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.1-5 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
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               |

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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. 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. 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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