Resuscitation in Out-of-Hospital Cardiac Arrest Patients With COVID? Never Tell Me the Odds!*

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Including the words "no survivors" in the title of a critical care research study effectively grabs the attention of readers. It is also likely to elicit strong reactions from those that have been on the frontlines of the COVID pandemic for the past 2 years. It may reinforce the frustration and exasperation felt by those that know first hand how deadly this infectious disease can be. Alternatively, it may offer evidence to those considering the ethical dilemma of attempting resuscitation for out-of-hospital cardiac arrest (OHCA) in acutely infected patients. Regardless of headlines, the study by Baert et al (1) published in this issue of *Critical Care Medicine* does call into question the futility of resuscitation in COVID patients if the chance of patient survival is zero. Unfortunately, those seeking a definitive answer to the question "Should resuscitation even be attempted in COVID patients with OHCA?" will need to wait for more evidence.

Prior to the study by Baert et al (1), there has been plenty of data showing an increase in the number of OHCA during the early pandemic compared with 2019, with a concurrent decrease in survival. This phenomena was seen in Paris (2), New York (3), and Lombardy (4). A meta-analysis of these reports found nearly two times higher odds of admission for OHCA during the pandemic (5). In these studies, it was difficult to discern the direct effect of COVID on the increased mortality. Collectively, these studies allude to a multitude of factors of a strained healthcare system. Delayed emergency medical services (EMS) response from an overworked system, patients delaying care over fear of coming to the hospital, alterations in advanced life support (ALS) protocols and decreased bystander cardiopulmonary resuscitation due to fear of infection, psychologic stress from the pandemic and associated lockdowns, reorganization of healthcare systems, and rationing of care all potentially played a role in increased mortality in OHCA patients. Chan et al (6) explored this further in the United States and showed that rates of sustained return of spontaneous circulation (ROSC) for patients with OHCA fell across all counties during the first wave of the pandemic from 29.8% to 23.0% with corresponding fall in survival to discharge from 9.8% to 6.6%. Interestingly, survival was not significantly affected in areas of otherwise low COVID mortality, supporting the suggestions that there are direct effects from COVID as well as confounding factors beyond the virus itself leading to poor survival rates (6).

The objective of the study by Baert et al (1) was to primarily describe the 30-day survival rate of confirmed-COVID patients after experiencing an OHCA between March 2020 and December 2020 in France. Secondarily, the

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authors compare those known to be infected, those suspected of being infected, and those known to be negative. Data were extracted from the French National OHCA Registry. Six thousand six hundred twenty-four patients were included from this registry with 1.9% confirmed to have COVID and another 7.1% suspected cases. Notably, there was not a significant difference between ROSC and survival to hospital admission between the three groups. However, zero patients with confirmed COVID ultimately survived to day 30 post-ROSC, compared with 3.5% in the non-COVID patients. As the authors point out, it is highly unusual to have a survival rate of zero in a cohort of patients with OHCA. Rightfully so, the authors state that this finding raises the issue of resuscitation futility in patients with COVID experiencing an OHCA.

There are findings that support the conclusion that the disease itself was directly responsible for the dismal lack of survival: most of the confirmed-COVID patients had preceding respiratory distress (53.7%) and many had a history of respiratory disease. These results are supported by known evidence that the virus has higher mortality for those with comorbid conditions (7). The authors correctly point out that acute respiratory distress syndrome, of any etiology, can lead to hypoxemic cardiac arrest. Hypoxemia is classically a "reversible" cause of cardiac arrest, even in patients with COVID, but may not be "reversible" in the prehospital setting or in advanced disease states. COVID is also peculiar in its ability to cause silent hypoxemia (8), leading to delayed presentations in some individuals and sudden cardiac arrest. It is also worth noting that other "reversible" etiologies of cardiac arrest such as myocardial infarction and pulmonary embolism can occur at higher rates in patients with COVID (9).

Both the authors and the healthcare workers that provided care in these challenging times are to be commended for their efforts in advancing patient care through research and clinical practice. All studies of this nature have limitations, nevermind the challenges of the COVID pandemic. There are prehospital system factors that the authors point out that may contribute to some of this study's findings. Patients with confirmed COVID were less likely to be intubated, less likely to receive ALS, and less likely to have an automated external defibrillator used. As the authors note, this could explain some of the difference in survival in addition to the lethality of COVID. It is not explicitly clear why these intervention rates were different but it can be inferred that some of these differences are potentially related to provider safety concerns and perceived futility. The authors note several other limitations: the French model uses a two-tiered EMS model, with the first tier being basic life support (BLS) providers and the second tier being Emergency Medicine physicians with ALS and intubation capabilities. It is difficult to determine if earlier access to ALS and endotracheal intubation in a different EMS system would make a difference in patient outcomes. ALS versus BLS has not been shown to improve outcomes in OHCA previously (10). Whether this is the case in COVID-related arrests where there is a large burden of respiratory pathology is hard to determine from the study by Baert et al (1). The most important limitation was the lack of knowledge about how patients were managed in the hospital, with regards to withdrawal of care in particular. However, these perceived limitations are real world issues that are reflective of current everyday medical practice in many healthcare systems.

The study by Baert et al (1) is important. It is the first to our knowledge to specifically describe the survival rate of patients suffering an OHCA known to be infected with COVID. Although COVID patients had similar rates of ROSC and admission to the hospital, none of these patients with confirmed COVID survived at 30 days. The findings certainly reinforce the known lethality of severe acute respiratory syndrome coronavirus 2. With the healthcare systems across the world stretched to the breaking point, resource utilization and workforce safety remain high priorities that must be considered when weighing the cost versus benefit of these resuscitations. In surge situations where critical care resources are being rationed, the study by Baert et al (1) may inform difficult resource allocation decisions.

However, this does not mean that patients with COVID that experience OHCA cannot survive. This is a leap too far—based on the study by Baert et al (1) alone. To conclude that attempting resuscitation is futile based on this data ignores the fact that there are likely confounding factors that also contributed to the higher mortality, many that are related to the indirect effects of this novel pandemic just as much as the disease process at the individual level. Similar results of a

near-zero survival (1/471 patients) in OHCA were seen in a study conducted in Detroit, Michigan, in 2002 (11). A focus on modifiable public health factors and EMS initiatives has improved the rate of survival to hospital discharge to 6.4% in OHCA in 2016 (12). Whether a similar improvement can be seen in COVID patients with OHCA remains to be seen. This data need to be replicated in other healthcare systems before resuscitation in OHCA with COVID can be deemed futile. As COVID looks like it will be with us for the foreseeable future, we hope that this futility is not the case.

Until further studies prove or disprove the work by Baert et al (1), the decision to perform resuscitation in OHCA from suspected or confirmed COVID should be based on individual patient, arrest, and health system factors similar to non-COVID cardiac arrests with a trial of aggressive critical care when appropriate, timely multimodality prognostication, and palliative care when aggressive critical care is no longer indicated. Healthcare workers should have access to adequate personal protective equipment and vaccinations to perform resuscitations safely. Finally, it is safe to say that preventing OHCA with widespread vaccinations and close follow-up for those known to be infected should remain the primary strategy to avoid this increasingly common tragic scenario for patients, families, and healthcare providers.

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