

EDITORIAL

Be Prepared

See Article by Tam et al

Amer K. Ardati, MD, MSc
Alfredo J. Mena Lora, MD



The ongoing coronavirus disease 2019 (COVID-19) outbreak is poised to challenge populations and healthcare systems the world over. In this issue of *Circulation: Cardiovascular Quality and Outcomes*, Tam et al¹ from the Queen Mary Hospital in Hong Kong report their experiences with managing a primary percutaneous intervention program during the early days of the outbreak. Despite an established system of care for ST-segment–elevation myocardial infarction (STEMI), the report shows a sharp increase in time from symptom onset to first medical contact in a handful of STEMI patients treated after infection control measures are instituted and suggests that door-to-device times may also be jeopardized. The article highlights the impact of a potential pandemic on a healthcare system's ability to maintain operational integrity for high acuity patients. The current moment demands that healthcare systems develop plans to mitigate the impact of a communicable disease pandemic on operations and to protect vulnerable patients with cardiovascular disease from nosocomial infection and limited access to care. This is not simply a problem limited to a single specialty or condition but a concern that will hold lessons for anyone who cares for ill patients.

Studies have described the role of nosocomial transmission during the Middle East respiratory syndrome outbreak in South Korea. Nosocomial clusters were an important reservoir early during the epidemic and contributed to a significant number of secondary infections.² Healthcare systems must plan accordingly with appropriate engineering controls for indoor ventilation systems and healthcare worker training on proper personal protective equipment use to prevent the nosocomial spread of infectious diseases. A recent study from Singapore during the current COVID-19 outbreak found extensive environmental contamination from a patient with mild upper respiratory tract involvement.³ Samples collected before routine cleaning had positive results in 13 of 15 room sites, and positive samples were found in air outlet fans, toilet bowl, sink, and door handles. This report highlights the potential role of the environment for transmission of COVID-19. As respiratory droplets and fecal shedding may contribute to the burden of viral particles, adherence to infection control protocols, isolation, environmental controls, and hand hygiene are imperative to reduce nosocomial spread.

Nosocomial transmission matters. Cardiac patients may have a higher risk of complications with novel coronavirus. During the Middle East respiratory syndrome outbreak in 2015, a nosocomial cluster of cases in a cardiac surgery ward was associated with a high mortality rate.⁴ Epidemiological studies have found temporal associations between viral illnesses and coronary events. Studies have shown a decreased incidence of acute coronary syndrome in patients with coronary artery disease who received the influenza vaccine. It is estimated that influenza vacci-

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nation can contribute to a 15% to 45% reduction in acute coronary events.⁵ The development of a vaccine for COVID-19 is of significant interest and a research priority. As we wait for this vaccine, developing strategies to reduce the likelihood of infection with COVID-19 will be critical for healthcare systems to protect vulnerable populations like cardiac patients during this surge of cases.

Patients with congestive heart failure, acute coronary syndrome, and arrhythmia account for a substantial proportion of the inpatient census in the United States. The American College of Chest Physicians Task Force on Mass Critical Care recommends that during a crisis that medically fragile patients may need to be supported in the ambulatory setting to conserve hospital-based resources and to limit nosocomial spread.⁶ Addressing length of stay and reducing admissions for select cardiac patients could significantly improve access to acute care resources and help protect at-risk individuals who might be exposed during an inpatient stay. Of course, this may not be easy, but it could be effective. Models for the outpatient management of acutely decompensated heart failure have shown that ambulatory infusion of furosemide can reduce all-cause hospitalization at 30 days.⁷ Successful outpatient management of heart failure requires an investment in home-based healthcare services including visiting nurses, 24-hour telephone access for advice and protocols for the management of electrolytes, and changes in renal function.

Chest pain accounts for millions of emergency department (ED) encounters annually and frequently results in admission. Implementation of accelerated diagnostic protocols that safely triage low-risk chest pain patients to early discharge have been shown to reduce hospitalizations without the necessity of resource intense specialist consultation, stress testing, or angiography.⁸ Observational data of STEMI and non-ST-segment-elevation acute coronary syndrome admissions suggest that extending length of stay beyond 48 hours is not associated with a reduction in post-discharge mortality.^{9,10} Regional variations in length of stay suggest a substantial opportunity to systematically reduce resource utilization in acute coronary syndrome patients nationwide. Atrial fibrillation accounts for a majority of arrhythmia presentations in the ED setting and often results in admission despite potential outpatient management strategies. A process to identify and triage patients to early ED discharge reduced admissions without a concomitant increase in repeat ED visits.¹¹

One tool with immense potential to continue care while limiting exposure is right in our pocket. Smartphones have the ability to expand our access to vulnerable cardiac patients while decreasing on-site healthcare utilization and the possibility of infection. Mobile health has been used during infectious diseases outbreaks and can improve communication between patients and pro-

viders, triage the need for inpatient care or acute visits, and monitor patients while they are in their communities.¹² Telemedicine can help leverage our resources in an effective manner and may align with patient behaviors during outbreaks. Telemedicine has also been used to expedite consultations for myocardial infarctions in the ED.¹³ This may help improve ED throughput during infectious disease outbreaks. A resilient healthcare system that leverages mobile health to reduce acute care needs protects vulnerable patients from possible exposures, while adapting to a more enhanced community-based network of care is within our grasp.

The Queen Mary Hospital STEMI report identifies 2 areas of concern for patients requiring acute cardiac care: (1) delays in presentation and (2) delays in treatment. The causes for late presentation for STEMI are likely multifactorial and may include patient fear of contracting an infection from the healthcare system or by limited emergency medical services due to sick staff or systemic overload. Public health departments, emergency medical services, and hospitals will need to maintain the highest standards of infection control to earn community trust. Additionally, mass public education efforts will need to assure patients that healthcare services remain operational and safe for use. Internal process delays need to be anticipated especially since stresses on the system are likely to affect critical supply chains for essential medicines and equipment. Cardiac centers should consider the need to defer elective procedures and to carefully monitor employee health and availability for duty. Crucial conversations will need to be had with staff to ensure their ability to provide services and step in for sick colleagues at a moment's notice. Care providers may be subject to travel restrictions and cancellation of elective leave. Employers and community leaders will need to support first responders and healthcare workers who may be under quarantine. In the event of school and day-care closures, child-care alternatives will need to be identified for critical staff. Regional STEMI systems should develop reliable alternatives to default receiving centers that go offline due to lack of capacity. Cardiologists, ED staff, and intensive care nurses accustomed to the 24/7 availability of primary percutaneous coronary intervention for STEMI should refamiliarize themselves with the use of thrombolytic therapy.

The scouting motto "Be Prepared" has never been more prescient. Strategies to maximize acute care resources, maintain access to services, and limit nosocomial spread will rely on careful planning, teamwork, and investment in education and training. Our ability to adapt to the demands of a global pandemic will be determined by our willingness to develop resilient systems of care that are lean and protective of vulnerable patients. This is as true for cardiac specialists as it is for all of the house of medicine.

The time to act is now. Will we Be Prepared?

ARTICLE INFORMATION

Correspondence

Amer K. Ardati, MD, MSc, University of Illinois at Chicago, 840 S Wood St MC 715, CSB 934, Chicago, IL 60612. Email aardati@uic.edu

Affiliation

Department of Medicine, Section of Cardiology (A.K.A.) and Department of Medicine, Section of Infectious Disease (A.J.M.L.), University of Illinois at Chicago.

Disclosures

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REFERENCES

1. Tam CCF, Cheung KS, Lam S, Wong A, Yung A, Sze M, Lam YM, Chan C, Tsang TC, Tsui M, Tse HF, Siu CW. Impact of coronavirus disease 2019 (COVID-19) outbreak on ST-segment-elevation myocardial infarction care in Hong Kong, China. *Circ Cardiovasc Qual Outcomes*. 2020;13:e006631. doi: 10.1161/CIRCOUTCOMES.120.006631
2. Chowell G, Abdirizak F, Lee S, Lee J, Jung E, Nishiura H, Viboud C. Transmission characteristics of MERS and SARS in the healthcare setting: a comparative study. *BMC Med*. 2015;13:210. doi: 10.1186/s12916-015-0450-0
3. Ong SWX, Tan YK, Chia PY, Lee TH, Ng OT, Wong MSY, Marimuthu K. Air, surface environmental, and personal protective equipment contamination by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) from a symptomatic patient. *JAMA*. [epub ahead of print] 2020. doi: 10.1001/jama.2020.3227
4. Nazer RI. Outbreak of middle east respiratory syndrome-coronavirus causes high fatality after cardiac operations. *Ann Thorac Surg*. 2017;104:e127-e129. doi: 10.1016/j.athoracsur.2017.02.072
5. MacIntyre CR, Mahimbo A, Moa AM, Barnes M. Influenza vaccine as a coronary intervention for prevention of myocardial infarction. *Heart*. 2016;102:1953-1956. doi: 10.1136/heartjnl-2016-309983
6. Christian MD, Devereaux AV, Dichter JR, Rubinson L, Kisson N. Introduction and executive summary. *Chest*. 2014;146:8S-34S.
7. Buckley LF, Carter DM, Matta L, Cheng JW, Stevens C, Belenkiy RM, Burpee LJ, Young MA, Weiffenbach CS, Smallwood JA, Stevenson LW, Desai AS. Intravenous diuretic therapy for the management of heart failure and volume overload in a multidisciplinary outpatient unit. *JACC Heart Fail*. 2016;4:1-8. doi: 10.1016/j.jchf.2015.06.017
8. Mahler SA, Lenoir KM, Wells BJ, Burke GL, Duncan PW, Case LD, Herrington DM, Diaz-Garelli JF, Futrell WM, Hiestand BC, Miller CD. Safely identifying emergency department patients with acute chest pain for early discharge. *Circulation*. 2018;138:2456-2468. doi: 10.1161/CIRCULATIONAHA.118.036528
9. Rymer JA, Tempelhof MW, Clare RM, Pieper KS, Granger CB, Van de Werf F, Moliterno DJ, Harrington RA, White HD, Armstrong PW, Lopes RD, Mahaffey KW, Newby LK. Discharge timing and outcomes after uncomplicated non-ST-segment elevation acute myocardial infarction. *Am Heart J*. 2018;201:103-110. doi: 10.1016/j.ahj.2018.04.010
10. Swaminathan RV, Rao SV, McCoy LA, Kim LK, Minutello RM, Wong SC, Yang DC, Saha-Chaudhuri P, Singh HS, Bergman G, Feldman DN. Hospital length of stay and clinical outcomes in older STEMI patients after primary PCI: a report from the National Cardiovascular Data Registry. *J Am Coll Cardiol*. 2015;65:1161-1171. doi: 10.1016/j.jacc.2015.01.028
11. Bellew SD, Bremer ML, Kopecky SL, Lohse CM, Munger TM, Robelia PM, Smars PA. Impact of an emergency department observation unit management algorithm for atrial fibrillation. *J Am Heart Assoc*. 2016;5:e002984. doi: 10.1161/JAHA.115.002984
12. Wood CS, Thomas MR, Budd J, Mashamba-Thompson TP, Herbst K, Pillay D, Peeling RW, Johnson AM, McKendry RA, Stevens MM. Taking connected mobile-health diagnostics of infectious diseases to the field. *Nature*. 2019;566:467-474. doi: 10.1038/s41586-019-0956-2
13. Miller AC, Ward MM, Ullrich F, Merchant KAS, Swanson MB, Mohr NM. Emergency department telemedicine consults are associated with faster time-to-electrocardiogram and time-to-fibrinolysis for myocardial infarction patients. *Telemed J E Health*. [epub ahead of print] 2020. doi: 10.1089/tmj.2019.0273

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