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ORIGINAL RESEARCH

Epidemiology and clinical features of emergency department patients with suspected COVID-19: Results from the first month of the COVID-19 Emergency Department Quality Improvement Project (COVED-2)

Gerard M O'REILLY [1,2,3] Rob D MITCHELL [1,2] Jamin WU,[1,4] Prithi RAJIV,[1,4] Holly BANNON-MURPHY [1] Timothy AMOS [1] Lisa BRICHKO,[1,2,5] Helen BRENNECKE,[1] Michael P NOONAN,[1,3,6] Biswadev MITRA [1,2,3] Andrew PATON,[1,7] Ryan HILLER,[1] De Villiers SMIT,[1,2,3] Carl LUCKHOFF,[1] Mark J SANTAMARIA[1] and Peter A CAMERON [1,2]

[1]Emergency and Trauma Centre, Alfred Health, Melbourne, Victoria, Australia, [2]School of Public Health and Preventive Medicine, Monash University, Melbourne, Victoria, Australia, [3]National Trauma Research Institute, Alfred Health, Melbourne, Victoria, Australia, [4]Central Clinical School, Monash University, Melbourne, Victoria, Australia, [5]Emergency Department, Cabrini Hospital, Melbourne, Victoria, Australia, [6]Trauma Service, Alfred Health, Melbourne, Victoria, Australia, and [7]Adult Retrieval Victoria, Ambulance Victoria, Melbourne, Victoria, Australia

Abstract

Objective: The aim of the present study was to describe the epidemiological and clinical features of ED patients with suspected and confirmed COVID-19.

Methods: The COVID-19 Emergency Department (COVED) Project is an ongoing prospective cohort study that includes all adult patients presenting to The Alfred Hospital ED who undergo testing for SARS-CoV-2. Current guidelines recommend testing for patients with fevers or chills, acute respiratory symptoms or a high-risk exposure history, as well as implementation of infection prevention and control precautions for all suspected and confirmed cases. Study outcomes include a positive SARS-CoV-2 test result and intensive respiratory support.

Results: In the period 1–30 April 2020, 702 of 3453 ED patients (20%; 95% CI 19–22) were tested, with a significant increase during the study period (incident rate ratio 1.019; 95% confidence interval 1.017–1.021, $P < 0.001$). The primary outcome of a positive SARS-CoV-2 test was recorded in 14 patients (2%; 95% confidence interval 1–3). Shortness of breath (77%), fatigue (100%), myalgia (67%) and diarrhoea (67%) were common among positive cases, while close contact (9%), fever (0%) and healthcare occupation (0%) were not. No positive cases required intensive respiratory support in the ED.

Conclusions: The volume of ED patients with suspected COVID-19 is increasing. Low numbers of positive cases precluded development of accurate predictive tools, but the COVED Project is fulfilling an important role in monitoring the burden of infection prevention and control requirements on the ED. The

Key findings

- During April 2020, at a large hospital in Melbourne, Victoria, the volume of ED patients with suspected COVID-19 increased.
- The number of ED patients who were SARS-CoV-2 positive remained relatively low.
- The increasing number of patients meeting isolation criteria has the potential to impact on patient flow and may lead to ED overcrowding.

Correspondence: Associate Professor Gerard M O'Reilly, Emergency and Trauma Centre, The Alfred, 55 Commercial Road, Melbourne, VIC 3004, Australia. Email: gerard.oreilly@monash.edu

Gerard M O'Reilly, MBBS, MPH, MBiostat, FACEM, PhD, Emergency Physician, Adjunct Clinical Associate Professor, Head of Epidemiology and Biostatistics, NHMRC Research Fellow; Rob D Mitchell, MBBS (Hons), BMedSc (Hons), MPH&TM, GradCertDisRefHlth, FACEM, Emergency Physician, PhD Scholar; Jamin Wu, BMedSc (Hons), Medical Student; Prithi Rajiv, BMedSc (Hons), Medical Student; Holly Bannon-Murphy, MBBS, BA, Emergency Registrar; Timothy Amos, MBBS, Be/BSc, Emergency Registrar; Lisa Brichko, MBBS (Hons), MHM, DCH, AFRACMA, FACEM, Emergency Physician, Adjunct Research Associate; Helen Brennecke, MBBS, FACEM, Emergency Registrar; Michael P Noonan, MBChB (Hons), BPhty (Hons), MMEd, FACEM, Emergency Physician, Honorary Consultant, Trauma Consultant; Biswadev Mitra, MBBS, MHSM, FACEM, PhD, Director of Emergency Medicine Research, Professor, Head of Clinical Research; Andrew Paton, MBChB, FACEM, CHIA, Emergency Physician, Retrieval Consultant; Ryan Hiller, MBBS, Emergency Registrar; De Villiers Smit, MBChB, FACEM, Emergency Physician, Director, Adjunct Associate Professor, Head of Emergency Medicine Program; Carl Luckhoff, MBChB, FACEM, Emergency Physician; Mark J Santamaria, MBBS, FACEM, CHIA, Emergency Physician; Peter A Cameron, MBBS, FACEM, MD, Emergency Physician, Adjunct Professor.

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increasing number of patients meeting isolation criteria has the potential to impact on patient flow and may lead to ED overcrowding.

Key words: *COVID-19, emergency, isolation, quality improvement, registry.*

Introduction

As the COVID-19 pandemic continues over the months ahead, ED clinicians will require real-time tools and data to guide clinical decision making. Although public health measures have been successful at reducing the incidence of COVID-19 in Australia, the easing of restrictions, and the threat of a second wave, present new challenges for frontline staff.[1,2] ED clinicians will need to remain vigilant, maintaining an awareness of risk factors, predictors and outcomes for patients with COVID-19.

Diagnostic testing for SARS-CoV-2 continues to be based on specific criteria and, outside of targeted surveillance programmes, screening of asymptomatic patients is not recommended. Case definitions have evolved rapidly, however, and in Victoria, Australia, criteria for testing were expanded significantly in mid-April. Current statewide guidance requires testing of patients with fever or chills in the absence of an alternative diagnosis that explains the clinical presentation or acute respiratory infection (e.g. cough, sore throat, shortness of breath, runny nose or anosmia). In addition, testing is recommended for patients with new onset of other clinical symptoms consistent with COVID-19 (such as headache, myalgia, stuffy nose, nausea, vomiting, diarrhoea), and who are close contacts of a confirmed case of COVID-19, have returned from overseas in the past 14 days or are healthcare workers (HCW) or aged care workers.[3]

The COVID-19 Emergency Department (COVED) Quality Improvement Project continues to monitor the clinical features and outcomes of patients presenting to ED with suspected COVID-19. As cases accumulate, the COVED Project aims to determine and report the clinical and epidemiological predictors of a positive SARS-CoV-2 test result and the requirement for intensive respiratory support among patients presenting to the ED with suspected COVID-19.[4] The objective of this analysis (COVED-2) is to report the results for the first month of the COVED Project: 1 to 30 April 2020.

Methods

COVED is an ongoing prospective cohort study that commenced on 1 April 2020. The study protocol has been published previously.[4]

The study includes adult patients who had a SARS-CoV-2 polymerase chain reaction (PCR) test requested in the ED. As outlined above, testing criteria are defined by the Victorian Government, and broadened significantly from 14 April.[3]

As part of COVED, clinical details for patients with suspected or confirmed COVID-19 are collected prospectively using a dedicated form embedded in the hospital's electronic medical record (EMR) system. Data are subsequently entered into a novel registry utilising Research Electronic Data Capture (REDCap) tools, hosted and managed by Helix (Monash University).[5] Administrative data are exported directly from the EMR.

The EMR form and REDCap database have been designed so that they can be updated with additional variables as new information regarding COVID-19 emerges. Current versions of the data dictionary and case report form are available on The Alfred Hospital's academic programmes website at https://emergencyeducation.org.au/research/coved/.

This analysis (COVED-2) describes study findings for all eligible patients who presented to The Alfred Emergency and Trauma Centre between 1 and 30 April 2020. The Alfred Hospital is a tertiary, adult, level 1 trauma centre with an annual ED census of approximately 70 000. A co-located but geographically separate screening clinic for COVID-19 was operational during the study period, but not under the governance of the ED. Patients who attended the screening clinic and did not present for medical assessment in the ED were excluded.

Outcome measures include a positive SARS-CoV-2 PCR test result and requirement for intensive respiratory support. A complete list of additional variables has previously been published in the study protocol.[4] These include history (age, sex, symptoms and duration of presenting complaint, epidemiological features, comorbidities), findings on clinical examination, radiological and blood investigations, care provided in the ED and hospital

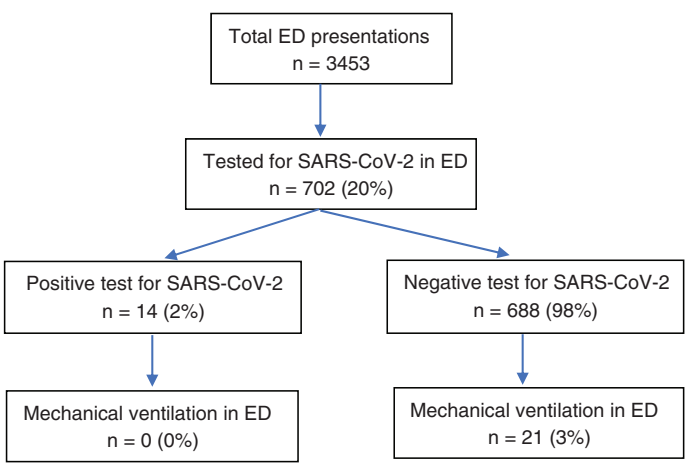

Figure 1. *Flowchart demonstrating proportion of SARS-CoV-2 positive tests and mechanical ventilation among cases with suspected COVID-19 in the ED.*

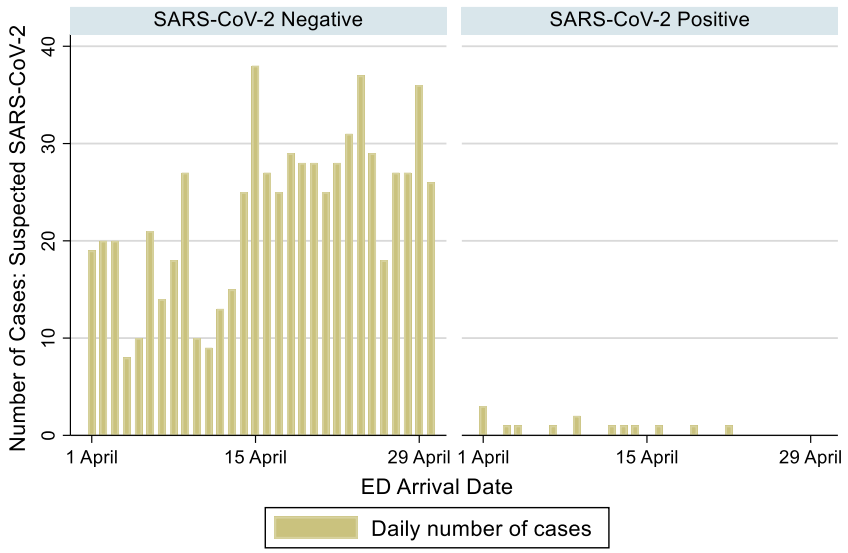

Figure 2. *Graph showing incidence of suspected COVID-19 cases (by SARS-CoV-2 test result) over the study period.*

(including commencement of mechanical invasive ventilation and ED disposition destination) and patient outcomes (including survival to discharge). COVED variables and definitions have been harmonised with international COVID-19 research tools developed by the World Health Organization and International Severe Acute Respiratory and Emerging Infection Consortium.[6]

For the purposes of this analysis, summary descriptive statistics have been determined for the pre-specified variables across all patients meeting inclusion criteria. This data has also been stratified by SARS-CoV-2 test result. Among this group of symptomatic patients, the definition of a COVID-19 diagnosis used for COVED-2, as for COVED-1, was the existence of a positive test result from a SARS-CoV-2 PCR swab taken either prior to, or during the hospital presentation.[7]

According to the study protocol, inferential analyses (comparing predictors and outcomes by SARS-CoV-2 test result, with summary measures of association and 95% confidence intervals [CIs]) were only to be conducted if the number of SARS-CoV-2 positive cases allowed for a valid analysis. That is not the case for the first full month of the Project, and COVED-2 is therefore limited to descriptive statistics.

Symmetrical numerical data have been summarised using the mean and standard deviation; skewed and ordinal data have been summarised using the median and interquartile range (IQR); and categorical data have been summarised using the frequency and percentage. To examine the trend in count data (i.e. presentation rate) over the study period, negative binomial regression methods were employed, and these results were summarised using incident rate ratios (IRRs). Data were analysed using STATA statistical software (version 15.1; StataCorp, College Station, TX, USA). Ethics approval was obtained from the Alfred Human Research Ethics Committee (Project No: 188/20) on 26 March 2020.

Results

Over the study period of 30 days, there were 3453 presentations to the ED. Of these, 702 (20%; 95% CI 19–22) had a SARS-CoV-2 test requested and were included in this analysis (Fig. 1). The daily number of eligible (suspected COVID-19) patients presenting to the ED increased during the study period (IRR 1.019; 95% CI 1.017–1.021, $P < 0.001$) (Fig. 2). SARS-CoV-2 was detected in 14 (2%; 95% CI 1–3) cases.

Table 1 describes the clinical features of patients who underwent SARS-CoV-2 PCR swab testing in the ED. The mean (standard deviation) age was 57 (22) years, and 392 (56%) were male. There were 17 (2%) patients who were transferred from another hospital, and 363 (52%) arrived by road ambulance. The most frequent triage category assigned was category 3 (n = 351 [50%]), followed by category 2 (n = 168 [24%]).

Regarding history and clinical examination findings, the most common presenting complaints were acute shortness of breath (n = 339 [58%]) and acute cough (n = 303 [50%]). The median (IQR) number of days between first symptom and ED presentation was 3 (IQR 1–7) days. The proportion of SARS-CoV-2-tested patients living in a residential aged care facility was 10% (n = 62). There were no HCWs in the study sample. Almost one fifth of patients (n = 118 [17%]) had been tested for SARS-CoV-2 prior to their ED presentation, of whom eight (1%) were reported to be SARS-CoV-2 positive. Abnormal vital signs were reported as hypoxia in 33 (5%), hypotension in 32 (5%), tachycardia in 209 (30%) and fever in 75 (11%) patients on their initial vital signs in the ED.

Table 2 provides the descriptive statistics for the investigations, care and outcomes of patients for whom a SARS-CoV-2 PCR swab test was conducted in the ED. There were 554 (79%) patients who had a chest X-ray, 40 (7%) of which were reported by a radiologist as having bilateral infiltrates. According to blood tests performed in the ED, 187 (29%) had a leucocytosis and 146 (26%) had a C-reactive protein (CRP) of greater than 50 mg/L.

Among patients who tested positive for SARS-CoV-2, the most common reported symptoms were shortness of breath (77%), fatigue (100%), myalgia (67%) and diarrhoea (67%). Among other variables considered to confer an increased

TABLE 1. *Descriptive statistics for clinical features of patients with suspected COVID-19 in the ED*

Variable	Missing, *n* (%) (*n* = 702)	All cases of suspected COVID-19 (*n* = 702)	SARS-CoV-2 test positive† (*n* = 14)	SARS-CoV-2 test negative (*n* = 688)
Age (years), mean (SD)	0 (0)	57 (22)	50 (18)	57 (22)
Sex, *n* (%)	0 (0)			
Male		392 (56)	11 (79)	381 (55)
Transfer from other hospital, *n* (%)	0 (0)	17 (2)	1 (7)	16 (2)
Mode of transport, *n* (%)	0 (0)			
Ambulance – road		363 (52)	4 (29)	359 (52)
Ambulance – helicopter		10 (1)	0 (0)	10 (1)
Public transport		50 (7)	1 (7)	49 (7)
Private transport/Other		279 (40)	9 (64)	270 (39)
Triage category, median (IQR)	0 (0)	3 (2,3)	3 (3,3)	3 (2,3)
Triage category, *n* (%)				
1		23 (3)	0 (0)	23 (3)
2		168 (24)	1 (7)	167 (24)
3		351 (50)	11 (79)	340 (49)
4		157 (22)	2 (14)	155 (23)
5		3 (0)	0 (0)	3 (0)
Presenting complaint, *n* (%)				
Shortness of breath	121 (17)	339 (58)	10 (77)	329 (58)
Cough	101 (14)	303 (50)	8 (67)	295 (50)
Change to chronic cough	240 (34)	52 (11)	1 (11)	51 (11)
Anosmia or dysgeusia	408 (58)	22 (7)	2 (29)	20 (7)
Sore throat	214 (30)	154 (32)	3 (30)	151 (32)
Runny nose	254 (36)	114 (25)	4 (40)	110 (25)
Fever	112 (16)	263 (45)	7 (58)	256 (44)
Fatigue	347 (49)	175 (49)	11 (100)	164 (48)
Myalgia	332 (47)	115 (31)	8 (67)	107 (30)
Diarrhoea	254 (36)	63 (14)	8 (67)	55 (13)
Other	77 (11)	336 (54)	6 (43)	330 (54)
Number of days since first symptom, median (IQR)	39 (6)	3 (1,7)	7 (4,21)	3 (1,7)
Other relevant history, *n* (%)				
Overseas in previous 28 days	178 (25)	35 (7)	6 (50)	29 (6)
Contact with confirmed case	192 (27)	24 (5)	7 (64)	17 (3)
Residential aged care facility	89 (13)	62 (10)	1 (9)	61 (10)
Healthcare worker	99 (14)	0 (0)	0 (0)	0 (0)
Previous SARS-CoV-2 swab†	0 (0)			
SARS-CoV-2 positive		8 (1)	8 (57)	0 (0)
SARS-CoV-2 negative		67 (10)	0 (0)	67 (10)
Swab result unknown		43 (6)	1 (7)	42 (6)

(*Continues*)

TABLE 1. *Continued*

Variable	Missing, *n* (%) (*n* = 702)	All cases of suspected COVID-19 (*n* = 702)	SARS-CoV-2 test positive† (*n* = 14)	SARS-CoV-2 test negative (*n* = 688)
No prior swab		584 (83)	5 (36)	579 (84)
Comorbidities, *n* (%)				
Chronic respiratory	149 (21)	187 (34)	2 (17)	185 (34)
Obesity	358 (51)	94 (27)	1 (13)	93 (28)
Smoker	278 (40)	191 (45)	9 (56)	186 (45)
Chronic cardiac	160 (23)	167 (31)	3 (25)	164 (31)
Hypertension	161 (23)	208 (38)	2 (17)	206 (39)
Diabetes mellitus	181 (26)	95 (18)	2 (17)	93 (18)
Malignant neoplasm	155 (22)	72 (13)	2 (15)	70 (13)
Immunosuppressive pharmacotherapy	176 (25)	86 (16)	1 (9)	85 (17)
Other	9 (1)	126 (18)	4 (29)	122 (18)
Examination – first vital signs in ED				
Temperature (°C), mean (SD)	2 (0)	36.7 (1.6)	36.9 (0.6)	36.7 (1.6)
Fever recorded (temperature ≥38°C), *n* (%)		75 (11)	1 (7)	74 (11)
SaO_2 (%), mean (SD)	2 (0)	97 (4)	97 (4)	97 (4)
Hypoxia (SaO_2 <92%), *n* (%)		33 (5)	1 (7)	32 (5)
Systolic BP (SBP) (mmHg), mean (SD)	6 (1)	138 (27)	139 (26)	138 (27)
Hypotension (SBP <100 mmHg), *n* (%)		32 (5)	1 (7)	31 (5)
Heart rate (/min), mean (SD)	3 (0)	92 (20)	89 (21)	92 (20)
Tachycardia (heart rate >100/min), *n* (%)		209 (30)	4 (29)	205 (30)
GCS, median (IQR)	3 (0)	15 (15,15)	15 (15,15)	15 (15,15)
Abnormal GCS (GCS ≤13), *n* (%)		70 (10)	1 (7)	69 (10)
AVPU, *n* (%)	95 (14)			
A		555 (91)	11 (100)	544 (91)
V		29 (5)	0 (0)	29 (5)
P		7 (1)	0 (0)	7 (1)
U		16 (3)	0 (0)	16 (3)
Examination – other				
Abnormality on chest auscultation,‡ *n* (%)	298 (42)	123 (30)	3 (75)	120 (30)

†SARS-CoV-2 positive cases are defined in COVED-2 as having a positive SARS-CoV-2 test either *prior to or during their hospital presentation*. ‡May not have been performed. IQR, interquartile range; SD, standard deviation.

risk of COVID-19, close contact (9%), fever (0%) and being a HCW (0%) were uncommon. Half reported a history of overseas travel.

Mechanical ventilation was commenced in the ED for 21 (3%) tested patients, but none had a positive result for SARS-CoV-2. From the ED, 300 (43%) patients were admitted to the general ward and 29 (4%) to the ICU, proportions that were consistent across the study month.

TABLE 2. *Descriptive statistics for investigations, care and outcomes of patients who underwent SARS-CoV-2 testing in the ED*

Variable	Missing, *n* (%) (*n* = 702)	All cases of suspected COVID-19 (*n* = 702)	SARS-CoV-2 test positive† (*n* = 14)	SARS-CoV-2 test negative (*n* = 688)
Investigations – imaging‡				
Chest X-ray abnormal, *n* (%)	148 (21)			
Yes – bilateral infiltrates		40 (7)	5 (38)	35 (6)
Yes – other abnormality		159 (29)	1 (8)	158 (29)
No		355 (64)	7 (54)	348 (64)
CT chest abnormal, *n* (%)	607 (86)			
Yes – bilateral infiltrates		0 (0)	0 (0)	0 (0)
Yes – other abnormality		60 (63)	1 (100)	59 (63)
No		35 (37)	0 (0)	35 (37)
Investigations – blood tests‡				
White cell count (WCC) ($\times 10^9$/L), mean (SD)	53 (8)	10 (10)	6 (3)	10 (10)
Leucocytosis (WCC >11.0 [$\times 10^9$/L]), *n* (%)		187 (29)	1 (8)	186 (29)
CRP (mg/L), mean (SD)	140 (20)	43 (72)	68 (94)	43 (71)
CRP >50, *n* (%)		146 (26)	6 (50)	140 (25)
INR (ratio), mean (SD)	342 (49)	1.2 (1.0)	1.0 (0.1)	1.2 (1.0)
Coagulopathy (INR >1.3), mean (SD)		50 (14)	0 (0)	50 (14)
Haemoglobin (Hb) (g/L), mean (SD)	53 (8)	131 (22)	135 (23)	131 (22)
Anaemia (Hb <8.0 g/L), *n* (%)		0 (0)	0 (0)	0 (0)
Platelets (10^9/L), mean (SD)	54 (8)	243 (91)	171 (74)	245 (91)
Thrombocytopenia (platelet count <150 × 10^9/L), *n* (%)		69 (11)	4 (31)	65 (10)
Emergency care				
Goals of care documentation, *n* (%)	578 (82)			
A = For ICU and MV		67 (54)	4 (100)	63 (53)
B = For ICU, not for MV		32 (26)	0 (0)	32 (27)
C = Not for ICU, for comfort care		18 (15)	0 (0)	18 (15)
D = Not for ICU, for palliation		7 (6)	0 (0)	7 (6)
Invasive mechanical ventilation in ED, *n* (%)	0 (0)	21 (3)	0 (0)	21 (3)
Disposition destination from ED, *n* (%)	0 (0)			
Died in ED		3 (0)	0 (0)	3 (0)
ICU		29 (4)	1 (7)	28 (4)
Ward (not ICU)		300 (43)	7 (50)	293 (43)
ED short stay unit		154 (22)	2 (14)	152 (29)
Home		174 (25)	4 (29)	170 (25)
Other (including transfer)		42 (6)	0 (0)	42 (6)

(*Continues*)

TABLE 2. *Continued*

Variable	Missing, *n* (%) (*n* = 702)	All cases of suspected COVID-19 (*n* = 702)	SARS-CoV-2 test positive† (*n* = 14)	SARS-CoV-2 test negative (*n* = 688)
Disposition destination from hospital, *n* (%)	3 (0)			
Died in hospital		29 (4)	0 (0)	29 (4)
Residential Care Facility		17 (2)	0 (0)	17 (2)
Home		537 (77)	12 (86)	525 (75)
Transfer to other hospital		72 (10)	0 (0)	72 (11)
Discharge against medical advice		18 (3)	0 (0)	18 (3)
Hospital in the Home		15 (2)	0 (0)	15 (2)
Other		1 (0)	0 (0)	1 (0)
Inpatient at end of study period		11 (2)	2 (14)	9 (1)

†SARS-CoV-2 positive cases are defined in COVED-2 as having a positive SARS-CoV-2 test either *prior to or during their hospital presentation*. ‡May not have been performed. IQR, interquartile range; SD, standard deviation.

During the study period, 29 (4%) patients died in hospital, of which none had tested positive for SARS-CoV-2.

Discussion

In the first full month of the COVED Project, the daily number and proportion of patients with a positive SARS-CoV-2 test remained relatively low, but the rate of patients presenting to the ED with suspected COVID-19 increased significantly. Despite the low number of positive cases, the present study highlights the substantial burden to EDs from patients with suspected COVID-19. The low number of hospitalised positive cases precluded the development of predictive tools, but previously identified epidemiological and clinical risk factors (such as overseas travel, sick contacts and fever) were uncommon among patients who tested positive for SARS-CoV-2.

Infection prevention and control (IPC) procedures for patients meeting criteria for suspected COVID-19 stipulate that they are managed as if SARS-CoV-2 positive until negative test results are returned. While these infection control measures are warranted, the significant number of suspected cases may have a negative impact on the timeliness of patient assessment and management, as well as overall system efficiency.[8] While this impact has so far been minimised by significantly reduced ED attendance,[9] there is a risk that the EDs could soon become overwhelmed by patients requiring isolation.[8] Furthermore, there is likely to be an increasing number of patients presenting with COVID-like symptoms due to other viral illnesses, particularly as the traditional influenza season begins alongside a relaxation of state and national social distancing measures. Similar concerns, especially in relation to the potential implications of access block and overcrowding, have been raised overseas.[10]

The small number of SARS-CoV-2 positive cases (*n* = 14) to date precludes confidence in identifying those epidemiological factors, clinical features and outcomes that distinguish SARS-CoV-2 positive from SARS-CoV-2 negative patients. Among patients presenting to ED with suspected SAR-CoV-2 infection in April 2020, most patients with a positive test for SARS-CoV-2 still reported recent overseas travel and/or contact with a confirmed case.

As highlighted in COVED-1,[7] fatigue was universally present as a complaint in all patients who were SARS-CoV-2 positive and should continue to be sought in the assessment of potential COVID-19 patients. The results from the first month of the Project suggest initial leucocytosis or a raised CRP are inadequate discriminators for positive SARS-CoV-2 status. Among positive cases, with only one patient admitted from the ED to the ICU and with no in-hospital deaths, it still appears to be the case that the outcome of COVID-19 patients in Australia may be favourable compared to other countries.[11–14]

Although it was not the primary intent of the project, COVED is adding value by providing information around the current burden of suspected COVID-19 patients in the hospital system. As the management of suspected COVID-19 patients becomes part of 'business as usual', the relevance of this data will increase.[8] It will also hopefully highlight the importance of rapid testing turn-around times as well as innovative models of care to mitigate the risk of access block and ED overcrowding.

Beyond the ongoing role of the COVED Project and COVED Registry, the demand for an ongoing source of contemporary clinical information and sentinel surveillance

in EDs will persist. A registry for emergency care (REC), with the short-term capacity to examine the impact of IPC processes on patient care, will have an essential role as a source of real-time clinical data to guide emergency care delivery and public health response, especially in the setting of communicable disease outbreaks.[15,16] Tools of this nature may help offset the impact of public health emergencies on Australian EDs,[17] and help drive innovative approaches to managing the risks of nosocomial transmission.[8]

Limitations

The low incidence of SARS-CoV-2 positive results over the first full month of the COVED Project has precluded valid inferential analyses regarding how COVID-19 patients differ in terms of their demographic features, clinical presentation, severity risk factors, need for intensive respiratory support and key outcomes. While some percentages displayed in Tables 1 and 2 may vary between those who have had a positive SARS-CoV-2 test and those who do not, these figures should be interpreted with caution. Missing data remains an issue for some variables, and continual efforts will be required to increase the level of data completeness for those variables needing to be extracted manually from the EMR form used by ED clinicians.

During the study period, Victorian Government testing criteria broadened significantly. From 14 April, testing was recommended for any patient with fever or chills in the absence of an alternative diagnosis that explains the clinical presentation or acute respiratory infection characterised by cough, sore throat or shortness of breath. Additionally, patients with recent onset of other clinical symptoms consistent with COVID-19 (headache, myalgia, runny or stuffy nose, anosmia, nausea, vomiting, diarrhoea), who are close contacts of a confirmed case of COVID-19 or who have returned from overseas in the past 14 days were also recommended for testing. Prior to these changes, testing had been based on a combination of symptoms plus epidemiological criteria, or severe bilateral pneumonia in isolation. While the project protocol clearly stated that testing would be performed in line with contemporary criteria, these changes likely explain the increased number of patients tested, and isolated awaiting results, from the middle of April.

Conclusions

Among patients presenting to a tertiary Australian ED in April 2020, an increasing number met testing criteria for COVID-19. While relatively few had a positive test for SARS-CoV-2, the IPC burden of suspected COVID-19 cases is significant. The low incidence of SARS-CoV-2 positive cases currently precludes the development of accurate predictive tools.

As physical distancing requirements are relaxed, and testing criteria are broadened, an increasing number of ED patients are likely to require isolation. This will probably create inefficiencies and impediments to patient flow, potentially increasing the risk of access block and ED overcrowding.

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This article was prepared by the authors and reflects their expert, consensus opinion. A decision not to externally peer review the article was taken by the Editor in Chief and reflects the urgent need to expedite publication and dissemination of guidance for clinicians during the COVID-19 pandemic.

Author contributions

All authors listed have contributed to the concept and design of this original research, including its analysis plan, and have critically reviewed the original research for content.

Competing interests

GMOR, BM and PAC are section editors for *Emergency Medicine Australasia*.

Data availability statement

Data that support the findings of this study may be available upon reasonable request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

References

1. Cheng AC, Williamson DA. An outbreak of COVID-19 caused by a new coronavirus: what we know so far. *Med. J. Aust.* 2020; **212**: 393–394.e1.
2. Coghlan B, Majumdar SS, Pedrana A, Hellard ME, Crabb BS. A strategic framework to ease community-wide COVID-19 suppression measures. *Med. J. Aust.* 2020.
3. Department of Health and Human Services. Health Services and General Practice – Coronavirus Disease (COVID-19). [Cited 26 Apr 2020.] Available from URL: https://www.dhhs.vic.gov.au/health-services-and-general-practitioners-coronavirus-disease-covid-19

4. O'Reilly GM, Mitchell RD, Noonan MP *et al*. Informing emergency care for COVID-19 patients: the COVID-19 Emergency Department Quality Improvement Project protocol. *Emerg. Med. Australas.* 2020; **32**: 511–4.
5. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap) – a metadata-driven methodology and workflow process for providing translational research informatics support. *J. Biomed. Inform.* 2009; **42**: 377–81.
6. International Severe Acute Respiratory and Emerging Infection Consortium. COVID-19 Clinical Research Resources. [Cited 29 Mar 2020.] Available from URL: https://isaric.tghn.org/covid-19-clinical-research-resources/
7. O'Reilly GM, Mitchell RD, Rajiv P *et al*. Epidemiology and clinical features of emergency department patients with suspected COVID-19: initial results from the COVID-19 Emergency Department Quality Improvement Project (COVED-1). *Emerg. Med. Australas.* 2020; **32**: 638–45.
8. Staib A, Small N. Emergency medicine's COVID future: facing the triple challenge after flattening the curve. *Emerg. Med. Australas.* 2020; **32**: 880–2.
9. Cunningham M, Noyes J. Locked-down lives drive emergency department numbers to record lows. *The Age*, 21 April 2020.
10. O'Dowd A. Emergency departments must not return to pre-COVID of overcrowding and lack of safety. *BMJ* 2020; **1848**: m1848.
11. Remuzzi A, Remuzzi G. COVID-19 and Italy: what next? *Lancet* 2020; **2**: 10–3.
12. Grasselli G, Pesenti A, Cecconi M. Critical care utilization for the COVID-19 outbreak in Lombardy, Italy. *JAMA* 2020; **323**: 1545–6.
13. Zhou F, Yu T, Du R *et al*. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet* 2020; **395**: 1054–62.
14. Novel Coronavirus Pneumonia Emergency Response Epidemiology Team. The epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (COVID-19) in China. *Zhonghua Liu Xing Bing Xue Za Zhi* 2020; **41**: 145–51.
15. Reeves JJ, Hollandsworth HM, Torriani FJ *et al*. Rapid response to COVID-19: health informatics support for outbreak management in an academic health system. *J. Am. Med. Inform. Assoc.* 2020; **27**: 853–9.
16. O'Reilly GM, Mitchell RD, Mitra B *et al*. Informing emergency care for all patients: the registry for emergency care (REC) project protocol. *Emerg. Med. Australas.* 2020; **32**: 687–91.
17. Markwell A, Mitchell R, Wright AL, Brown AFT. Clinical and ethical challenges for emergency departments during communicable disease outbreaks: can lessons from Ebola Virus Disease be applied to the COVID-19 pandemic? *Emerg. Med. Australas.* 2020; **32**: 520–4.