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SHORT REPORT

Informing emergency care for COVID-19 patients: The COVID-19 Emergency Department Quality Improvement Project protocol

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Abstract

Objectives: There is an urgency to support Australian ED clinicians with real-time tools as the COVID-19 pandemic evolves. The COVID-19 Emergency Department (COVED) Quality Improvement Project has commenced and will provide flexible and responsive clinical tools to determine the predictors of key ED-relevant clinical outcomes.

Methods: The COVED Project includes all adult patients presenting to a participating ED and meeting contemporary testing criteria for COVID-19. The dataset has been embedded in the electronic medical record and the COVED Registry has been developed.

Results: Outcomes measured include being COVID-19 positive and requiring intensive respiratory support. Regression methodology will be used to generate clinical prediction tools.

Conclusion: This project will support EDs during this pandemic.

Key words: *emergency*, *registry*, *COVID-19*.

Background

The number of patients with COVID-19 (SARS-CoV-2) presenting to Australian EDs is expected to increase dramatically. While there are copious case-series and perspectives regarding international management of the pandemic,[1–3] there is a paucity of published data specific to the ED context.

COVID-19 threatens to overwhelm healthcare resources.[3–5] It is imperative that ED clinicians have tools to identify patients at high risk for adverse outcomes. Predictive models for patient-level outcomes, based on real-time data, could help improve clinical care and ED processes. The COVID-19 Emergency Department (COVED) Quality Improvement Project has been initiated to meet this objective.

Aim

The aim of this manuscript is to introduce the COVED study protocol. The specific aim of the project is to determine the demographic and clinical predictors of being COVID-19 positive and requiring intensive respiratory support among patients who present to the ED with acute symptoms and/or signs consistent with potential COVID-19 and undergo testing.

Methods

COVED is a prospective cohort study. The initial and current project site is the Alfred Hospital, Melbourne; it is intended that other Australian EDs will participate to form a network of sentinel sites. The Alfred Hospital is a tertiary, adult, level 1 trauma centre with an ED census of approximately 70 000.

All adult patients who present to the ED and meet COVID-19 testing criteria, based on contemporary case definitions at the time of presentation, are included. The primary outcome of interest being measured is the patient's result using the recommended initial test for detecting COVID-19 infection. This test is currently the COVID-19 polymerase chain reaction test, using the nasopharyngeal sample taken during the index ED presentation. Secondary

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BOX 1. *Variables for which data is being collected at the commencement of the COVED project*

Variable	Type	Domain
Demographics and history		
Age (years)	Continuous	18–120
Sex	Binary	Male or female
Overseas travel	Binary	Yes or no
Close contact with confirmed COVID-19 case	Binary	Yes or no
Residential care facility resident	Binary	Yes or no
Healthcare worker	Binary	Yes or no
Pregnancy	Binary	Yes or no
Comorbidities		
Chronic respiratory disease	Binary	Yes or no
Chronic cardiac disease	Binary	Yes or no
Chronic hypertension	Binary	Yes or no
Diabetes mellitus	Binary	Yes or no
Smoker or ex-smoker	Binary	Yes or no
Obesity	Binary	Yes or no
Current known cancer	Binary	Yes or no
Immunosuppression	Binary	Yes or no
Other	Free text	
ED arrival		
Interhospital transfer	Binary	Yes or no
Mode of arrival	Nominal	Types of transport
Triage category	Ordinal	1–5
Symptoms		
Coryza	Binary	Yes or no
Fever	Binary	Yes or no
Cough	Binary	Yes or no
Sore throat	Binary	Yes or no
Acute dyspnoea	Binary	Yes or no
Acute diarrhoea	Binary	Yes or no
Acute muscle aches	Binary	Yes or no
Acute fatigue	Binary	Yes or no
Anosmia and/or dysgeusia	Binary	Yes or no
Number of days since onset of first symptom	Continuous	0–28
Signs		
Vital signs		
Systolic blood pressure (mmHg)	Continuous	0–300
Heart rate (beats/min)	Continuous	0–300
Respiratory rate (breaths/min)	Continuous	0–50
Temperature (degrees Celsius)	Continuous	20–50
GCS	Ordinal	3–15
Abnormalities on chest auscultation	Binary	Yes or no

BOX 1. *(continued)*

Variable	Type	Domain
Investigations		
Abnormalities on chest X-ray	Nominal	Abnormality and Type
Abnormalities on chest CT	Nominal	Abnormality and Type
Blood test results (ED)	Numerical	Test specific
SARS-CoV-2 test result in ED	Binary	Positive or negative
SARS-CoV-2 test result – subsequent as inpatient	Binary	Positive or negative
Management in the ED		
Clinical impression (Severity)	Ordinal	Mild to Extreme
Goals of care	Ordinal	A, B, C or D
Oxygen delivery methods in the ED:		
Nasal prongs	Binary	Yes or no
Mask	Binary	Yes or no
High flow nasal	Binary	Yes or no
Non-invasive	Binary	Yes or no
Invasive ventilation	Binary	Yes or no
Intubation in the ED	Binary	Yes or no
Disposition		
Hospital admission	Binary	Yes or no
ICU admission	Binary	Yes or no
Mechanical ventilation during admission	Binary	Yes or no
Number of ventilation free days (days)	Continuous	0–Maximum
Hospital length of stay (days)	Continuous	0–Maximum
Death in hospital	Binary	Yes or no

outcomes include hospital admission, ICU admission, mechanical ventilation, the number of ventilator-free days, hospital length of stay and death during hospital admission.

Data variables being collected (covering inclusion criteria, potential predictors, clinical management and outcome measures) are listed in Box 1 and are mostly consistent with the variables in the larger COVID-19 case report form generated by the International Severe Acute Respiratory and Emerging Infection Consortium.[6] The COVED list of variables is flexible to change as new data emerges regarding outcome predictors and treatment strategies. Up to date versions of the data dictionary and case report form will be made available on The Alfred's academic programmes website at www.emergencyeducation.org.au. This will facilitate standardisation of variables across participating sites.

Most of the data for these variables are captured using a dedicated, clinical form embedded in The Alfred Hospital's electronic medical record (EMR). This form is completed for all patients who meet the case definition for COVID-19 testing, and replaces the general EMR template that is otherwise used in the ED. It has been designed to take less than 2 min to complete and is flexible to frequent updates (particularly with respect to emerging candidate predictors of COVID-19 and clinical outcomes). Administrative data are automatically exported from the EMR into the study database.

All data are entered into a novel COVED Registry utilising Research Electronic Data CAPture (REDCap; Vanderbilt University, Nashville, TN, USA) software (licensed to Monash University).[7] Analyses and reports are conducted and generated, respectively, on a weekly basis. For each of the selected outcomes being measured, univariable regression methods (logistic, linear and survival) are used to determine crude predictors. For the same set of outcomes, multivariable regression methods (logistic, linear and survival) are used to determine independent predictors.

This iterative approach to prospective data collection and analysis makes COVED a novel quality improvement project. The establishment of a dedicated registry, populated with prospectively collected EMR-embedded data, enables regular analyses to be conducted. This

will help ensure that study results are timely, relevant and meaningful.

The focus of the present study is consistent with guidance from the Australasian College for Emergency Medicine regarding research priorities during the COVID-19 pandemic.[8] Ethics approval has been obtained from the Alfred Human Research Ethics Committee (Project No: 188/20).

Impact

This agile quality improvement project will inform real-time improvements in ED care.[9] By determining the clinical predictors of patient-centred outcomes for patients with COVID-19, the study will enable a dynamic approach to systems design, resource allocation and clinical management during the pandemic. The COVED protocol is novel, with a methodology designed to meet the extreme and accelerating nature of the pandemic. Other sites interested in participating in the project are encouraged to contact the study investigators.

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Competing interests

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

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