A descriptive analysis of the effect of the national COVID-19 lockdown on the workload and case mix of patients presenting to a district-level emergency centre in Cape Town, South Africa

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Background. The global COVID-19 pandemic caused many countries to institute nationwide lockdowns to limit the spread of the disease. Objectives. To describe the effect of the national COVID-19 lockdown in South Africa (SA) on the workload and case mix of patients presenting to a district-level emergency centre.

Methods. The electronic patient tracking and registration database at Mitchells Plain Hospital, a district-level hospital in Cape Town, was retrospectively analysed. The 5-week lockdown period (27 March - 30 April 2020) was compared with a similar period immediately before the lockdown (21 February - 26 March). A comparison was also made with corresponding time periods during 2018 and 2019. Patient demographics, characteristics, diagnoses and disposition, as well as process times, were compared.

Results. A total of 26 164 emergency centre visits were analysed (8 297 in 2020, 9 726 in 2019, 8 141 in 2018). There was a reduction of 15% in overall emergency centre visits from 2019 to 2020 (non-trauma 14%, trauma 20%). A 35% decrease was seen between the 2020 lockdown period and the 5-week period before lockdown (non-trauma 33%, trauma 43%), and the reduced number of visits stayed similar throughout the lockdown period. The median age increased by 5 years during the 2020 lockdown period, along with an 8% decrease in patients aged <12 years. High-acuity patients increased by 6% and the emergency centre mortality rate increased by 1%. All process times were shorter during the lockdown period (time to triage ~24%, time to consultation ~56%, time to disposition decision ~29%, time in the emergency centre ~20%).

Conclusions. The SA national COVID-19 lockdown resulted in a substantial decrease in the number of patients presenting to the emergency centre. It is yet to be seen how quickly emergency centre volumes will recover as lockdown measures are eased.

The COVID-19 pandemic, caused by SARS-CoV-2, has changed the way of life across the world. The most pertinent measure that was implemented was social distancing, with the intention to reduce transmission and to lessen the acute burden imposed on the healthcare system. Social distancing refers to the practice of increasing and maintaining the physical space between people in order to decrease the chance of spreading contagious diseases.

Individual actions further include wearing a cloth face covering, avoiding large public gatherings, limiting use of public transportation, and working from home if possible.

Many countries across the globe instituted national lockdown measures to minimise contact with potentially infected persons, and it is estimated that more than a third of the global population were simultaneously under some sort of lockdown at the height of the outbreak in May 2020.

Healthcare facilities have braced themselves for the expected wave of COVID-19 patients, but the potential impact on acute care services remains uncertain, as other diseases will continue to present during the pandemic. Previous outbreaks have demonstrated that when health systems are overwhelmed, mortality from other treatable conditions can also increase dramatically. During the 2014 - 2015 Ebola outbreak, the number of deaths caused by measles, malaria, HIV/AIDS and tuberculosis far exceeded deaths from Ebola, the main reason being the reduction in access to healthcare services.

Emergency centres are the frontline medical response during an outbreak of a pandemic disease and can quickly be stretched to their limits. Emergency centres in the USA experienced an 18% increase in overall visits during the 2009 influenza A(H1N1)pdm09 pandemic. On the other hand, emergency centres often recorded a substantial reduction in patient volumes during the peak of an epidemic. Emergency centre visits decreased by a third during the 2015 MERS (Middle East respiratory syndrome) outbreak in Korea, and halved in Taiwan at the peak of the 2003 SARS (severe acute respiratory syndrome) epidemic.

There have also been anecdotal reports of decreased patient volumes during the current COVID-19 pandemic.

The first detected case of COVID-19 in South Africa (SA) was diagnosed on 5 March 2020, and a National State of Disaster was declared on 23 March. This included the institution of a 21-day nation-wide lockdown which was extended by a further 2 weeks (27 March - 30 April). SA's lockdown was deemed one of the...
strictest around the world and was mainly instituted to buy some
time for the overburdened public hospital system to increase its
capacity in anticipation of the influx of COVID-19 patients.[12]
Primary level healthcare services in SA are provided by local clinics
and 24-hour community health centres, and the country has a
three-tiered hospital system consisting of district (level 1), regional
(level 2) and tertiary/central (level 3) hospitals.[13] District-level
hospitals are equipped to provide basic diagnostic and therapeutic
services, and specialist services are not always available.[13] Data on
the impact of the COVID-19 pandemic and the associated social
distancing measures on entry-level healthcare facilities are lacking.

Objectives
To describe the effect of the COVID-19 lockdown on the workload
and case mix of patients presenting to a district-level emergency
centre in Cape Town, SA.

Methods
Study design
A retrospective analysis of a prospectively collected observational
data database was conducted.

Study setting
Mitchells Plain Hospital is a 230-bed district-level hospital, situated
~32 km from Cape Town’s city centre. It serves a population of
~600 000, which includes the population of Mitchells Plain and
the greater part of Philippi, a large nearby township. Looking at
demographics, Mitchells Plain is home to low- to middle-income
families, of which 90% are coloured;[14] Philippi has a low-income
community that comprises 90% black residents.[15] The area battles
with social challenges, including gangsterism, crime, drug abuse,
unemployment and poverty. Interpersonal violence and other injuries
are particularly prevalent over weekends.[16] The emergency centre
manages ~50 000 patients annually, with ~60% being of high acuity.

Mitchells Plain Hospital utilises an electronic patient tracking
and registration database called HECTIS (Hospital and Emergency
Centre Tracking Information System). It was primarily designed for
administrative and management purposes in order to streamline
and track patient processes in the emergency centre, including
their process times, triage scores, diagnoses and dispositions.
Routine clinical data are collected for every patient who enters the
emergency centre. The data are stored electronically on an off-site
Oracle database, version 12.1.0.2.0 (Oracle Corp., USA) and are
automatically backed up daily. Authorised users can access the data
via the HECTIS application using an active-directory authenticated
login and password. Users of the registry are granted access and
authorisation according to their clinical role, e.g. a clinician will
access a different part of HECTIS to a triage nurse.

Study participants
Convenience sampling was used to include all patients that
presented to the emergency centre at Mitchells Plain Hospital
over the study periods, which were the 3-week lockdown period
(27 March - 30 April 2020), a 5-week period immediately before the
lockdown (21 February - 26 March), and corresponding periods
during 2019 and 2018.

Data collection and management
Data were exported from the HECTIS database for the various
study periods. Variables included age, gender, mode of transport,
Discussion
The national COVID-19 lockdown measures resulted in a decreased workload at a district-level emergency centre. A 14% decrease in emergency centre visits occurred during the 2020 lockdown period compared with the corresponding period in 2019. A 35% reduction was also seen compared with the 5-week period before the national lockdown was instituted, and this decrease remained constant until the end of the lockdown period. The time to consultation decreased by 56%, even with more patients presenting with high-acuity disease.

The substantial decrease in the number of emergency visits during the COVID-19 lockdown period is similar to previous epidemics. A significant reduction in patients presenting to emergency centres was also experienced during the 2003 SARS epidemic. A 52% reduction in daily emergency centre visits occurred in Taiwan, with noticeable reductions in respiratory diseases (e.g. acute bronchitis, upper respiratory infection) and minor ailments (e.g. gastrointestinal disorders and back pain). A Hong Kong emergency centre also documented a 24% reduction in overall emergency centre visits and a 39% reduction in trauma-related visits. This reduction in emergency centre visits also occurred during the 2015 MERS epidemic, where the emergency centre attendance of a Korean emergency centre decreased by 33%.

The reduction in emergency centre visits seems contradictory during an epidemic or pandemic. One would expect an increase in patients, especially related to the epidemic itself. The de-escalation of outpatient services and elective surgery during the lockdown period was also projected to increase the number of emergency centre visits, as these patients were expected to seek medical care from the emergency centres. An increase in process times was further expected if the inpatient disciplines are overwhelmed, resulting in an overflow into the emergency centre. The reduction in emergency centre visits seems to be caused by two main factors. Firstly, people are afraid to visit healthcare facilities, staying away in order to avoid contracting the disease. A recent US survey indicated that 29% of adults had delayed or avoided medical care because they were concerned about contracting COVID-19.

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Secondly,
the changes in community behaviour (either spontaneous, or enforced as during COVID-19 lockdowns) during an epidemic result in a lower incidence of trauma and other diseases.\cite{19} The decrease in traffic volumes could result in fewer trauma presentations,\cite{22} whereas patients with minor illnesses may decide to self-medicate at home. An additional factor in our study was that the national lockdown in SA was implemented at a very early stage of the pandemic: only a total of 1 170 cases and 1 death had been confirmed on the day the lockdown period started.\cite{23} More patients may have presented to the emergency centre if the lockdown period had coincided with a later stage of the pandemic.

People’s fear of attending healthcare facilities during an epidemic has a downside. Delay in seeking or avoidance of medical care results in patients being sicker when they do present to the emergency centre. This was evident in the 6% increase in high-acuity patients, and corresponds to the report from an emergency centre in Canada that presenting patients were sicker than is usually seen.\cite{24} A 1% increase in the emergency centre mortality rate was also documented in our study. One could argue that the percentage is inflated, since the overall number of patients (mainly the less acute patients) decreased. However, the absolute number increased compared with 2019 and with the period immediately before the 2020 lockdown. Existing evidence indicates that delayed onset of emergency care increases patient mortality,\cite{25} and it is a possible reason for the increase in the mortality rate. The delay in seeking medical care could even be more detrimental in terms of mortality, as patients may die before reaching the emergency centre. Anecdotal evidence from areas in the USA indicates a five-fold increase in deaths at home.\cite{9}

Study limitations
This study has limitations. It was a retrospective analysis using an existing electronic database from a single district-level facility. The results do not reflect the workload and characteristics of patients presenting to other healthcare facilities, and care must be taken in generalising the results. Diagnostic codes (ICD-10) were also used as a surrogate measure of disease and may not be entirely accurate. We did not attempt to quantify any potential misclassifications and subsequent bias that could have resulted from either the validity of the diagnosis made or the association between the diagnostic code and the documented diagnosis. Nonetheless, we are confident that the results are closely related to the truth.

Key messages
What is already known on this topic
• Many healthcare systems have been overburdened during the COVID-19 pandemic
• Reports from previous epidemics (e.g. SARS, MERS) indicated a decrease in emergency centre volumes at the peak of the epidemic
• The effect of lockdown on the workload of district-level emergency centres is not known.

What this study adds
• Our study indicates a decrease in patient volumes at a district-level emergency centre during the COVID-19 lockdown period
• Patients who did visit the emergency centre had a higher acuity of disease, and a higher proportion were admitted to inpatient disciplines.

Conclusions
The SA national COVID-19 lockdown resulted in a substantial decrease in the
Table 2. Demographics and characteristics of patients presenting to the emergency centre during the 5-week COVID-19 lockdown and pre-lockdown periods* and corresponding periods for 2 years prior to the lockdown

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>2018 Pre-lockdown (N=3 825)</th>
<th>2019 Pre-lockdown (N=4 705)</th>
<th>2020 Pre-lockdown (N=5 014)</th>
<th>2020 Lockdown (N=3 283)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median (Q1 - Q3)</td>
<td>29 (11 - 45)</td>
<td>29 (9 - 46)</td>
<td>29 (10 - 47)</td>
<td>34 (21 - 53)</td>
</tr>
<tr>
<td>≤12 years, n (%)</td>
<td>963 (25)</td>
<td>1 166 (27)</td>
<td>1 299 (26)</td>
<td>581 (18)</td>
</tr>
<tr>
<td>Female</td>
<td>1 913 (50)</td>
<td>2 171 (50)</td>
<td>2 436 (49)</td>
<td>3 419 (49)</td>
</tr>
<tr>
<td><strong>Arrived from, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scene/home</td>
<td>2 425 (64)</td>
<td>2 865 (66)</td>
<td>3 453 (69)</td>
<td>2 376 (72)</td>
</tr>
<tr>
<td>Other healthcare facility</td>
<td>910 (23.8)</td>
<td>895 (21)</td>
<td>959 (19)</td>
<td>599 (18)</td>
</tr>
<tr>
<td>General practitioner</td>
<td>489 (12.8)</td>
<td>556 (13)</td>
<td>587 (12)</td>
<td>301 (9)</td>
</tr>
<tr>
<td>Unknown</td>
<td>1 (&lt;1)</td>
<td>0</td>
<td>7 (&lt;1)</td>
<td>1 (&lt;1)</td>
</tr>
<tr>
<td><strong>Transport method, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self</td>
<td>2 512 (66)</td>
<td>2 915 (68)</td>
<td>3 108 (62)</td>
<td>1 987 (61)</td>
</tr>
<tr>
<td>Ambulance</td>
<td>753 (20)</td>
<td>772 (18)</td>
<td>1 169 (23)</td>
<td>896 (27)</td>
</tr>
<tr>
<td>Fire or police services</td>
<td>24 (&lt;1)</td>
<td>26 (&lt;1)</td>
<td>53 (1)</td>
<td>20 (1)</td>
</tr>
<tr>
<td>Unknown</td>
<td>536 (14)</td>
<td>603 (14)</td>
<td>691 (14)</td>
<td>380 (12)</td>
</tr>
<tr>
<td><strong>Patient acuity, n (%)</strong>†</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-urgent (green)</td>
<td>319 (8)</td>
<td>284 (7)</td>
<td>427 (9)</td>
<td>259 (8)</td>
</tr>
<tr>
<td>Urgent (yellow)</td>
<td>1 990 (52)</td>
<td>2 178 (51)</td>
<td>2 249 (45)</td>
<td>1 295 (39)</td>
</tr>
<tr>
<td>Very urgent (orange)</td>
<td>1 259 (33)</td>
<td>1 562 (36)</td>
<td>1 992 (40)</td>
<td>1 485 (45)</td>
</tr>
<tr>
<td>Emergency (red)</td>
<td>149 (4%)</td>
<td>168 (4)</td>
<td>200 (4)</td>
<td>171 (5)</td>
</tr>
<tr>
<td>Unknown</td>
<td>108 (3)</td>
<td>124 (3)</td>
<td>143 (3)</td>
<td>73 (2)</td>
</tr>
<tr>
<td><strong>Diagnostic category, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical</td>
<td>1 982 (52)</td>
<td>2 289 (53)</td>
<td>2 540 (51)</td>
<td>1 798 (55)</td>
</tr>
<tr>
<td>Trauma</td>
<td>686 (18)</td>
<td>743 (17)</td>
<td>899 (18)</td>
<td>491 (15)</td>
</tr>
<tr>
<td>Surgical</td>
<td>472 (12)</td>
<td>484 (11)</td>
<td>496 (10)</td>
<td>356 (11)</td>
</tr>
<tr>
<td>Obstetrics and gynaecology</td>
<td>194 (5)</td>
<td>206 (5)</td>
<td>214 (4)</td>
<td>203 (6)</td>
</tr>
<tr>
<td>Psychiatry</td>
<td>149 (4)</td>
<td>149 (4)</td>
<td>207 (4)</td>
<td>144 (4)</td>
</tr>
<tr>
<td>Toxicology</td>
<td>53 (1)</td>
<td>54 (1)</td>
<td>62 (1)</td>
<td>37 (1)</td>
</tr>
<tr>
<td>Unknown</td>
<td>289 (8)</td>
<td>391 (9)</td>
<td>592 (12)</td>
<td>254 (8)</td>
</tr>
<tr>
<td><strong>Disposition from emergency centre, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharged home</td>
<td>2 051 (54)</td>
<td>2 230 (52)</td>
<td>2 504 (50)</td>
<td>1 489 (45)</td>
</tr>
<tr>
<td>Referred to inpatient disciplines</td>
<td>1 270 (33)</td>
<td>1 372 (32)</td>
<td>1 610 (32)</td>
<td>1 298 (40)</td>
</tr>
<tr>
<td>Absconded/refused hospital treatment</td>
<td>229 (6)</td>
<td>304 (10)</td>
<td>556 (11)</td>
<td>196 (6)</td>
</tr>
<tr>
<td>Transferred to higher-level facilities</td>
<td>17 (4)</td>
<td>252 (6)</td>
<td>204 (4)</td>
<td>165 (5)</td>
</tr>
<tr>
<td>Referred to other facilities</td>
<td>82 (2)</td>
<td>125 (3)</td>
<td>93 (2)</td>
<td>78 (2)</td>
</tr>
<tr>
<td>Died in emergency centre</td>
<td>23 (&lt;1)</td>
<td>33 (&lt;1)</td>
<td>47 (1)</td>
<td>57 (2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process times (minutes), median (Q1 - Q3) (maximum)</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>To triage (n=25 355)</td>
<td>25 (8 - 63)</td>
<td>29 (10 - 64)</td>
<td>31 (7 - 51)</td>
</tr>
<tr>
<td>To consultation (n=25 086)</td>
<td>113 (55 - 205)</td>
<td>198 (86 - 395)</td>
<td>235 (105 - 480)</td>
</tr>
<tr>
<td>To disposition decision (n=25 086)</td>
<td>233 (135 - 383)</td>
<td>361 (191 - 626)</td>
<td>404 (208 - 761)</td>
</tr>
<tr>
<td>In emergency centre (n=25 086)</td>
<td>348 (195 - 618)</td>
<td>588 (297 - 922)</td>
<td>590 (295 - 1 008)</td>
</tr>
</tbody>
</table>

Q1 = quartile 1; Q3 = quartile 3.
*Pre-lockdown (or corresponding) period 21 February - 26 March; lockdown (or corresponding) period 27 March - 30 April.
†According to the South African Triage Scale.[17]
number of patients presenting to the emergency centre. Decreased numbers of emergency visits were witnessed throughout the lockdown period. It is yet to be seen how quickly emergency centre volumes will recover as lockdown measures are eased.

Declaration. None.

Acknowledgements. None.

Author contributions. DJvH and CH conceived the study, CH and MP undertook data collection and DJvH data management and analysis. DJvH drafted the article and CH and MP critiqued the paper for important intellectual content. DJvH is the guarantor.

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Conflicts of interest. None.


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