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ORIGINAL ARTICLE

The impact and management SARS-CoV-2 in a psychiatric hospital setting

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Background

During the months of August and September 2020, an outbreak of SARS-CoV-2 took root in Mount Carmel Hospital and affected 29 elderly female chronic psychiatric inpatients, representing a significant clinical undertaking within the context of this low-resource healthcare setting.

Methods

An emergency isolation ward was set up to contend with the outbreak, while a medical response team comprised of two psychiatric doctors and five extended foundation trainees was established in order to care for this vulnerable patient cohort. Close liaison with the Infectious Diseases team at Mater Dei Hospital fostered an effective therapeutic setting within which these patients could be treated. This represented a unique approach in an environment where literature on SARS-CoV-2 is scarce – the psychiatric inpatient setting.

Results

All 29 of our patients recovered from SARS-CoV-2 during the course of this period as a result of close clinical observation, a system of twice-daily patient review, early identification of patient deterioration and effective cross-speciality communication.

Conclusion

An outbreak of SARS-CoV-2 within the mental health inpatient setting represents a number of unique clinical, managerial and interpersonal challenges, though straightforward clinical measures and effective patient monitoring can greatly aid the response to viral outbreaks in low-resource healthcare settings.

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INTRODUCTION

During the months of August and September 2020, as cases of SARS-CoV-2 in Malta had experienced a recrudescence in earnest, an outbreak of the virus took place at Mount Carmel Hospital, our main psychiatric inpatient facility. At the time, confirmed cases of SARS-CoV-2 had totaled over 29 million worldwide. The highest rates of infection fatality have been observed in elderly populations, and the UK Office for National Statistics reports that those over 65 account for 90.6% of deaths, with those aged 80 to 84 representing the highest proportion (20.8%).[1] In Malta, as of September 14th, 2,405 cases of SARS-CoV-2 had been identified, and there had been 16 confirmed deaths.[2]

Main routes of transmission of the virus are through respiratory droplet and contact spread, as well as through indirect spread via fomites. Airborne transmission may also be possible in specific circumstances, with particles potentially remaining suspended in the air for long periods of time.[3] These characteristics make the presence of SARS-CoV-2 in long-term care facilities particularly perilous.[4] In the US, up to one-third of all SARS-CoV-2 deaths until mid-May occurred in nursing home residents and workers.[5] High rates of infection (40%) and mortality (26%) have also been well studied in one outbreak investigation of UK nursing homes. A concerning finding was that 60% of residents had either atypical symptoms or were entirely asymptomatic.[6]

The impact of the pandemic and lockdowns on mental health has received healthy consideration. In August, the CDC recognized disproportionately elevated mental health outcomes associated with SARS-CoV-2 in US adults. 31% of respondents described symptoms of anxiety/depression, 13% reported starting or increasing their use of illicit substances and 25% of young adults reported having seriously considered suicide.[7] This burden only compounds the limitations in the implementation of adequate medical inpatient care and infection control which already exist in the setting of a psychiatric hospital.

While the toll on mental wellbeing has rightly been widely discussed in the literature and in the media, limited research presently exists on outbreaks of the virus within a psychiatric hospital, nor on the obstacles one faces in managing SARS-CoV-2 infection in patients with chronic mental illness. Interestingly, these challenges were identified as early as February in Wuhan, in Hubei province, China, after 323 psychiatric patients and 30 mental health professionals contracted the virus. Nation-wide psychiatric understaffing; an overreliance on hospital-centric rather than community-based services; patient crowding and group-interaction were notable areas of concern.[8]

The psychiatry ward presents a number of unique obstacles in the adherence to proper infection control policies. Patients with mental illness may not cooperate with isolation instructions. They often require close supervision and physical contact for the administration of treatment and within the context of physical or chemical restraint. Furthermore, the presence of severe mental illness is associated with significantly higher odds of medical comorbidity.[9] The majority of psychogeriatric admissions (91.5%) have at least one concurrent medical comorbidity.[10] Advanced age and comorbidity are well-documented predictors of increased case fatality rates in SARS-CoV-2.[11,12]

The outbreak which occurred in Mount Carmel Hospital, affected two inpatient wards of long-term, largely psychogeriatric patients. A cumulative total of 29 patients, all female, contracted the virus over a four-week period. A medical response team was

established to contend with this outbreak. This represented a unique logistical challenge and we believe that the model followed which led to the positive outcomes we experienced is something which can be replicated in inpatient psychiatry and other potential low-resource healthcare settings.

MATERIALS AND METHODS

Hospital Outbreak

The outbreak of the virus affected two chronic inpatient wards at Mount Carmel Hospital. The two involved wards catered to female psycho-geriatric and rehabilitation patients, and shall henceforth be referred to as Ward A and Ward B. While Ward A forms part of the central hospital complex, Ward B is detached from the main building, having its own separate entrance. Infection control policies in place prior to this outbreak included a mandatory 14-day period of quarantine in a separate ward that patients were required to fulfil prior to transfer to either ward. It was noted that simple measures such as hand hygiene and the use of personal protective equipment (PPE) were not being adhered to strictly in view of under-resourcing and a lack of clear guidance and training. Shortened visiting times were still being observed for patient relatives.

The majority of patients had complex needs in keeping with high medical and psychiatric illness burden. In keeping with this, both wards would regularly see high turnover rates of healthcare staff.

Screening of patients commenced following the identification of typical (cough, fever and/or breathlessness) and/or atypical (diarrhoea, vomiting and other URTI symptoms) in patients. Hospital procedure dictates that symptomatic patients be transferred to a temporary isolation ward to undergo SARS-CoV-2 nasopharyngeal swab testing, and then either to return to the ward should the test return negative, or be transferred to another isolation ward for positive patients should they be diagnosed as positive. All patients in Wards A and B underwent regular screening following the identification of positive patients. The incidence of infection in Wards A and B is displayed in *figures 1* and *2*.

Figure 1 SARS-CoV-2 Incidence

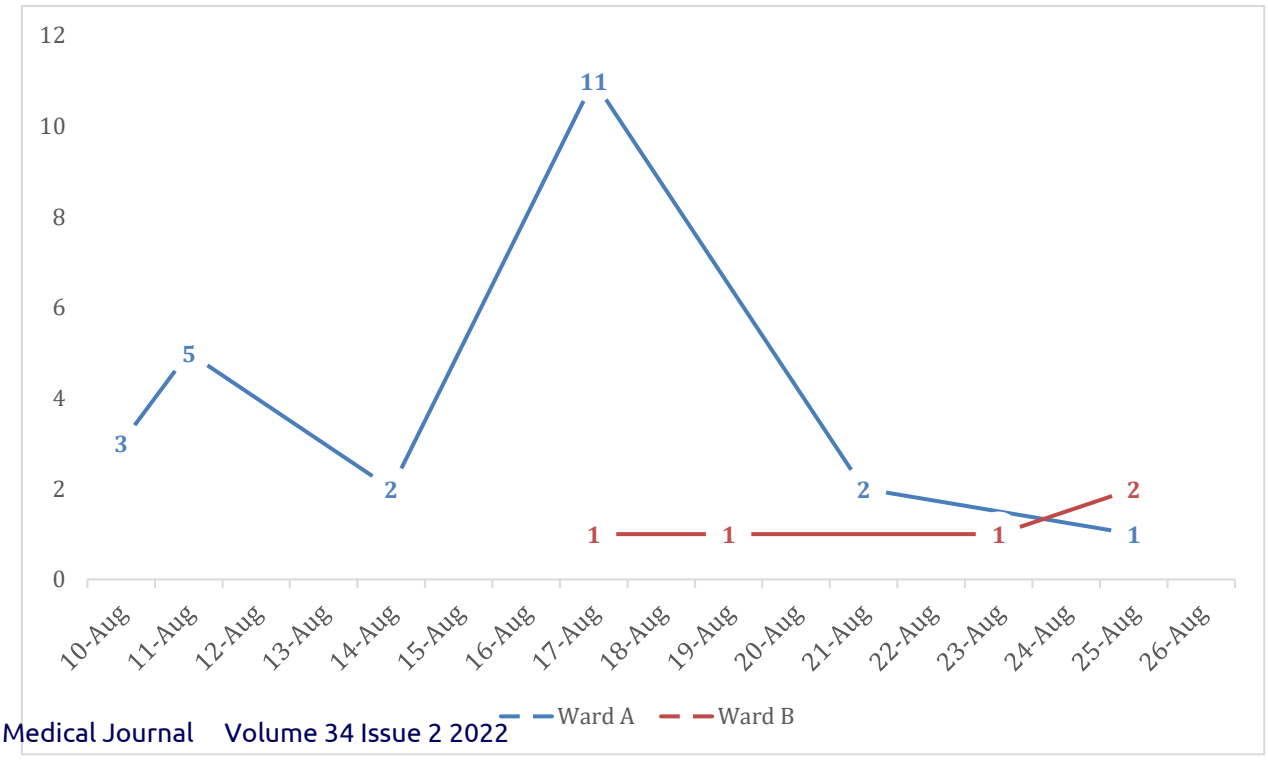
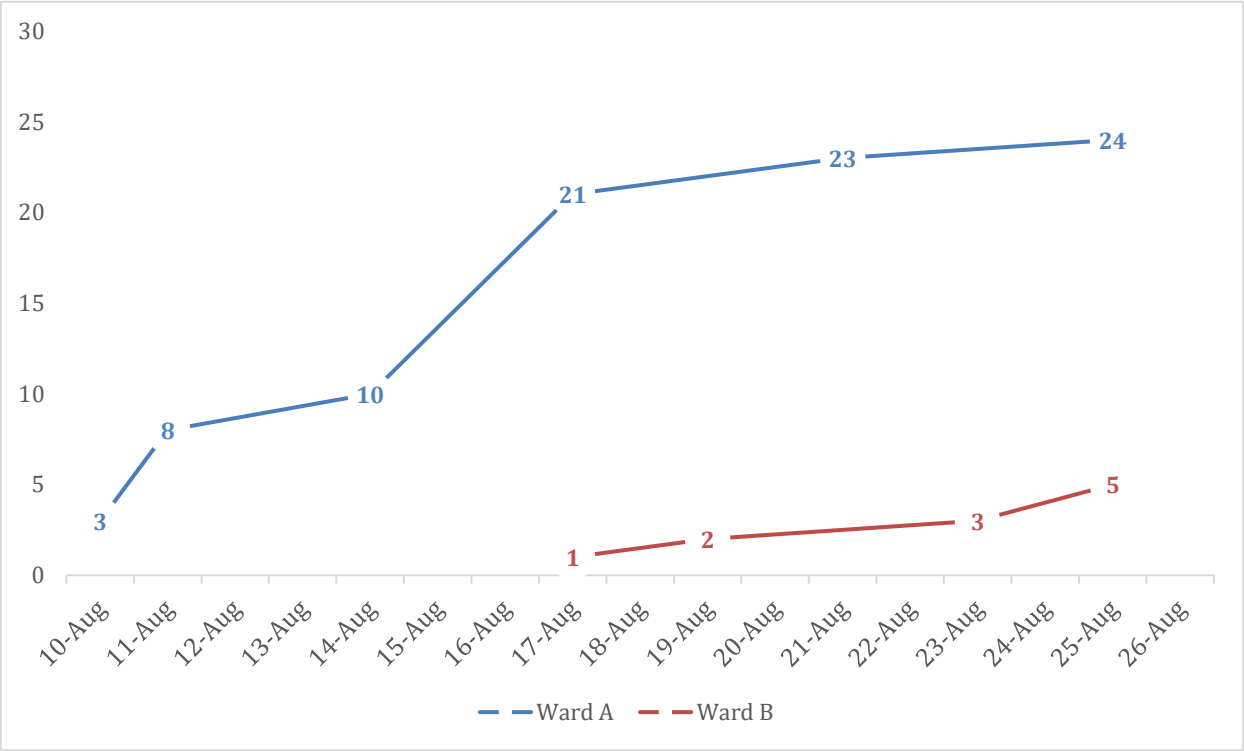


Figure 2 SARS-CoV-2 cumulative incidence



The first positive patients were identified on the 10th and 17th of August in Wards A and B respectively. Of note, the affected patients identified in Ward B all shared the same dormitory, and were some of the more physically dependent patients. Furthermore, the source of infection was later realized as an infected healthcare worker assigned to the care of these patients during their shift, highlighting the risks of healthcare workers representing potential vectors of infection in these vulnerable patient groups.

The first positive patient in Ward A was identified in view of fever noted on routine parameter-charting. Likely contributing to the spread of the virus in this ward was the fact that this patient was fully independent and enjoyed spending time and conversing with other patients on the ward. Group meal times and ward activities may have further compounded this risk.

Outbreak Containment

The cohort of positive patients were transferred incrementally to an isolation ward. Favourable characteristics of the isolation ward were independent ward access which averted the need to bypass other areas of the hospital, and negative pressure rooms which had been set up prior to the outbreak.

The ward was comprised of two 8-bedded rooms, and one 12-bedded room; one of the two 8-bedded having pre-established oxygen supply. This structure allowed for the seamless isolation of patients who would later be retested negative. Contaminated and non-contaminated areas were clearly demarcated and, where necessary, this distinction was marked by a border of adhesive tape along the floor. This allowed for separate paths for exposed and nonexposed staff within the context of a low-resource setting underprepared for such a scenario. Visiting hours for relatives were

suspended for the duration of the outbreak and beyond, as part of a hospital-wide policy.

Patient Demographics

In total, 29 patients were isolated during our hospital's wave of infections over a two-week period. The patients' demographic data was compiled from medical files and online databases which are shared with Mater Dei Hospital.

The patient cohort ranged in age from 45 to 87 – age group distribution is represented in *figure 3*. The mean age was 69.93. All of these patients were residing at Mount Carmel Hospital for psycho-geriatric care. The most common psychiatric comorbidity was schizophrenia, which was found in 8 patients. Of note, 4 patients were known cases of Huntington's Disease, including the youngest patient in the cohort (*table 1*). Seven patients suffered from 2 psychiatric comorbidities concomitantly.

There was a mean number of 2.14 medical comorbidities per patient (*table 2)*. The commonest were cardiovascular disease, diabetes mellitus and dyslipidemia, findings not entirely unexpected given the metabolic risk profiles of long-term psychiatric inpatients, and the age of this patient cohort. Research has shown that comorbid cardiovascular disease and diabetes mellitus are strong predictors of hospital admission.[15] Compounding medical illness, was the fact that 16 (55.17%) patients were entirely dependent in their activities of daily living (ADLs), while 6 (20.68%) were only semi-independent, requiring assistance with mobilization and toileting. Only 7 (24.14%) patients from the cohort were fully independent.

Figure 3 Age groups

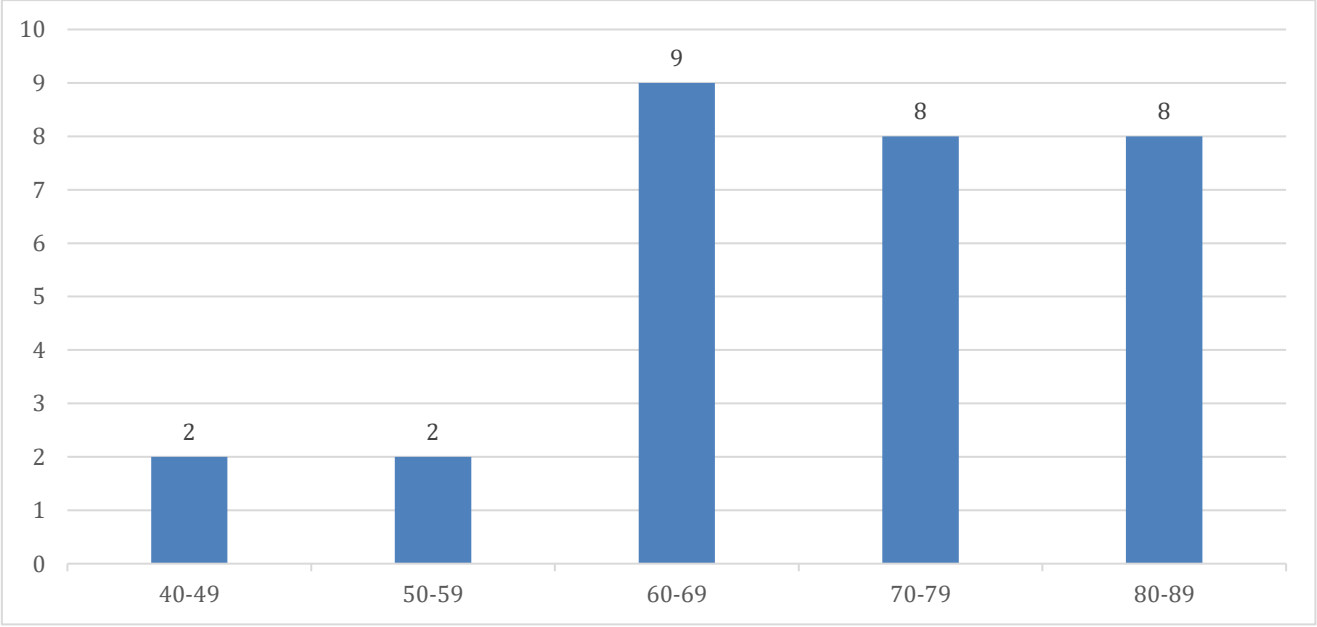


Table 1 Frequency of psychiatric comorbidities in patient cohort

Psychiatric Diagnosis	Frequency
Huntington's Disease	4
Bipolar affective disorder	3
Dementia	5
Depression	7
Schizophrenia	8
Schizoaffective Disorder	4
Anxiety	1
Multiple Sclerosis	1
Learning disability	2
Unspecified	1

Table 2 Frequency of medical comorbidities in patient cohort

Medical Comorbidity	Frequency
Cardiovascular Disease*	13
Diabetes Mellitus (type 2)	10
Dyslipidaemia	11
Neurological Conditions**	7
Hypothyroidism	7
Cerebrovascular Accident	3
Chronic Kidney Disease	2
Visual Impairment	2
Hearing Impairment	1
Respiratory Disease***	2
Metastatic Disease	1
Glaucoma	1
Gout	1
Darier's Disease	1

*Including Hypertension
**Includes Epilepsy, Parkinson's Disease and Multiple Sclerosis
***Includes Asthma & Chronic Obstructive Pulmonary Disease (COPD)

Patient and Ward Management

The patient cohort was incrementally transferred to the isolation ward as described. Two separate entrances rendered contaminated and non-contaminated pathways into and out of the ward feasible. Donning and doffing stations were established in appropriate areas in the ward. The structural layout of the ward did not allow for the use of an anteroom. To circumvent this issue, all PPE besides the N95 mask was doffed in a contaminated area, before the mask itself was disposed of in a clean area.

Close liaison with Infectious Diseases physicians at Mater Dei hospital played a key role in the set-up and care of our patients. The ward was visited by the team during the early stages of the outbreak, and daily patient logs outlaying the clinical status of our patients were relayed to them. The advice of the team was sought to contend with any patient deterioration requiring specialist input and in order to augment the infection control policy of the ward. This alliance also allowed for smooth and appropriate escalation of care where hospital-to-hospital transfer was necessary.

The medical response team which was established was comprised of 7 doctors. Clinical duties were carried out during twice-daily shifts, where a comprehensive morning ward round preceded a more targeted evening review. All patients were inspected clinically during the morning assessment, with any focused clinical examination dependent on the emergence of worrying signs, symptoms or investigation results. To limit infection risk, clinical parameter charting formed the mainstay of patient observation. During the evening review, assessment of parameter trends; investigation results; and nursing feedback was carried out. Only those patients who raised concern were then examined clinically during the evening. The care of any hospital inpatients outside of the isolation ward did not fall within the remit of the response team.

The team was later joined by a physiotherapist and speech and language pathologist (SLP).

Straightforward non-invasive devices formed the mainstay of the equipment used for patient monitoring. Both ear- and finger-probe pulse-oximeters were made use of for monitoring patient oxygen saturations. Ear probes proved essential in those patients with poor peripheral perfusion in whom clear readings could not be taken using finger-probes. Separate monitoring sets, which included non-contact infrared thermometers, were provided in each room.

In light of the risks of venous thromboembolism in SARS-CoV-2 patients, all patients were started on low-molecular-weight heparin upon diagnosis.[16] Patients were started on a daily dose of either 20mg or 40mg depending on baseline characteristics, comorbidity and drug history, in accordance with routine medical practice.

In terms of PPE, N95 masks were utilized, with FFP2 masks being made use of when N95 masks were not available. Medical clogs were provided for use in any designated contaminated area, being removed as part of the doffing process once clinical duties had been completed.

A fundamental aspect to our duties during this period was communication. In this low-resource setting, simple hospital pagers were used as the team divided to conduct ward rounds and carry out other clinical tasks. Team-members entering the contaminated area were able to relay clinical findings to, as well as receive the results of laboratory investigations from, those team members who remained in the non-contaminated area. This latter group was also tasked with documentation of ward-round findings.

A second important consideration with regards communication, was that with relatives. More specifically, that between patient and relative, and that between relative and doctor. The pager system was relied upon almost entirely for the contacting of patients by their relatives. Furthermore, the delivery of information regarding the wellbeing of patients to their relatives, as well as their involvement for strategic clinical decision-making, were also tackled via telephone call.

Viral polymerase chain reaction (PCR) testing was performed via nasopharyngeal swabbing. Patients were swabbed 14 days after being first identified as positive for SARS-CoV-2 as per our local Public Health guidance. Patient recovery was identified by a negative swab result taken after this allotted time period in conjunction with the absence of signs or symptoms of illness. Swab testing was repeated every 7 days in those patients who remained positive for the viral PCR test. Recovered patients were isolated from SARS-CoV-2-positive patients within the isolation ward, prior to being transferred back to their original wards.

RESULTS

Clinical Presentation

13 (44.83%) patients were entirely asymptomatic at the time of SARS-CoV-2 diagnosis, and remained so throughout the course of illness. Typical symptoms were identified in another 13 patients, with 8 (27.59%) being identified with fever, 3 (10.34%) reporting cough and 2 (6.90%) complaining of shortness of breath. 6 patients (20.69%) presented with atypical symptoms initially; 3 (10.34%) with diarrhoea, and the remaining 3 with vomiting, sore throat and myalgia.

Patient Outcomes

All 29 of our patients recovered from SARS-CoV-2 using the management system we implemented. 28 (96.55%) of patients were asymptomatic and swabbed negative two weeks after being diagnosed. Only 1 (3.45%) patient retested positive. She had remained asymptomatic throughout her course of illness, and was then swabbed negative after one further week.

In total, 13 (44.82%) patients required added oxygen supplementation during their course of illness, a demand which was met by one eight-bedded room with pre-installed oxygen supply, and oxygen cylinders for all remaining patients. One patient with low baseline oxygen saturations within the context of suspected Obesity Hypoventilation Syndrome (OHSS) refused oxygen supplementation as she was asymptomatic. Another, with a past medical history of COPD, was already receiving long-term oxygen therapy (LTOT), and experienced no increase in her oxygen demands. She was therefore not included in the portion of patients with increased requirements.

The patients required a mean duration of 8.85 days of oxygen therapy. It is worth noting that four of these oxygen-dependent patients were started on antibiotic therapy in view of suspected bacterial pneumoniae, which were identified by productive coughs and more persistent fever.

The age ranges for the patients requiring oxygen are displayed in *figure 4*. Interestingly, the 50-59-year and 60-69-year age groups had greater proportionate oxygen demands than those of the 70-79-year age group. Both individuals in the 50-59 group required new oxygen prescription (100%), while 44.44% of the 60-69-year age group needed oxygen. 62.5% of the 80-89-year age group had increased demands. The 70-79-year age group had the lowest proportionate requirements (12.50%). These percentages are represented in *table 3*.

Figure 4 Hypoxia across age groups

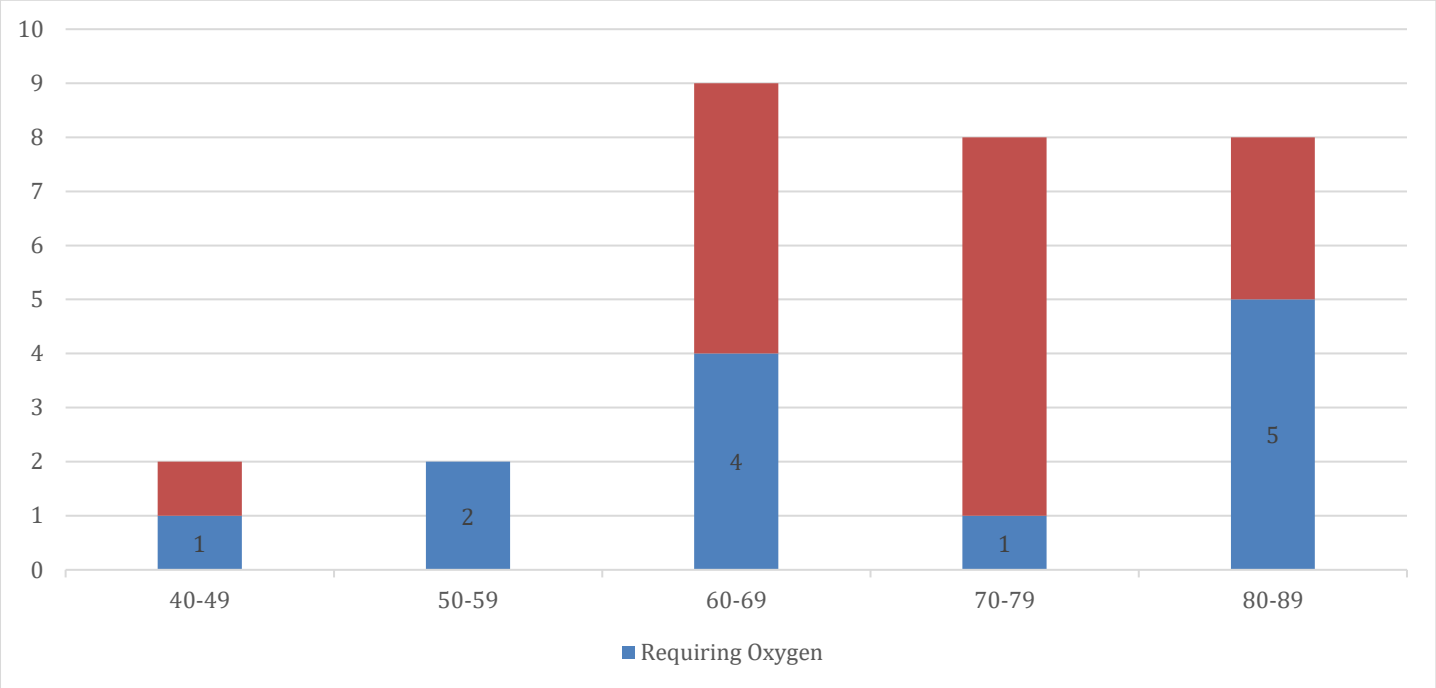


Table 3 Oxygen requirements by age-group

Age Group	Requiring Oxygen	Proportion
40-49	1	50%
50-59	2	100%
60-69	4	44.44%
70-79	1	12.50%
80-89	5	62.50%

Two patients required transfer to Mater Dei Hospital in view of clinical deterioration. Both were oxygen-dependent patients with secondary bacterial lower-respiratory tract infections. Both were moved in view of the increasing likelihood of needing ventilatory support. They returned following inpatient admissions of a mean duration of 7.5 days to complete their recovery at Mount Carmel Hospital. Neither patient required ventilatory support.

DISCUSSION

The outbreak of SARS-CoV-2 in such a vulnerable patient population within the setting of a mental health hospital represented a challenging undertaking. We believe that the formation of the medical response team and the partnership which

was formed with the Infectious Diseases team were key to the positive outcomes we experienced.

The burden a pandemic would place on mental health services and inpatient facilities was identified early from data gathered in Wuhan,[8] though further literature on the subject remains scanty. One of the conclusions of this study was that hospital bed shortage had necessitated the setting up of isolation wards within psychiatric hospitals for confirmed cases in psychiatric patients. The setting up of the isolation ward and management principles applied at our hospital during the outbreak no doubt alleviated the Infectious Diseases Unit at Mater Dei Hospital of significant strain.

The quality of presenting symptoms identified in our cohort were consistent with findings reported in a large scale study of SARS-CoV-2 in nursing homes in the United Kingdom.[6] While still striking, the proportion of our patients who were asymptomatic or presented atypically (44.83% and 20.69% respectively) was not higher in long-term psychiatric inpatients, suggesting that sufferers of chronic mental illness are no more likely to present without or with atypical symptoms than their counterparts in care homes.

Elderly psychiatric patients are at increased risk of medical comorbidity due to a number of factors.[10,13] Access to healthcare can be impaired; clinical presentation can be more difficult to elicit; and psychiatric medications can have their own adverse effects, which means medical illnesses can be both underdiagnosed and undertreated.[14]

An intriguing feature during the early stages of the set-up which was put in place was the approach that nursing staff took to this new group of patients. Semi-dependent and even entirely independent patients were nursed as if they were completely dependent in their ADLs. Patients who were able to mobilize and toilet without assistance were nursed almost entirely at the bedside and given nappies to meet their bathroom needs. We hypothesize that inexperience with SARS-CoV-2 patients and subsequent anxiety in nursing staff may have contributed to this initial strategy of care.[17]

There were a number of limitations in our study. First, our patient cohort was exclusively female – males have consistently been demonstrated to fare worse with the virus.[1,6,11,15] It is not unlikely that our outcomes may have been poorer should the cohort have been mixed. Second, the limited communicative capabilities a number of our patients faced may have actually led to an underrepresentation of presenting symptoms. Third, while oxygen cylinders had to be manually transported to meet the requirements of all of our oxygen-dependent patients, having one 8-bedded room with established oxygen supply was advantageous. We understand this might not always be the case in other low-resource healthcare settings. Fourth, a number of our patients suffered from secondary bacterial infections – it is unclear how much they contributed to their presenting symptomatology and oxygen requirements. Fifth, it is likely the initial barriers to care that have been laid out above may have lengthened recovery times and led to the development of complications.

CONCLUSION

Outbreaks of SARS-CoV-2 within the setting of a low-resource, long-term care or psychiatric inpatient facility can be contained and managed using a policy that employs straightforward clinical monitoring and supportive care; a targeted medical response team; an identified isolation ward; and close liaison with regional Infectious Diseases specialists.

SUMMARY

Present Knowledge

- Age and medical comorbidity are well-known risk factors for a more adverse outcome in SARS-CoV-2 infection.
- Greater rates of mortality have been observed in vulnerable settings such as long-term care homes.
- Psychiatric illness is associated with greater medical disease burden, diagnostic difficulties and communication barriers, which can worsen prognosis on SARS-CoV-2.

New Findings

- The impact of SARS-Cov-2 in the setting of a mental health inpatient facility in patients with chronic psychiatric illness has not been widely studied.
- Positive outcomes can be achieved through straightforward clinical monitoring, the setting up of a medical response team and liaison with specialists in Infectious Diseases.
- Patients with psychiatric illness present with similar rates of asymptomatic and atypical presentations to those encountered in long-term care homes.
- The setting of a psychiatric hospital presents unique clinical and interpersonal difficulties, and the impact of SARS-CoV-2 can significantly affect the psychological wellbeing of psychiatric patients.

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