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# Internal medicine patients admitted without COVID-19 during the outbreak

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## Abstract

**Background:** The first case of COVID-19 in Israel was reported on February 21, 2020. Shaare Zedek (SZ), a 1000-bed tertiary care medical centre in Jerusalem, Israel, cared for a significant number of these patients. While attention focused on COVID-19 patients, uninfected patients were admitted to decreasing numbers of available internal medicine (IM) beds as IM departments were converted to COVID-19 isolation wards. As a result of the increase in COVID-19 patients, closure of IM wards, reassignment of staff and dynamic changes in available community placement options, we investigated the impact of the outbreak on IM patient not admitted for COVID-19.

**Methods:** We reviewed IM admissions during March 15-April 30, 2020 for patients without COVID-19. Characteristics assessed included number of admissions, age, length of stay, mortality rate, number of discharges, number discharged home and functional status of the patients. Data were compared with the previous 3 years (2017-2019) during the same time period.

**Results:** During March 15-April 30, 2020 there were 409 patients admitted to IM compared with a mean of 557 over the previous 3 years. Fewer patients were admitted to the ED and the IM wards during the outbreak. There was no significant difference between the two groups with regards to gender, in-hospital mortality rate, number discharged, number discharged home and patient functional level. Patients admitted during the outbreak to IM were younger (74.85 vs 76.86 years) and had a mean shorter hospital length of stay (5.12 vs 7.63 days) compared with the previous 3 years.

**Conclusion:** While the characteristics of patients admitted to IM during the outbreak were similar, hospital length of stay was significantly shorter. Internal management processes, as well as patient preferences may have contributed to this observation. An infectious disease outbreak may have a significant effect on uninfected admitted patients.

## 1 | BACKGROUND

While the first cases of coronavirus disease (COVID-19) were reported in December 2019,[1] the first case of COVID-19 in Israel was reported on February 21, 2020 and rapidly spread (Figure 1). Shaare Zedek (SZ), a 1000-bed tertiary care medical centre in Jerusalem, Israel, cared for a significant number of these patients. The hospital adapted to the surge in patients as information regarding clinical signs and symptoms, possible treatments and testing were in development.[2-4] While attention focused on COVID-19 patients,

  

uninfected patients were admitted to decreasing numbers of available Internal Medicine (IM) beds. Pre-outbreak, SZ had four functioning IM departments. During the outbreak, the hospital developed five patient COVID-19 isolation wards and a dedicated COVID-19 Intensive Care Unit (ICU). There were fewer Emergency Department (ED) patients, but COVID-19 isolation wards filled up quickly. Staff had to be trained and deployed to work in these units. Many times, staff included subspecialist and non-IM tract interns. During the peak of the outbreak, two IM Departments were converted to COVID-19 isolation wards. As a result of the increase in COVID-19 patients, closure of IM wards, re-assignment of staff, and dynamic changes in available community placement options, we investigated the impact of the outbreak on IM patients not admitted for COVID-19.

**What's known**

- Hospitals in Israel had to adapt to the surge in COVID-19 patients, including training and deploying staff to work in newly formed COVID-19 isolation wards.

**What's new**

- While fewer numbers of patients were seen in the Emergency Department, non-COVID-19 patients continued to be admitted to a rapidly decreasing number of internal medicine beds at our institution.
- The COVID-19 outbreak was associated with changes in non-COVID-19 internal medicine patient characteristics and hospital length of stay.
- Research should focus on how outbreaks affect entire hospital populations and community resources.

## 2 | METHODS

We reviewed IM admissions during March 15-April 30, 2020 for patients without COVID-19. Characteristics assessed included number of admissions, age, length of stay, mortality rate, number of discharges and number discharged home. The term "outlier" was used to describe patients with longer hospital lengths of stay. For this analysis, we compare length of stay ≥10 days between the two groups. Data were compared with the previous 3 years (2017-2019) during the same time period. Functional status of the patients was approximated using the Norton scale. The Norton scale has traditionally been used to assess risk for pressure ulcers.[5] However, it is also a valid assessment tool for predicting hospitalisation length, complications during hospitalisation and in-hospital mortality in elderly patients admitted to an IM department.[6,7] The scale consists of five questions addressing physical condition, mental condition, activity level, patient mobility, frequency and type of incontinence. The score ranges from 5-20; less than 10 (very high risk), 10-14 (high risk), 15-18 (medium risk) and greater than 18 (low risk). Use of the scale is obligatory at SZ, and an assessment is conducted at the time of admission to the IM wards from the ED, and once a week thereafter. The last value during the admission was used for this analysis. Descriptive statistics were utilised to assess characteristics of the study population. Association between categorical variables were tested using the Yates' chi-square. Comparison of quantitative variables in two independent groups were performed using the t test. For statistical tests, two-sided *P* values of <.05 were considered significant. Statistical analyses were performed using Statistical Package for the Social Science software version 17 (SPSS Inc, Chicago, IL, USA). This study was approved by the Shaare Zedek Medical Center Institutional Review Board (Helsinki Committee, #0176-20-SZMC).

## 3 | RESULTS

During March 15-April 30, 2020 there were 409 patients admitted to IM compared with a mean of 557 over the previous 3 years (Table 1). Fewer patients were admitted to the ED (Figure 2) and the IM wards during this time. With regards to patient gender, in-hospital mortality rate, number discharged, number discharged home (ie, vs a healthcare facility) and the mean Norton score, there did not appear to be a significant difference between the two groups. In both groups, more than half of the patients were considered high or very high risk according to the Norton score, consistent with lower functional status for this study. Patients admitted during the outbreak to IM were younger and had shorter mean hospital stays by over 2 days, when compared with the previous 3 years. The median length of stay was the same, but the interquartile range was shortened by 1 day for the group of patients admitted during the outbreak. There were no difference between the two groups with regards to the number of patients admitted for ≥10 days.

## 4 | DISCUSSION

This was an extremely dynamic period in Israel. A national shutdown severely limited movement, except for essential personnel and activities. During this period, the overall number of patients presenting to the Emergency Department (ED) was visibly less than the previous 3 years. While there were fewer patients admitted to IM via the ED, there were progressively fewer IM departments. During one of the peak days of the outbreak, the number of IM wards had been decreased from four to two. Additionally, a small 14-bed satellite unit was established to help decompress the IM wards. By this time, five isolation wards had been rapidly established, including an ICU ward for COVID-19 patients. Therefore, in comparison to the previous year, four IM wards had been replaced by two IM wards and five COVID-19 isolation wards (Figure 3). There are reports of hospitals having to shutdown wards and reallocate personnel and resources to be able to care for the influx of COVID-19 patients.[8] While no approach has been standard, there

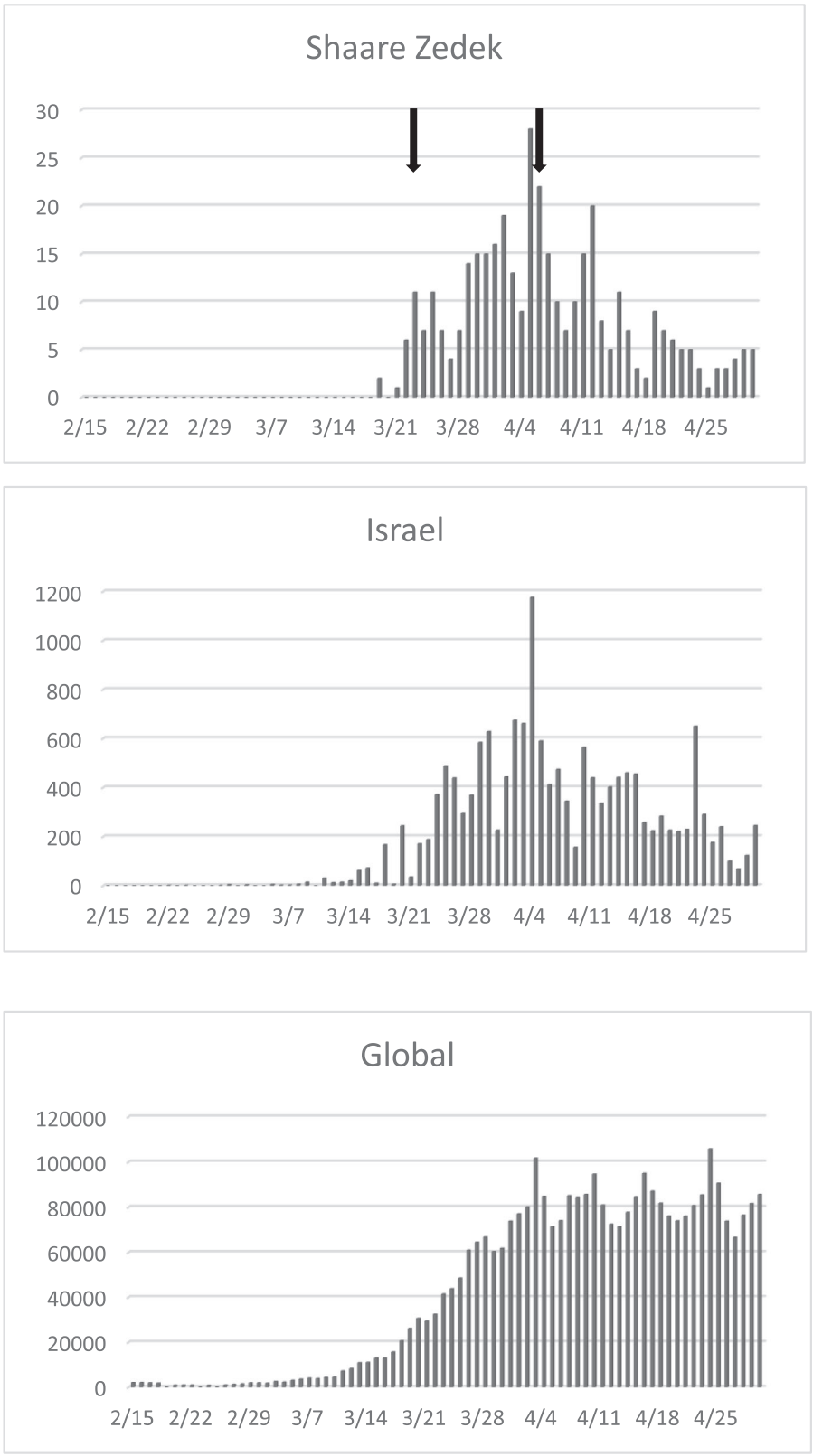


**FIGURE 1** New cases of COVID-19 by date of positive test in 2020. Black arrows indicate the closure of a single Internal Medicine department. Source for Israel and global data, https://www.worldometers.info/coronavirus/

will be a need to look back and assess individual site response to the pandemic, as well as to formulate a plan for the current effort and future healthcare epidemics.

Patients admitted to IM were significantly younger, as older patients may have been admitted to isolation wards, died at home or feared coming to the hospital, thinking it an epicentre of infection.

Nursing homes may have been hesitant to send patients to the hospital, knowing that an open bed might mean accepting a possibly infected patient in return. While patients were younger, they were not young (ie, mean age of approximately 75 years). More than half of the patients on the IM wards were not independent and their pre-discharge Norton score indicates a low functional status. This finding is consistent with the local demographics, the ageing population and the reported observation of functional decline in hospitalised elderly patients.[9] While not classically used for assessing the case-mix of patients, the use of the Norton scale is obligatory for every IM admission at our facility and does describe many aspects of the patient's physical and mental attributes. More complex, albeit possibly harder to derive, metrics for assessing functional assessment do exist as well.[10]

**TABLE 1** Characteristics of internal medicine patients admitted between March 15-April 30, 2017-2019 compared with 2020, without COVID-19 infection

| Variable | 2017-2019 (n = 1671) | 2020 (n = 409) | *P* Value |
|---|---|---|---|
| Patients per period, mean | 557 | 409 | NA |
| Age, years, mean (SD) | 76.86 (15.88) | 74.85 (17.66) | .013 |
| Male, n (%) | 271 (48.7) | 210 (51.3) | .369 |
| Length of stay, d, mean (SD) | 7.63 (10.87) | 5.52 (5.12) | <.001 |
| Length of stay, d, median (IQR) | 4 (2-8) | 4 (2-7) | .011 |
| Length of stay ≥ 10 d, n (%) | 172 (30.9) | 115 (28.1) | .303 |
| Mortality rate per period, n (%) | 75 (13.5) | 57 (13.9) | .891 |
| Patients discharged per period, n (%) | 481 (86.4) | 352 (86.1) | .916 |
| Patients discharged home per period, n (%) | 411 (73.8) | 303 (74.1) | .953 |
| Norton score, mean (SD) | 12.87 (4.31) | 13.12 (4.46) | .204 |
| High to very high risk, n (%) | 311 (55.8) | 224 (54.7) | NA |

Abbreviations: IQR, interquartile range; NA, not applicable.

We observed a significantly decreased hospital length of stay, without an increase in mortality. After admitting the first infected patient, the hospital director established a team dedicated to overseeing patient flow from admission to discharge. This team was comprised of a chief medical officer, a department head of IM, the director of social work and senior nursing managers. The team was in constant communication, met with staff and family members, and had discussions with the ministry of health, health maintenance organisations and local nursing homes. It is possible that this team aided in decreasing hospital length of stay. However, like many places in the world, Jerusalem has a significantly older and more dependent population. In addition, Patients are unwilling to be discharged to locations outside the city as this might limit the possibility of being visited by family members. There are also limited options for skilled nursing facilities. Even with these challenges, a decrease length of stay was observed. While patients themselves may have been more eager for discharge, there may be more unmeasured variables that explain this observation. Interestingly, comparing the mean SD of the length of stay for both groups accentuates the impact of outlier patients who have complicated admission or more likely (ie, in our system), complex discharge needs combined with limited community resources (eg, skilled nursing facility beds). During the outbreak, the mean SD hospital length of stay decreased significantly compare to 2017-2019 (5.52 vs 10.87 days), possibly related to patient preference or the above-mentioned increased effort by the hospital to free up potential beds. It might also have been possible that for the 2017-2019, there were more patients with hospital lengths of stay ≥10 days; however, we did not observe this. Patient functional level was similar to prior years, but the patient case-mix based on

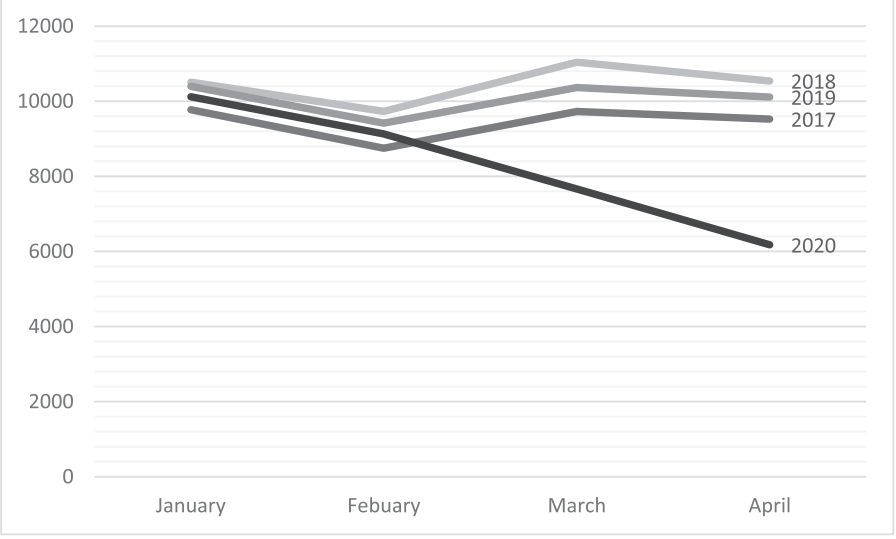


**FIGURE 2** Emergency room admissions to Shaare Zedek by Year, January—April

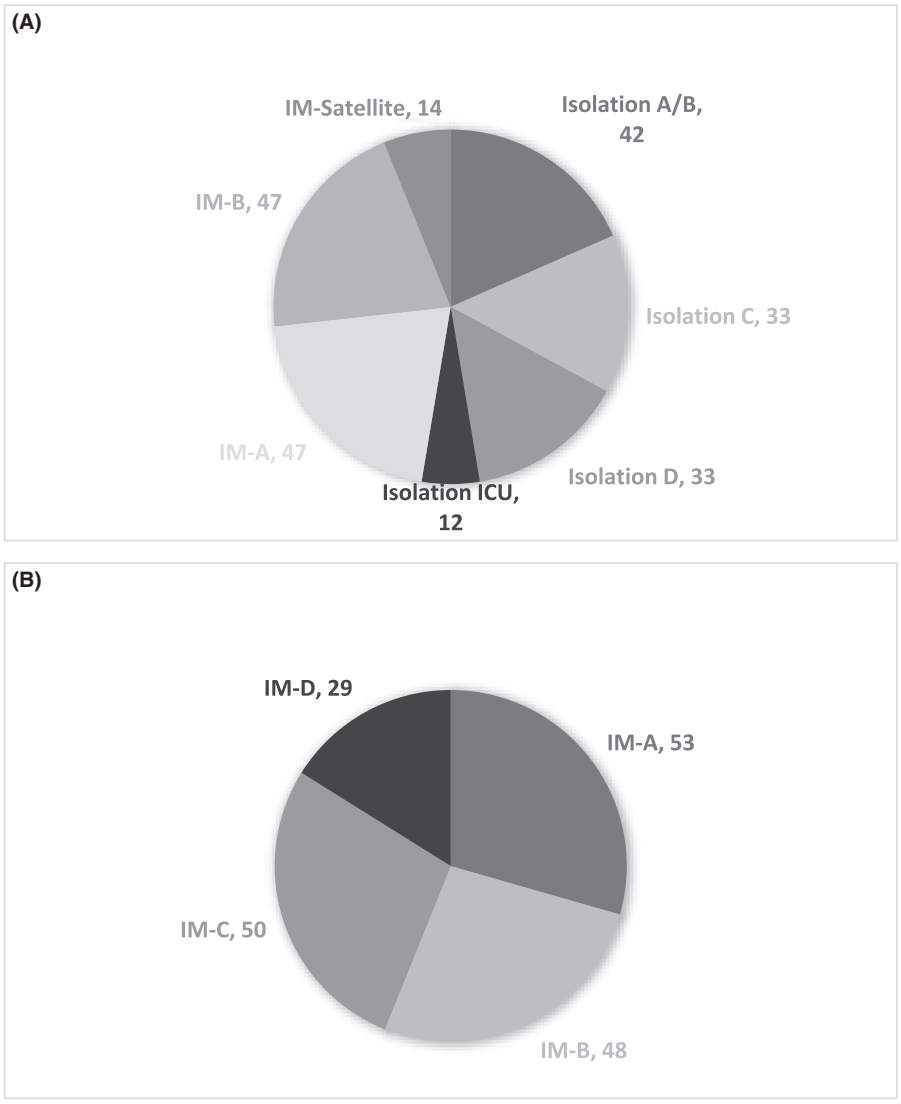


**FIGURE 3** Distribution and number of IM patients during a peak day of the outbreak (A), and the same day a year prior (B). IM, internal medicine ward; Isolation, rapidly built COVID-19 patient isolation ward; ICU, COVID-19 intensive care unit; Satellite, satellite IM ward

diagnosis (eg, admitting or discharge) was not assessed and might have differed between the two groups, possibly explaining the observed difference in hospital length of stay.

Physician staffing during this time period was a concern. Some IM residents and senior physicians were home in isolation, caring for children no longer at school during the day or retasked to COVID-19 isolation wards. We succeeded in maintaining IM staffing on the non-COVID-19 IM wards during this time and believe this helped allow us to maintain pre-outbreak mortality rates and numbers discharged. IM department teams were broken down into smaller groups and interaction between the groups was limited. Conversations between different hospital groups were conducted via video conferencing. While the administration was actively engaged and promoted regular top-down and bottom-up communication, burn-out was a concern on the IM as well as the isolation wards. However, the relatively short duration of the outbreak, as compared with other global locations, likely helped to keep the hospital functioning at a high standard.

IM patients on the regular non-COVID-19 wards and the COVID-19 isolation wards were all admitted, cared for and discharged by IM physicians and medical sub-specialist. Most patients were discharged home. Discharging patients to nursing homes was challenging. Specific requirements for SARS-CoV-2 testing prior to discharge changed frequently and were site-specific. The reported mortality rate in nursing homes during this time and the possibility of being isolated for an extended period, may have influenced patient preferences.[11]

Weaknesses of this study include its single centre design and that we did not analyse individual patient diagnoses. However, there were a large number of patients and the two groups were similar in-terms of functional status. Statistical significance of the variables addressed is only a measure of association and not an indication of causality. This analysis is unique in that it focused on non-COVID-19 patients admitted during the outbreak in a westernised country with a robust healthcare infrastructure, generalisable to other countries around the globe.

While hospitals have observed decreased admissions for appendicitis and myocardial infarction during the outbreak,[12] non-COVID-19 infected IM patients continued to arrive to SZ. Their care and clinical course were likely affected by the over 400 patients admitted to SZ with COVID-19. The outbreak identified weaknesses in the present healthcare infrastructure, but it also emphasised the role and versatility of IM physicians (ie, hospitalists), the vital role of communication and the importance of teamwork at every level. Proper planning allowed SZ to remain functional and even shorten IM patient length of stay. Further studies and research should address how outbreaks affect the entire hospital populations and surrounding community resources.

## DISCLOSURES

We confirm that all authors of this paper have fulfilled the conditions of the *IJCP* regarding contribution to the concept, design and drafting of the manuscript. In addition, all authors have passed final approval on the manuscript that is currently being submitted. We declare that the manuscript has not been submitted or accepted for publication elsewhere, and we are not aware of any manuscripts that are related to the one we submit. No conflicts of interests were declared by any of the authors regarding the content of this report.

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