility types (such as serviced apartments) and purpose-built quarantine facilities. Alternative quarantine arrangements could improve aspects of quarantine, including resident and staff health and wellbeing, infection prevention and control, clinical care and security if properly designed. While differing models of quarantine based on different levels of risk would introduce considerable logistical complexity, a hybrid model of hotel and other types of quarantine accommodation could be considered if this could be implemented by CQV over time.

The Howard Springs Quarantine Facility might be regarded as a reference standard model; although the infrastructure and environment presents many advantages for resident wellbeing and the prevention of transmission, some limitations have been identified that should be considered in future purpose-built facilities.

Informants felt that the ideal requirements for a quarantine facility from a clinical perspective would include consideration of the staffing requirements (e.g. in a hotel, more rooms per floor requires fewer police than fewer rooms and more floors); separate resident and staff access points, the feasibility to separate green and red zones, adequate areas for staff activities, infrastructure that satisfies security and IPC requirements (e.g. good ventilation, cleanable surfaces, no carpet), good information technology and wireless access, a loading dock for equipment, and an on-site kitchen. Common issues for guests include access to fresh air and exercise facilities, and the provision of food (e.g. cooking facilities for parents of young children). Informants also noted the importance of a range of accommodation options, such as serviced apartments for those with special health needs and large families.

**That in the medium to longer term, the Victorian Government consider the three options for quarantine arrangements:**

1. **Option 1: Strengthen existing hotel model**
2. **Option 2: Hybrid model of hotel and other types of accommodation**
3. **Option 3: Quarantine in purpose-built facilities or other identified fit-for-purpose facilities**

**These should be based on the following principles in formulating the design specifications of purpose-built facilities:**

* **Protection of the community from the spread of infectious diseases from potentially infectious persons.**
* **The health and well-being and mitigation of the impacts of quarantine on residents.**
* **Ensuring resident and worker safety from infections and other hazards**
* **Meeting the requirements of Victorian Charter of Human Rights**

### Option 1: Strengthen existing hotel model

This model would continue to use hotels for accommodation, but to strengthen protections by closing the gaps identified by SCV, from key informants and from other reports in the measures taken to prevent transmission as well as the organisational factors that support their implementation, monitoring and evaluation.

Addressing the identified issues in ventilation and operations should provide additional layers of protection. However, a consistent theme from the SCV rapid review and other reports is the importance of governance and culture, continuous improvement of operations to reduce risk and embed safe practices. While this review was not able to explore governance issues in depth, several SCV recommendations reinforce the importance of systems-level continuous improvement practices that learn from transmission events and incident reports. A system level view of the preventative measures that monitors, evaluates and refines existing protections, and considers where additional protections might be added is required.

In the short term, vaccination of staff is likely to be an additional effective mitigation against the escape of COVID-19 from quarantine facilities, although data on the impact of vaccination on the reduction of spread of SARS-Cov-2 are not yet available and there is concern that current vaccines may not be as effective against VoCs. Given these uncertainties, rigorous primary prevention measures will still be required, but vaccination of hotel staff may instill a false sense of security which could lead to complacency in IPC measures. Additionally, as the global situation improves with better public health controls such as social distancing and mask wearing, and the rollout of effective vaccines to populations (including international travelers), this risk should further decrease. Depending on future quarantine policies, ‘vaccine passports' may mean that a lower capacity of quarantine accommodation for unvaccinated arrivals may be required.

While there are clearly measures that can be taken to increase protections in a hotel environment, there are also limitations on what is feasible in established buildings that were not designed to prevent transmission of infectious diseases. Preventing transmission during interactions between workers and guests relies on the lower levels of the hierarchy of controls, particularly administrative controls and personal protective equipment. These levels of mitigation are susceptible to human factors; in an environment where engineering controls (such as ventilation and physical separation) are optimised, minor breaches in process or technique in administrative controls and personal protective equipment are less likely to result in quarantine failure.

Additionally, the hotel environment is not optimised for the delivery of clinical care, effective infection prevention and control of a highly transmissible respiratory virus, or for the wellbeing of residents. Depending on the required capacity, the ongoing supply of hotels with suitable infrastructure is not assured.

### Option 2: Hybrid model of hotel and other types of accommodation

A hybrid model could use a mix of models of quarantine, including hotel, home and purpose-built accommodation. Other types of accommodation could be used for specific cohorts, either defined by levels of risk or by type (e.g. international students, seasonal agricultural workers). Serviced apartments may be more suitable for some cohorts, such as large families. Home quarantine, with compliance strengthened by technological enhancements, could be suitable for selected low-risk international arrivals (e.g. Victorian residents who were vaccinated prior to arrival in Victoria).

However, this option with multiple models of quarantine may introduce considerable complexity in staffing, training and operations. Risks introduced by multiple quarantine models may be mitigated by introducing a more limited number of accommodation options gradually. For example, the simplest type of alternative accommodation would be to introduce suitable serviced apartments for arriving residents with special requirements. Another hybrid model could be a combination of purpose-built facilities with hotels as surge capacity and/or health hotels.

Prolonged transportation to multiple sites could be logistically difficult and lead to an increased risk of transmission. It would require considerable planning, as the provision of services and the need for protections may vary considerably between settings. Each would require their own standards and operating procedures, and specific workforce training. Each new model would need review and approval by public health, but not necessarily each individual facility.

The numbers of staff required to support multiple quarantine settings may need to be considerably larger (and thereby increasing risk of incursion into the community). The necessary risk assessment process to determine which cohorts would be best accommodated in each model could be complex and difficult to implement depending on the number of different settings. This would require pre-departure assessment and planning not only to assess the potential infectious risk, but also for other factors that may impact on the appropriateness of different quarantine models (e.g. behaviour). These factors would also have to be reviewed during the quarantine period, and the obligations of the resident defined (e.g. regular reporting, compliance checks)

### Option 3: Quarantine in purpose-built facilities

A purpose-built quarantine facility (‘quarantine station’) would facilitate engineered controls that are higher in the hierarchy of controls, that in theory should provide the best protection of staff and guests. This would reduce (although not completely eliminate) the risk of incursion into the community. This would be especially true for variants of concern which are somewhat more transmissible. However, this is not a substitute for organisational factors that support preventative measures, as highlighted above.

Although any attenuation in vaccine protection by variants of concern are not yet known, early data suggest that at least some strains (e.g. P.1 from Brazil) may be more difficult to control with vaccines.  A large quarantine station would require considerable maintenance but will be useful for future pandemics, such as those due to novel subtypes of influenza if deemed appropriate by public health authorities. An optimal design may reduce the number of staff required for some functions such as security.

This option would have a long lead time to design and construct and would be expensive to establish and maintain. The location of such a facility would require careful consideration of staffing and support services (e.g. local hospital capacity).  A long term ‘quarantine station' may be useful for future people at risk of COVID-19 or for future pandemics. A quarantine station may have other uses that could be deployed quickly, such as emergency bushfire accommodation or as a unique accommodation setting for tourists.

***Table 5: Three options for future quarantine arrangements***

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Option 1: Hotel quarantine** | **Option 2: Hybrid model of hotel and other types of accommodation** | **Option 3: Purpose-built quarantine facilities** |
| **Description** | Retain existing hotel model  Strengthen protections and quality improvement | Mix of hotel and other types of accommodation incl. self-contained apartments, caravans/cabins, student accommodation, farm accommodation, etc | Purpose built quarantine facilities (i.e. quarantine station) |
| **Pros** | the risk of community incursion may be reduced by vaccination of staff and as the global situation improves  Previous reports have identified potential gaps that can be addressed; additional protections can be introduced  Lack of escape from ‘health hotels' trained staff supported by strong governance is effective | Non-hotel accommodation could be used for specific cohorts (defined by risk or by type e.g. international students)  Simplest option: home quarantine for vaccinated; serviced apartments for large families.  Alternative would be to combine hotel and purpose-built facilities | Purpose-built facilities allow for engineered protections that are more effective than administrative and personal protection esp. for VOCs.  If supported by strong organisational governance, this would provide the best protection of staff and guests, and reduce the risk of community incursion  Long term ‘quarantine station' may be useful for future pandemics  Purpose-built facilities would be associated with improved mental health and resident wellbeing. |
| **Cons** | Relies on lower levels of the hierarchy of protections (particularly administrative controls and personal protective equipment)  VoC appear somewhat more infective, so existing model may be associated with higher risk of escape  Hotels vary in their potential for airborne transmission, suitability for the provision of clinical care, IPC, security or wellbeing of residents  Ongoing access to hotel facilities with suitable infrastructure may not be assured | Difficult to define which cohorts would be best accommodated in each model  Introduces complexity to staffing, training and operations in multiple sites and settings  Potential for multiple uses that could be deployed quickly e.g emergency bushfire accommodation  Prolonged transportation from airports may increase risk of transmission | Will take considerable time to establish  Long term need for quarantine not clear  Requires consideration of staffing and supports (e.g. local hospital capacity)  Need to consider environmental health factors, such as noise and air quality from adjacent airport  Prolonged transportation from airports may increase risk of transmission |

**That a permanent system be put in place to ensure that safe, effective quarantine can be provided into the future, even if the need to quarantine for COVID-19 ceases. This functional capacity could be managed by CQV in its current form or by another governmental agency or department with health and logistical expertise.**

Since the formation of Operation Soteria, the first iteration of hotel quarantine, a tension has been evident between the logistics and compliance functions and the public health functions. This issue, which was reflected in difficulties in defining roles and responsibilities, was highlighted in the Coate Board of Inquiry. The formation of a single agency in CQV, with the Commissioner directly reporting to the Minister for Police, was the response to those findings.

This is not to say that CQV has not been without its difficulties. At the time it was created, there were several immediate operational demands concurrent with the need to establish systems and processes. Several back-office functions including human resources, procurement and finance were established quickly. From this standing start to a fully functioning complex quarantine program with thousands of staff and up to a 3,000-bed capacity, managing a resident population with complex health and other needs, is a remarkable achievement.

What is needed now is for CQV to be allowed to mature its governance, management and culture, and for Victoria to benefit from this capacity. Whether there is a long term need for quarantine for COVID-19, or even if quarantine is no longer required at some point in the future, an established organisation with the capacity to quickly pivot to an emergency management footing should be maintained. This might be similar to operations centres in other jurisdictions, including:

* The Australian Medical Assistance Teams which run the Commonwealth Howards Springs Quarantine Facility
* The State Health Incident Command Centre which operate the WA hotel quarantine program
* The State Health Emergency Operations Centre, which are closely involved in the hotel quarantine program run by NSW Police
* The State Health Emergency Co-ordination Centre (Queensland Health) which operate the hotel quarantine program in Queensland

It is noted that early arrangements for hotel quarantine in late March 2020 (Operation Soteria) were within the State Control Centre, and then an Emergency Operations Centre within DHHS. Future considerations for CQV may be for it to continue as an ongoing agency, or to be incorporated into another agency or department which can maintain its capacity to provide logistical support with a health focus. This might be considered in a future review of the State Health Emergency Response Plan and the broader State Emergency Response Plan. It should have a clearly defined role in responding to class 2 health emergencies but ideally would have established governance, structures and processes that would not need to be re-established in future health emergencies.

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Glossary of Terms

|  |  |
| --- | --- |
| COVID-19 | Coronavirus disease 2019. The disease caused by SARS-CoV-2. |
| Isolation | Separating people who are ill (cases) from those who are healthy to help stop the spread of an infectious/communicable disease. |
| Quarantine | The limitation of freedom of movement for a period of time of well persons who are likely to have been exposed to the virus (contacts) to prevent their contact with people who have not been exposed. |
| SARS-CoV-2 | Severe acute respiratory syndrome coronavirus 2. The coronavirus that causes COVID-19. |
| Self-Isolation | A direction for an individual who has tested positive to COVID-19 or who has symptoms and has undergone a COVID-19 test and are waiting on results. This individual must stay in their home, hotel or other accommodation until they receive their test results, or if they have tested positive, until they are cleared by a Public Health Unit. |
| Self-Quarantine | A direction for an individual who is at greater risk of having COVID-19 (e.g. they may have had close contact with someone who is unwell with COVID-19 or just returned from overseas) need to remain in their home, hotel room or other accommodation for 14 days. |
| Variants of Concern | New lineages of SARS-CoV-2 that have genetic changes in the viral sequence of virological, immunological, clinical or epidemiological significance. |

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