

Knowledge Primer: Outcomes of Intra-Hospital Cardiac Arrest in Patients Admitted with COVID-19 Infection

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Key Message

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) continues to surge in Canada and British Columbia, particularly with the emergence and rapid spread of viral variants of concern (VOC). It is expected that increasing numbers of patients will require admission to hospital in the coming weeks. These admissions should prompt discussions around patient goals of care, particularly in the case of in-hospital cardiac arrest (IHCA)

The clinical presentation of COVID-19 is varied, ranging from asymptomatic or mildly symptomatic infections to more severe clinical presentations such as pneumonia and acute respiratory distress syndrome that may result in hospitalization, admission to intensive care, and death. Patients hospitalized for severe COVID-19 infection are at risk for a number of adverse outcomes, including IHCA, which is encountered in 8% of patients admitted with COVID. The most common rhythms encountered among patients with IHCA are pulseless electrical activity followed by asystole.

In patients with COVID-19 who receive cardiopulmonary resuscitation, **IHCA is associated with high mortality, with meta-analysis data demonstrating 3% survival to hospital discharge.** Based on a single study, neurologic outcomes are favourable in less than 50% of those surviving IHCA. Predictors of mortality include advancing age and frailty, although hospital capacity factors such as availability of patient monitoring and admission to a non-critical care setting may play a role in outcomes of IHCA. The mAPACHE, CISSS, and ISARIC-4C scores can be used to accurately predict in-hospital mortality.

It is worth noting that this data does not yet reflect the impact of variants of concern (VOCs), which, compared to earlier variants SARS-CoV-2, are associated with a 63% increased risk of hospitalization, a 103% increased risk of intensive care unit (ICU) admission, and a 56% increased risk of death.

Collectively, available evidence demonstrates that IHCA in patients with COVID-19 carries an extremely poor prognosis with high in-hospital mortality. This knowledge should inform Goals of Care discussions and recommendations for resuscitation, particularly in frail and/or elderly patients.

Summary

Background

As of April 15th, there were over 1000 people testing positive for COVID-19 daily in BC. As per the BC CDC, approximately 70% of these cases had a VOC, which have been associated with increased viral transmissibility, virulence, and mortality. A meta-analysis of studies that included people from Ontario, the United Kingdom, and Denmark with COVID-19 demonstrated that people infected with VOCs had a 63% higher risk of hospitalization, twice the risk of ICU admission, and a 56% higher risk of mortality (1). As hospital and ICU admissions increase in British Columbia, healthcare practitioners will inevitably have to address patients' goals of care and code status. An important component of these discussions is understanding the outcomes and prognoses of IHCA.

Questions

What are the outcomes of IHCA in patients who are admitted with SARS-CoV-2 infection?
What are the most important prognostic factors for outcome of IHCA due to SARS-CoV-2 infection?

Evidence

A number of studies have examined the outcomes of patients with SARS-CoV-2 infection who experience IHCA.

An observational registry-based study of 1000 patients in Sweden with IHCA secondary to COVID-19 demonstrated a survival rate of 23.1% at 30 days, although none of these patients had yet been discharged from hospital at the time of study publication. 74% of these patients had a non-shockable rhythm at the time of arrest (2). Patients without COVID-19 had higher survival rates and a higher proportion of IHCA due to a shockable rhythm (2).

Retrospective observational studies from single centers in New York City, USA and Wuhan, China demonstrated 30 day survival rates from IHCA of 3% and 2.9%, respectively (3) (4). The study from New York demonstrated an increase in the number of cardiac arrests occurring on general medicine wards (vs. in the ICU), with these arrests being run for a shorter duration of time and involving less endotracheal intubation (3).

A prospective cohort study of 5019 patients with COVID-19 admitted to ICUs across 68 centers in the US demonstrated showed that 14% of these patients sustained IHCA, with 57% receiving cardiopulmonary resuscitation (CPR) (5). Those who had an IHCA were generally older with a mean age of 63, had more cardiovascular comorbidities and risk factors, were more likely to be Black, had higher mSOFA scores, and were admitted to centers with fewer ICU beds (5). Most patients- almost 75%- had non-shockable rhythms at the time of arrest (5). Of those who received CPR, 12% survived to hospital discharge and 7% had a normal or mildly impaired

neurological status (5). Survival depended significantly on age. Only 2.9% of those over 80 years survived, compared 21% of those under 45 years (5).

Finally, a proportional prevalence meta-analysis examining outcomes of patients with IHCA admitted to hospital with COVID-19 demonstrated an IHCA incidence of 8% among these patients (6). While return of spontaneous circulation was achieved in 39% of patients, only 3% of patients who sustained IHCA survived to hospital discharge (6).

Numerous scoring systems have been developed to predict hospital mortality among patients with COVID-19. The mAPACHE, CISSS, and ISARIC-4C scoring systems were shown in one study to have the best discriminative accuracy, with area under the receiver operating characteristic curve (i.e. AUC) ranging from 0.72 to 0.81 (7). This and other studies have demonstrated that increasing frailty and age are the best predictors of functional outcome and mortality in patients with and without COVID-19 (7)(8)(9)(10). One observational cohort study of 1564 patients with COVID-19 across 10 centers (9 in the UK, 1 in Italy), demonstrated that increasing frailty, as defined by the clinical frailty scale (CFS), was a better predictor than either age or comorbidity for in-hospital mortality (10).

Interpretation

IHCA is a frequent occurrence among patients admitted with COVID-19. Most of these patients will have non-shockable rhythms at the time of arrest, with pulseless electrical activity being the most common presenting rhythm. IHCA associated with COVID-19 carries a very poor prognosis, with few patients surviving to hospital discharge. Age and frailty are important prognostic factors for mortality among these patients.

References

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