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Surveillance summary

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Abstract

We describe here the impact of managing coronavirus disease 2019 (COVID-19) outbreaks, during January–August 2022, in residential aged care facilities (RACFs) in Central Queensland, Australia, following the deployment of a public health rapid response team (PHRRT, comprising a medical officer, a communicable disease nurse, and an epidemiologist) from a regional public health unit (PHU). Our existing vaccine preventable diseases surveillance framework was used in identifying any symptomatic resident, triggering a PHRRT response. We found that the Hospital in the Home (HiTH) admission and death events were significantly lower after the introduction of the PHRRT than in the outbreaks that occurred before. Based on our experience with a PHRRT-led approach in mitigating the burden of outbreaks, we recommend regular reflection on optimising resources and practices in RACFs. Effective communication from PHUs can improve the RACFs' preparedness and capacity to respond, and can inform the best practice model to protect the highly susceptible elderly residents and their staff.

Keywords: COVID-19; outbreak; vaccine; aged care; public health

Introduction

Residential aged care facilities (RACFs) support the most vulnerable elderly population in our community; globally, RACFs experienced a high attack rate (AR) and case fatality rate (CFR) due to coronavirus disease 2019 (COVID-19), especially during the pre-COVID-19-vaccine era.[1] We describe here the impact of managing COVID-19 outbreaks, during January–August 2022, in residential aged care facilities (RACFs) following the deployment of a public health rapid response team (PHRRT) from a regional public health unit (PHU), in Central Queensland (CQ), Australia.

In Australia, the outbreak case fatality rate within some RACFs reached up to 46%; RACF residents accounted for 74% of all COVID-19-associated deaths prior to the nationwide vaccination program.[1,2] Before the COVID-19 pandemic, PHUs were regularly involved in communicable disease control and outbreak management within RACFs. With such a devastating toll of COVID-19-associated death among residents in RACFs, PHUs potentially played a central role, providing rapid outbreak management response in accordance with national and state guidelines. The evolving nature of pandemic transmission, and the subsequent easing of public health restrictions, resulted in an increased number of outbreaks in RACFs in Queensland from 2022 onwards.[3,4] Hence, there was an urgent need to implement an innovative multi-pronged approach, to coordinate outbreak management for protection of the high-risk older residents in care facilities. This PHRRT-led rapid response was intended to ensure timely diagnosis, prophylaxis, treatment, and isolation; to curb the transmission of the outbreak; to mitigate the burden of disease; and to minimise hospitalisation and deaths.

Methods

Study settings and data collection

Central Queensland Public Health Unit (CQPHU) launched an active enhanced vaccine preventable diseases (VPDs) surveillance project on 1 July 2021, for selected notifiable VPDs (influenza, pneumococcal disease, pertussis, varicella-zoster, and COVID-19). Our aim was to identify the burden of VPDs, aetiologies and risk factors among all RACFs (n = 19), comprising approximately 1361 residential aged care beds, within Central Queensland.[5] In April 2022, CQPHU launched an applied public health approach, in the RACFs that were under ongoing active enhanced surveillance for VPDs, to promptly identify respiratory outbreaks and then apply rapid coordinated management within the RACFs.[5]

Earlier studies reported that diagnoses of COVID-19 and influenza in RACFs were delayed and were often reported very late to respective PHUs.[4,6] This delay allowed pathogen transmission within the environment to continue, causing widespread outbreaks and resulting in increased morbidity and mortality.[6] We utilised our existing surveillance of VPDs to identify any symptomatic resident, triggering a PHRRT response comprising a medical officer, a communicable disease nurse, and an epidemiologist. Upon notification from the facility, the PHRRT visited the respective RACFs to initiate rapid onsite molecular point of care testing (POCT) using the cobas® Liat® system and provided immediate guidance to each affected facility as per the local and state outbreak management guidelines. In the case of symptomatic residents who needed urgent testing, the PHRRT was deployed promtly to establish if there was an outbreak and to support onsite management. While the farthest facility was located approximately 3 hours' drive from the local public health unit, attempts were made to attend all outbreaks to the maximum extent possible. Each team comprised public health registrars and a public health Nurse; at times we also utilised nurse practitioners to facilitate testing for early diagnosis. Teams were organised from a pool of five nurses and two medical officers. The team extended initial advice for every facility that experienced an outbreak, and provided support as needed. Symptomatic residents were targeted for testing. We used rapid onsite molecular point of care testing (POCT) using the cobas® Liat® System only for early diagnosis of symptomatic individuals. Most subsequent tests in an outbreak (after diagnosis of the first one or two cases) were done through private/public pathology providers (multiplex polymerase chain reaction [PCR]) and rapid antigen testing (RAT) kits. Antivirals were stored at RACFs as part of the Commonwealth supply. PHRRT medical officers prescribed antivirals in cases where getting a script from their regular general practitioner was difficult. The PHRRT-led team approach was launched in April 2022 along with the routine standard PHU-based communication with the facility. This analysis is a part of our ongoing surveillance of VPDs in RACFs.

Statistical analysis

The study period from January to August 2022 was chosen to capture a peak period for COVID-19 transmission in the region and to include four months prior to, and four months following, implementation of the PHRRT approach. There were three successive COVID-19 waves during this eight-month period, each with a different predominant Omicron variant circulating in the community:

- first wave: 1 January – 13 March 2022 [BA.1];
- second wave: 14 March – 12 June 2022 [BA.2]; and
- third wave: 13 June – 31 August 2022 [BA.5].

The National Medical Stockpile of oral anti-viral Lagevrio® (Molnupiravir) treatments were distributed to all RACFs from February 2022, prioritising those with an active outbreak.[7] However, it took another couple of months before general practitioners began prescribing COVID-19 antivirals more widely, as evidenced by our surveillance data. We measured the outcome of COVID-19 outbreaks among residents, describing the attack rate, case fatality rate, mortality rate, and hospitalisation rate. The attack rate (AR) was defined as the number of infected residents as a proportion of total residents in a facility for a particular outbreak. The case fatality rate (CFR) was defined as the proportion of the total number of infected residents that experienced COVID-19-related deaths. The mortality rate (MR) was estimated based on the number of resident deaths as a proportion of total residents present within a facility for that outbreak.

The hospitalisation rate (HR) was calculated as the number of residents admitted to the hospital from all the infected residents from an outbreak. Hospital in the Home (HiTH) criteria were followed for conditions requiring better clinical governance and residents were admitted as per the Queensland HiTH model of care guidelines.[8] The outbreak duration and notification delay for each outbreak were described and compared across both periods. The duration of the outbreak was calculated as the number of days from the identification of an infected resident to the date the outbreak was declared over, as per the Communicable Diseases Network Australia (CDNA) recommended COVID-19 outbreak definition. The notification delay was identified as the time in days it took for the facility from the identification of the first case in an outbreak to the date the case was notified to the local PHU as per guidelines.

Results

We found that the number of Hospital in the Home (HiTH) admissions, and death events within HiTH, were significantly lower after the introduction of the PHRRT than during the outbreaks that occurred before (Table 1). Across January–August 2022, a total of 16 RACFs experienced 46 COVID-19 outbreaks with 924 confirmed COVID-19 cases (539 cases in residents, 385 cases in staff) (Table 1). Among the RACF residents, the median age of cases was 86 years (range: 65–103 years) and there was a higher proportion of females (n = 333; 62%). Residents presented with variable clinical features, either symptomatic (n = 339, 63%) or asymptomatic (n = 158, 29%); the symptom status of 42 residents (8%) was unknown. During the January–August 2022 period, among the facilities experiencing outbreaks, more than two-thirds of the facilities (n = 11; 69%) reported > 90% COVID-19 vaccine coverage (≥ 2 dosages). The PHRRT team had an onsite visit to the affected facility in more than one-third of the outbreaks (n = 9; 37.5%) that occurred during the intervention period. The duration of outbreaks across the January–April 2022 (pre-PHRRT) and May–August 2022 (PHRRT) periods was approximately similar.[4,9] The outbreak definition was adopted as per CDNA) criteria, which evolved as the pandemic progressed over this period of time. On 28 April 2022, with the cessation of the requirement for isolation of close contacts, RACFs faced critical challenges for the management of COVID-19-exposed staff and residents.[10] Along with the existing minimal resources to furlough close contacts within multiple wings of an enclosed facility, and with staff concurrently working in multiple facilities, continuing transmission could possibly explain the absence of major differences in outbreak duration across the study period. An index case was identified in slightly more than half of the outbreaks (n = 26; 57%); of these outbreaks, the index case was more often a staff member (n = 14; 54%) than a resident. In a minority of outbreaks, the RACFs placed staff to work within specified wings, limiting cross-movement between wings; these RACFs were able to contain the outbreak spread, as evidenced in earlier reports.[11,12]

All but one of the infected residents to whom antiviral treatment was provided (n = 206) received the treatment during the PHRRT intervention period. Further sub-group analysis focusing to the period May – August based on the receipt of anti-viral medications did not reveal any substantial differences on the outcome characteristics among infected residents. However, this could be due to small sample size (i.e. small number of HiTH and hospital admissions during that period) (Table 2).

Table 1: Outcomes of COVID-19 outbreaks among residential aged care (RACF) residents, January–August 2022, under an applied public health approach from Central Queensland regional Public Health Unit

Characteristic	Category	Without PHRRT intervention (January–April)[a]	With PHRRT intervention (May–August)[a]	*p* value[b]
Number of outbreaks		22	24	—
Affected facilities		12	16	—
Rapid RT-PCR testing assay (n)[c,d]		0	45	—
Number of cases (n, %)	Resident (N = 539)	149 (27.6)	390 (72.4)	—
	Staff (N = 385)	119 (30.9)	266 (69.1)	
	Total cases (N = 924)	268 (29.0)	656 (71.0)	
Symptom status (n, %)	Symptomatic	113 (33.3)	226 (66.7)	—
	Asymptomatic	35 (22.1)	123 (77.8)	
	Unknown	1 (2.3)	41 (97.6)	
Duration of outbreaks (days)[e]	Mean (SD)	25.0 (11.3)	27.0 (9.6)	0.21
	Median; range (IQR)	23.5; 11–56 (10.2)	27.5; 8–46 (9.7)	
Notification delay (days)[e]	Mean (SD)	2.1 (2.6)	1.3 (1.8)	0.39
	Median; range (IQR)	1; 0–9 (4)	0.5; 0–6 (2.2)	
Antiviral medications treated cases (n)	Molnupiravir (200 mg)	1	205	—
Hospital in the Home (HiTH)	Admission (n, %)	62 (92.5)	5 (7.4)	< 0.00001[f]
	Emergency presentation (n, %)	15 (36.5)	26 (63.4)	0.25[f]
	Hospitalisation (n, %)	3 (20)	12 (80)	0.50[f]
	Died (n, %)	14 (46.7)	16 (53.3)	0.02[f]
Attack rate (%)	Mean (SD)	7.6 (6.6)	23.1 (14.6)	0.00015
	Median; range (IQR)	7.9; 0.8–28 (7.5)	17; 1.9–52.0 (21.8)	
Case fatality rate (%)	Mean (SD)	5.7 (11.5)	3.8 (7.9)	0.82
	Median; range (IQR)	0; 0–50 (10.6)	0; 0–33.3 (3.2)	
Mortality rate (%)	Mean (SD)	0.5 (1.1)	0.6 (1.0)	0.79
	Median; range (IQR)	0; 0–4 (0.99)	0; 0–3.8 (0.99)	
Hospitalisation rate (%)	Mean (SD)	9.5 (24.9)	3.2 (4.3)	0.17
	Median; range (IQR)	0; 0–100 (0)	0; 0–16.7 (6.2)	

a PHRRT: public health rapid response team.

b Wilcoxon rank-sum test, unless otherwise indicated.

c PCR: polymerase chain reaction.

d Number of sample specimens that underwent cobas® Liat® System for rapid reverse transcriptase PCR (RT-PCR) assay to establish an outbreak. Five tests were detected positive.

e SD: standard deviation; IQR: inter-quartile range.

f Proportion test ($p < 0{\cdot}05$ considered for statistical significance).

Figure 1: Outcomes of COVID-19 outbreaks among residential aged care (RACF) residents in Central Queensland by week of illness onset, January–August 2022

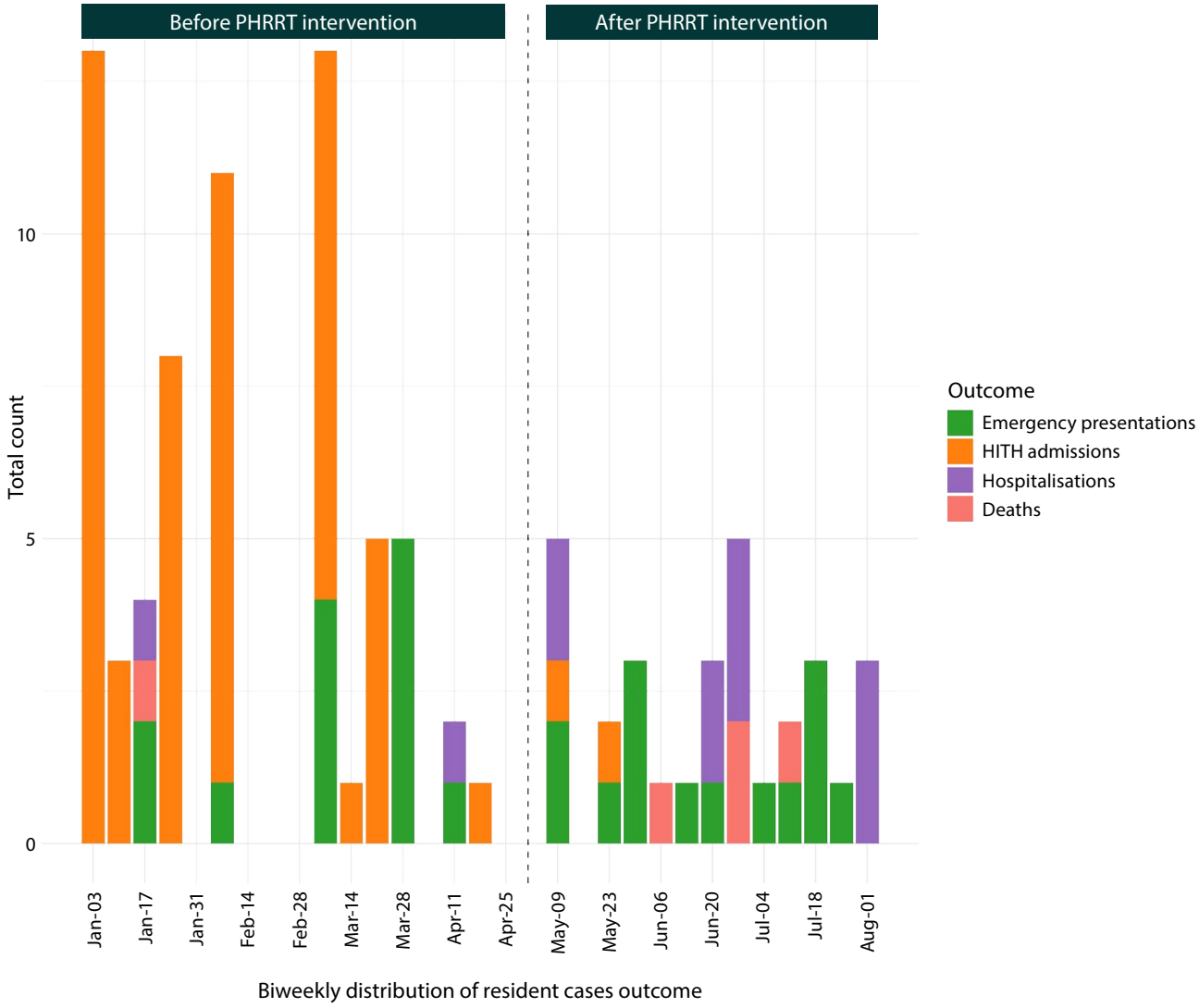

Table 2: COVID-19 outcomes among infected residents by receipt of anti-viral treatment during the public health rapid response team intervention period, May–August 2022

	Antiviral received? [Yes/No] (N = 390)		
Characteristic/outcome	**Yes (n = 205)**	**No (n = 185)**	***p* value[b]**
HiTH admission[b]	1 (0.4)	4 (2.1)	0.34
Emergency presentation	16 (7.8)	10 (5.4)	0.45
Hospitalisation	4 (1.9)	8 (4.3)	0.28
Death	7 (3.4)	9 (4.8)	0.64

a Proportion test ($p < 0{\cdot}05$ considered for statistical significance).

b HITH: hospital in the home.

Discussion

We commenced the PHRRT-led approach through the regional public health unit, utilising our existing enhanced surveillance system to generate evidence-based data among highly susceptible older residents in RACFs. This implementation science project demonstrates the importance of a coordinated approach in managing outbreaks and highlights the potential benefit from regional settings.

Table 1 summarises the occurrence of COVID-19 cases and outcomes during the eight-month study period, stratified into the January–April 2022 (pre-PHRRT) and May–August 2022 periods, during the latter of which the PHRRT-led outbreak management approach was applied as a public health intervention. During the PHRRT-led approach period, there was a mean reduction of 1.8 days in identification of outbreaks.[9] Earlier studies revealed that, with each day delay in notification to PHU of an influenza outbreak, the hospitalisation rate and the duration of the outbreak increased by 6% and 0·42 days, respectively.[6] Here, we found the notification delay was higher among outbreaks [mean (SD): 2·1 days (2·6)] without PHRRT team intervention than among outbreaks that underwent a PHRRT approach [mean (SD): 1·3 days (1·8)], but the difference did not reach statistical significance. The mean duration of outbreaks did not show much difference across facilities with (25 days) or without (27 days) a PHRRT-led approach. The increased number of outbreaks during May–August 2022, and the higher proportion of asymptomatic cases detected from the PHRRT-led approach within multiple wings across facilities, might explain this difference. An increased number of community cases per week over the periods, different circulating vaccine-escaping Omicron variants, increased detection of cases due to continued vigilance in surveillance, and improved testing capacities, might also be factors accounting for the increased number of outbreaks during this period.[10–12] While this analysis did not explore the overall vaccination coverage of all facilities, it is worth reiterating the importance of the effect of vaccination as a potential enabler in outbreak management.[13]

The independent review commissioned into the COVID-19 outbreak response in RACFs recommended applying the 'Swiss cheese model', using seven thematic 'slices of cheese' (leadership and management; effective communication; planning and preparation; infection control; emergency management; pathology testing; and workforce).[14] Our PHU implemented a PHRRT-led approach which underscored the crucial role of coordinated leadership complying with each of the recommended themes in managing COVID-19 outbreaks in RACFs.[14] With the surge of COVID-19 cases in the community, the vulnerable older adults in RACFs had increased risk infection and of developing subsequent adverse outcomes. Prompt identification of cases, inter-sectoral communication, timely allocation of resources to ensure appropriate utilisation of logistics, regular feedback between the PHU team and facility staff guided each stage of outbreak management, highlighted the role of leadership. The rapid response team played a vital role in accelerating the management ladder and engaging the stakeholders for better utilisation of available minimal resources. Effective management of communicable disease control and prevention requires a team-based approach and is contingent upon available resources for early detection, adherence with infection prevention, control strategies and treatment. Our existing VPD surveillance framework allowed the rapid response team to continue monitoring the outbreak dynamics and to extend supportive guidance across RACFs. Regular reflection of outbreak preparedness and management strategies can improve the response plan accordingly and can inform the best practice for this highly vulnerable yet under-resourced elderly community in aged care facilities. Bidirectional communication at regular intervals encourages trust between stakeholders in implementing appropriate testing strategies and restrictions, enabling real-time recommendations and supporting RACFs to launch prompt case detection and isolation strategies among residents and staff to deter further disease transmission. Such a workflow highlights the necessity of a collaborative approach in mitigating disease activity, and the need for continuous revision of management strategies in reducing morbidity and mortality. Effective communication from PHUs can improve the RACFs' preparedness and capacity to respond, and can inform the best practice model to protect highly susceptible elderly residents and their staff.

We acknowledge the findings from this study may not be generalisable to other regional public health units. Due to heightened surveillance activity during the COVID-19 period and with the regular communication built up from our existing VPD surveillance system, the monitoring and real-time recommendations from this PHRRT-team-led approach was noticeably effective.

Conclusion

As an implementation science project, we believe that our findings/experience would be beneficial for other PHUs/health services as well as RACFs/consumers. Timely identification of outbreak and routine collaborative implementation of preventive measures will facilitate in reducing disease-associated morbidity and mortality. Further prospective modelling is essential to generate evidence-based data to optimize clinical and public health practice.

Author contributions

GK, RB and MRH developed the initial concept for the commentary and MRH developed the first draft. JW, NS, DO, SB, MK, RB, and GK reviewed and provided written inputs on the first draft. MRH revised the draft which was reviewed by GK. Additional inputs/writing were incorporated by MRH to finalise the commentary for submission.

Declaration of competing interest

None declared.

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