



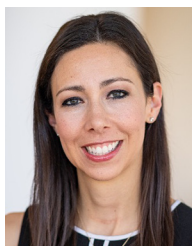
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Editorial

Lessons Learned From the MERS-CoV Outbreak



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The coronavirus 2019 (COVID-19) pandemic is not the first, nor will it be the last, infectious disease outbreak that the world will experience. COVID-19, caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is responsible for over a million deaths worldwide [1]. Two previously identified coronaviruses, SARS-CoV and the Middle East respiratory syndrome coronavirus (MERS-CoV), have been responsible for outbreaks of severe respiratory illness in the recent past. The 2003 SARS outbreak was associated with greater than 8000 reported cases and more than 700 deaths, with a case fatality rate of 9.7% [2]. The MERS-CoV outbreak emerged in 2012 and resulted in greater than 2000 reported cases and more than 800 deaths in 27 countries and was associated with a very high case fatality rate (34%) [2]. In light of the ongoing COVID-19 pandemic, it bears repeating the old adage that those who fail to learn from history are doomed to repeat it. In the case of the MERS-CoV outbreak, health systems identified strategies to manage cardiovascular care in spite of the public health crisis. More recently, governmental and regulatory bodies and health systems needed to quickly adopt similar strategies for management of patients with acute cardiovascular events during the COVID-19 pandemic.

In this issue of the journal, Alasnag et al. [3] present a retrospective, observational study of patients who were admitted to a single center in Saudi Arabia for acute coronary syndrome (ACS) during the MERS-CoV outbreak of 2014. Included in this study were all patients ($n = 148$) who were admitted with ACS between March 2014 and May 2014 to a tertiary referral center for cardiovascular care. Of those patients, 59 had ST-elevation myocardial infarction (STEMI), 42 had non-ST-elevation myocardial infarction (NSTEMI), and 47 had unstable angina. The health systems proactively identified strategies to effectively manage ACS patients during the outbreak. Elective admissions were suspended to preserve resources, and STEMI patients were treated with primary percutaneous coronary intervention (PCI) regardless of infection status. During PCI of STEMI patients, limited staff were involved in the procedure, and all wore World Health Organization (WHO)-recommended personal protective equipment (PPE), including N95 masks. In this study, all patients with STEMI met the guideline

recommendation of a door-to-balloon time of less than 90 min [4]. Patients with an NSTEMI were stratified into high- and low-risk groups based on their Global Registry of Acute Coronary Event (GRACE) score [3]. Patients with a GRACE score > 140 were designated as high-risk and were assigned to an early invasive strategy (within 24 h), regardless of their MERS-CoV status. Patients with a low-risk NSTEMI underwent MERS-CoV screening before the treatment strategy was determined. Low-risk patients with negative screening tests were treated with an invasive strategy once their test results returned, and those who were positive were treated conservatively.

It is commendable that there was no transmission of MERS-CoV to staff (nurses, physicians, radiographers, cardiovascular technologists) directly involved in patient care in this study. Although MERS-CoV is significantly less infectious compared to COVID-19 [5,6], wearing appropriate PPE and overall low healthcare worker exposure were important factors in mitigating the spread of infection. The authors state that a key component of providing expeditious cardiac care and maintaining low infectivity depended on consolidating the care of infected patients to a subset of medical centers. In Saudi Arabia during the MERS-CoV outbreak, the Ministry of Health (MOH) designated specific hospitals to care for patients with confirmed infection so that other tertiary-care centers could maintain a low admission rate of infected cases [3]. This strategy may not be easily adopted in other areas of the world during a viral pandemic. For example, some countries (such as the United States) do not have a national health care system, and a high volume of infected patients could make it difficult to isolate these patients to a limited number of hospitals.

Another important finding in this study was the significantly lower-than-usual number of patients who presented to the hospital with ACS. A reduction in patients presenting to hospitals with ACS during the COVID pandemic has also been reported [7,8]. The notable decrease in the number of patients presenting with ACS during the pandemic has been ascribed to patients' concerns of contracting a serious infection in the hospital [3,7]. Despite consolidating MERS-CoV care in other hospitals, the tertiary cardiovascular center in this study reported an

approximately 70% reduction in all ACS admissions [3]. This highlights the importance of (1) ensuring that health care systems are equipped to continue managing acute cardiovascular events in the midst of another public health crisis and (2) a need for a strong message to the public to continue to seek care for new cardiovascular symptoms. We cannot apply guideline-directed therapy unless patients seek care; late presentation impacts short- and long-term clinical outcomes.

In March 2020, the American College of Cardiology (ACC) Interventional Council and the Society for Cardiovascular Angiography and Interventions (SCAI) published a joint statement with recommendations for the management of ACS patients, resource allocation, and protection of healthcare workers during the COVID-19 pandemic [9]. This statement included practices described in the study by Alasnag et al., with some variations. Recommendations that were similar to those described in this study included suspension of elective admissions and wearing appropriate PPE, including N95 masks, during PCI of STEMI patients with unknown infection status. In contrast, the council recommended diagnostic testing for COVID-19 prior to cardiac catheterization in all patients with an NSTEMI.

Although this study has limitations (small sample size, single-center, and retrospective, observational design), there are obvious similarities between the problems faced during the MERS-CoV outbreak and the COVID-19 pandemic. This study highlights the importance of attempting to uphold best practices for the care of patients with an acute cardiovascular event and outlines a modified pathway for the management of ACS in the setting of a viral epidemic. Several of these strategies have been successfully employed by most medical centers during the COVID-19 pandemic. The significant number of ACS patients that avoid seeking medical care during infectious disease outbreaks is a critical obstacle that impedes the care of this population. This report, in light of the current COVID-19 pandemic, is a sobering reminder that with the ever-increasing ease of travel, we must study health crises

(and the response to them) occurring in geographically distant areas, in order to be well-prepared for the unexpected.

Declaration of competing interest

N.R.S. has received honoraria for speaking from Zoll and is an advisor to Cordis. K.R.K. has no disclosures.

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