Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Programmatic Responses to the Coronavirus Pandemic: A Survey of 502 Cardiac Surgeons

Laura Seese, MD, Edgar Aranda-Michel, BS, Ibrahim Sultan, MD, Victor O. Morell, MD, Michael A. Mathier, MD, Suresh R. Mulukutla, MD, Samir Saba, MD, Eric J. Dueweke, MD, Joshua E. Levenson, MD, and Arman Kilic, MD

Divisions of Cardiac Surgery, Pediatric Cardiothoracic Surgery, and Cardiology, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania

The rapid emergence and spread of coronavirus disease 2019 (COVID-19) has presented disruptive challenges to the health care system in the United States (US). In response, there have been systems-based changes within US cardiac surgical programs in efforts to enhance containment measures and to preserve essential resources needed to treat an influx of COVID-19 patients. The World Health Organization identified COVID-19 as a global pandemic on March 11, 2020, and within days, many cardiac surgical programs made drastic changes to their clinical practices with reductions in surgical volume due to delayed elective cases, reassignment of providers to intensive care settings outside their usual scope of practice, and the integration of virtual clinics for patient evaluation.[1]

As these systems-based changes were evolving, guidelines with adequate specificity to address the complexity of decision making for delaying cardiac surgery were unavailable. As a result, many hospital systems, in combination with their heart teams, developed program-specific policies. We surveyed US cardiac surgeons to gain insights into the variability of programmatic responses to COVID-19.

On March 31, 2020, an email invitation to complete an anonymous 10-question survey was sent to US attending-level cardiac surgeons. Email addresses and information on career status and specialty were obtained from the Cardiothoracic Surgery Network Surgeon Profiles.[2] Reminder invitations were sent at 72 hours and 2 weeks after the initial request. The University of Pittsburgh Institutional Review Board approved this study.

The survey was sent to 2991 cardiac surgeons and attained 502 responses (16.8%). Most respondents were in academic cardiac surgery practices (35.3% [n = 177]) or private practice with a combination of cardiac and general thoracic surgery (37.4% [n = 188]) (Figure 1). Most practice locations were in large metropolitan areas (42.2% [n = 212]).

Numbers of confirmed COVID-19 patients within the respondent's hospital systems varied between more than 100 (17.2% [n = 88]) and 0 (2.7% [n = 13]). However, at 81.7% of the centers (n = 410), no patients confirmed to be positive for COVID-19 had undergone cardiac surgery. Many programs have transitioned to only providing urgent or emergent cardiac surgery (81.2% [n = 408]) and adopted the use of telemedicine services in some cases (54.1% [n = 262]) or in all nonemergent cases (35.9% [n = 180]. Most of the programs (76.2% [n = 383]) saw a reduction in greater than 50% of cardiac surgical volume (Figure 2). These restrictions were similarly implemented for both cardiac surgical and cardiology service lines at 73.7% (n = 370) of programs, and cardiac surgeons were involved in these critical decisions at 62.2% of the institutions (n = 312).

Although reductions in case volume were not significantly associated with the number of reported COVID-19 hospitalizations or practice type, cardiac surgeons in private practice were less likely to use telemedicine (96.4% academic vs 85.2% private, $P < .001$) and less likely to be involved in policymaking decisions (69.9% academic vs 55.9% private, $P = .007$). Respondents found that systems-based responses could be improved with better communication from COVID-19 hospital leadership (21.7% [n = 149]), greater cardiac surgeon involvement in policymaking (23.3% [n = 160]), and greater access to personal protective equipment for frontline providers (35.6% [n = 243]).

We are in the midst of a global pandemic with an unprecedented scale and pace that has crippled many health care systems and other industries across the US.[3] Despite the severity of the ongoing public health crisis, the results of this survey suggest that most cardiac surgical programs responded expeditiously by decreasing elective case volume and implementing telemedicine approaches for patient evaluations. These approaches serve several important purposes:

Address correspondence to Dr Kilic, Division of Cardiac Surgery, University of Pittsburgh Medical Center, 200 Lothrop St, Ste C-700, Pittsburgh, PA 15213; email: kilica2@upmc.edu.

Dr Kilic discloses a financial relationship with Medtronic, Inc.

Ann Thorac Surg 2020;110:761-3 • 0003-4975/$36.00
https://doi.org/10.1016/j.athoracsur.2020.04.014

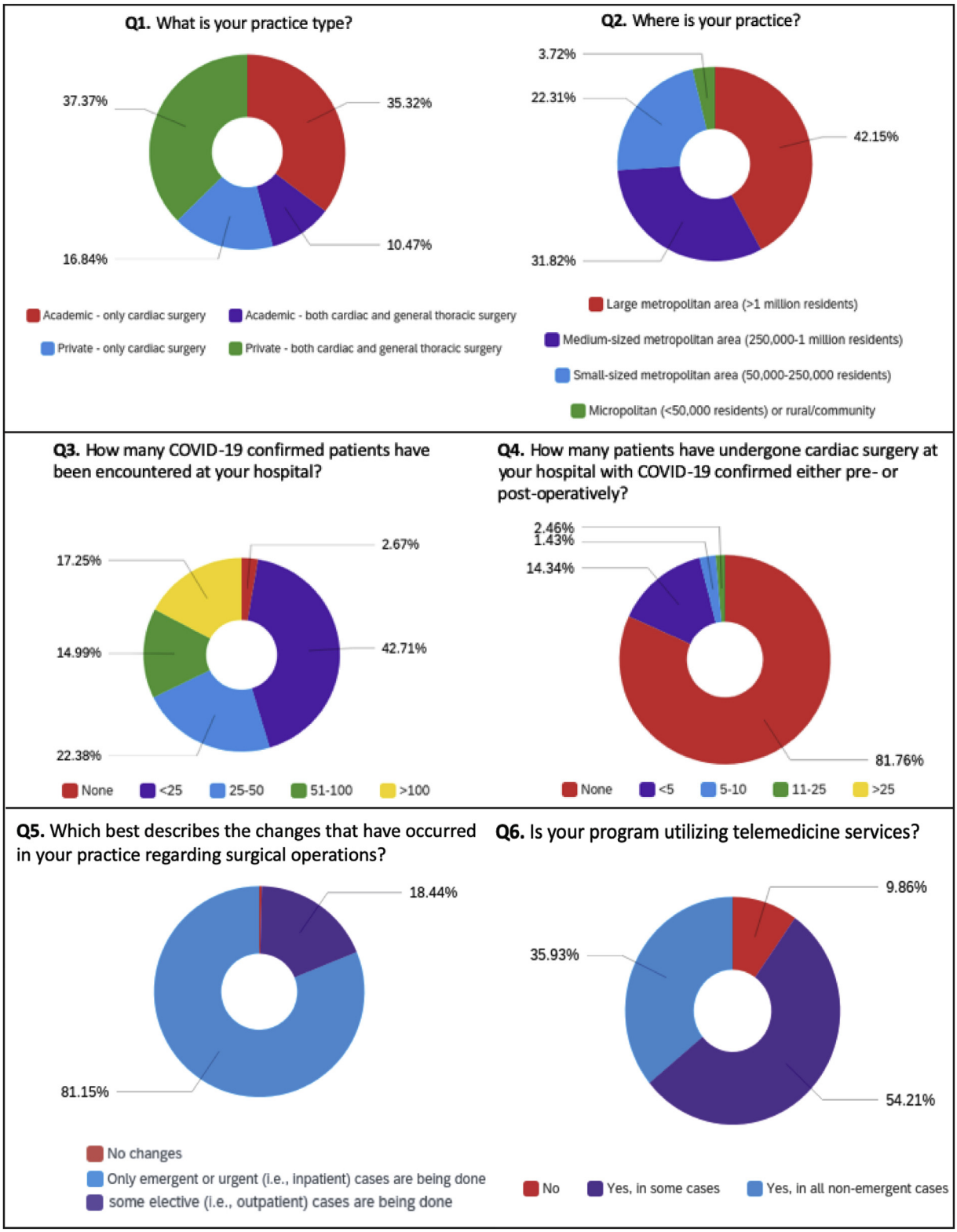

Figure 1. Coronavirus Disease 2019 (COVID-19) United States Cardiac Surgery Survey questions 1 through 6 (Q1-Q6) and responses.

First, reductions in elective case volume help conserve necessary hospital resources, such as ventilators, and impede transmission of COVID-19 to patients and hospital providers.

Second, this may prevent surgeons from operating on patients who are unknowingly within the COVID-19 incubation period, a practice that has been shown to exacerbate the pulmonary consequences of the virus.[4] The

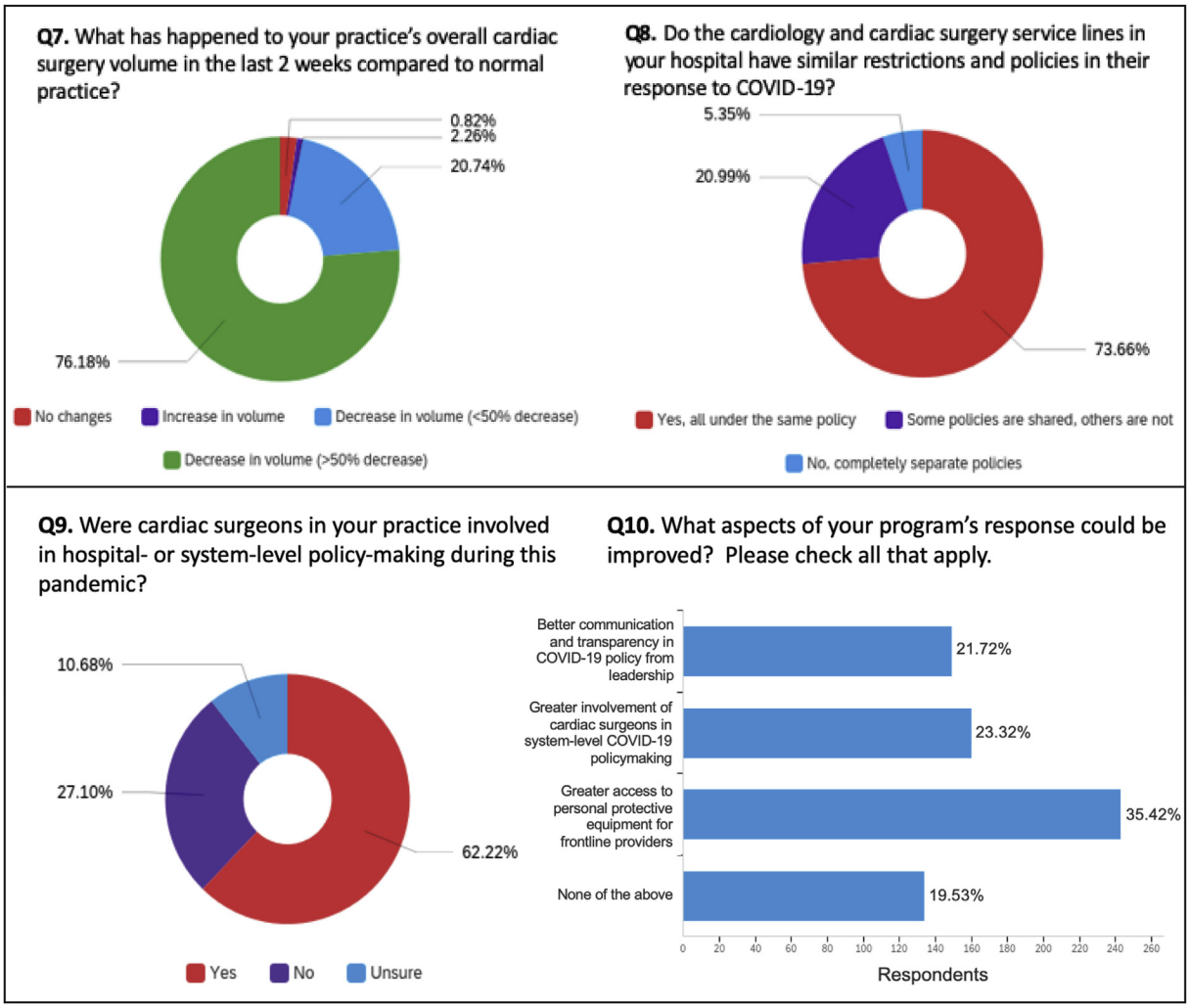

Figure 2. Coronavirus Disease 2019 (COVID-19) United States Cardiac Surgery Survey questions 7 through 10 (Q7-Q10) and responses.

balance between COVID-related risks associated with proceeding with surgery vs the risks of cardiovascular complications arising from delaying nonurgent cardiac operations can be delicate, with many unknowns on both sides. In addition, despite recommendations to undergo operative intervention, some patients refuse to come to the hospital out of fear of COVID-19 exposure. As the experience with the COVID-19 pandemic continues to evolve, the outcomes of patients for whom surgery was delayed will be an important metric to evaluate.

In conclusion, this survey of 502 cardiac surgeons demonstrates major changes in practice as a response to the COVID-19 pandemic. Lessons from the early US cardiac surgery response to COVID-19 that can be extrapolated to future pandemics include the importance of involving cardiac surgeons in policy decisions regarding cardiovascular patients, the need for enhanced communication between hospital leadership and service lines, and improved access to personal protective equipment for all providers. The collective experience from the COVID-19 pandemic can help serve as a catalyst to prepare permanent systems-based plans for future pandemic response situations.

References

1. Thoracic Surgery Outcomes Research Network, Inc. COVID-19 guidance for triage of operations for thoracic malignancies: a consensus statement from Thoracic Surgery Outcomes Research Network. *Ann Thorac Surg*. 2020;110:692-696.
2. Cardiothoracic Surgery Network. Surgeon Profiles. Available at: https://www.ctsnet.org/surgeons. Accessed March 30, 2020.
3. Daniels MJ, Cohen MG, Bavry AA, Kumbhani DJ. Reperfusion of ST-segment–elevation myocardial infarction in the COVID-19 era: business as usual? *Circulation*. 2020;141:1948-1950.
4. Lei S, Jiang F, Su W, et al. Clinical characteristics and outcomes of patients undergoing surgeries during the incubation period of COVID-19 infection. *EClinicalMedicine*. 2020;21:100331.