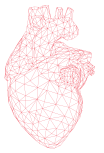




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Never Let a Crisis Go to Waste: What Have We Learned About Clinical Pathways for Transcatheter Structural Heart Interventions?

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The COVID-19 pandemic forced structural heart programs to adapt processes of care in unprecedented ways. Clinical pathways for transcatheter structural heart interventions and the associated outcomes for different patient cohorts are described in two articles in this issue of *Structural Heart*. Tuttle and colleagues¹ describe their experience early in the COVID-19 crisis (March through June 2020) when resources were significantly restricted. This cohort comprised mostly inpatients with refractory heart failure who underwent transcatheter aortic valve replacement (TAVR, $n = 22$) or percutaneous mitral valve intervention (PMVI, unspecified, $n = 4$) and had a higher risk of post procedure complications and high resource utilization. Conversely, Pop and colleagues² describe their experience applying a same-day discharge (SDD) protocol for TAVR ($n = 29$) later in the COVID-19 pandemic (July to December 2020). These patients were selected based on their low complication risk and limited resource consumption. Though each series represents outliers on opposite ends of the risk spectrum—Tuttle et al higher risk and Alum et al low risk—neither study found significant differences in outcomes when compared to a standard population of like patients.

Resource allocation based on benefit and capacity

Fair and just systematic use of resources is based on the assessment of the patient's potential benefits versus the risks of the procedure.^{3,4} Following the ACC/SCAI statement on triage for patients requiring structural heart intervention,⁵ Tuttle et al treated the most acute patients, who would generally be expected to have high resource utilization depending on definitions and metrics. Efforts to decrease resource use included telehealth and limiting the number of procedural staff members. New practices included completion angiography, vascular ultrasound, and post-discharge ambulatory telemetry monitoring. Significantly lower rates of vascular complications, permanent pacemaker implantation, and postprocedure discharge on day 1 were reported. Patients may have received benefit from the additional diagnostic imaging or surveillance, practices that became sustained changes to their clinical pathway. In addition, it is notable that Tuttle et al grouped the TAVR and PMVI patients; the latter typically do not require contrast or have vascular complications. Further inquiry into the outcome benefit and cost-effectiveness of resource inten-

sive practices is of growing interest. It could also be surmised that outcomes were favorable because patients who did not present for treatment were appropriately triaged and monitored by their nurse coordinators or did not present to their hospital.

While SDD appears safe and feasible, the benefits have yet to be established. Pop et al triaged patients based on hospital capacity, an operating principle of the Canadian Cardiovascular Society guidelines for structural interventions.⁴ Founded on the Vancouver 3M⁶ and Benchmark⁷ pathway, their protocol is described in detail and aims to improve outcomes while minimizing resource utilization along the continuum of care. Four series^{8–11} have demonstrated safety of SDD in select patients; Krishnaswamy et al presented the largest series of SDD in 444 patients at Transcatheter Cardiovascular Therapeutics on November 5, 2021.¹¹ These single-center studies beg several questions. Where do we go from here? Is SDD better than next-day discharge for TAVR, and if so, in whom and under what conditions? What is the patient's experience of SDD? Pop et al allude to the multicenter PROTECT-TAVR study for further validation. For now, capacity principles as highlighted in the crisis literature¹² and best practice recommendations for optimizing care in structural heart programs^{4,13} offer foundational guidance for adapting clinical pathways in site-specific ways. Until there is evidence of demonstrable benefit, SDD would be considered for select patients when a hospital is at restricted capacity, and may not be warranted at reduced or conventional capacity.

The critical staffing shortage

Constraints on space, supplies, and staff have varied widely through the pandemic, but the dire reality is COVID-19 created a critical shortage of our most valuable resource: health care workers. Up to 12% of physicians are considering leaving medicine.¹⁴ Three in 10 health care workers have already resigned.¹⁵ After more than 18 months of pandemic uncertainty, one's personal surge capacity (ie, health, internal resources, and ability to cope with stress) may be maximized or reached.

The multidisciplinary and multimodality aspects to provide standard care or be thoughtfully minimalist are in fact labor intensive. In other words, considerable time, effort, knowledge, skill, and routine oversight are necessary even with the most standard protocols to make the complex simple. The



triage, surveillance, and care coordination described in these two articles involve highly trained clinicians and coordinators. Preventing fragmentation of care relies upon a team-based approach heavily dependent upon nursing and allied health care professionals who are resigning in droves and are not readily replaced. A survey of more than 22,000 nurses found that nearly 20% plan to leave their jobs in the next 6 months due to burnout.¹⁶ Canada required several years to replenish the nursing staff that left the profession after a 2003 SARS epidemic. In Toronto, this outbreak lasted several months and was localized to 17 SARS cases. The COVID pandemic is global and has spanned parts of three years.¹⁷ The consequences of the "Great Resignation" are already constraining healthcare supply chain and service lines. Recovery, retention, and recruitment must be prioritized with resources and actions beyond the Triple Aim to the Quadruple Aim: clinician/staff satisfaction, experience, and well-being.

Dynamic innovation in care

Tuttle et al and Pop et al offer early insight on safe albeit distinct clinical pathways at different time points in the pandemic. Early on, the Center for Medicare Services (CMS) issued a series of COVID-19 waivers to ensure access to care in the United States. A current procedure terminology (CPT) code for complex percutaneous coronary intervention (PCI) was also issued for ambulatory surgical centers. As clinicians shaping structural heart clinical pathways, we anticipated a similar trajectory for structural heart therapy, launched SDD,⁸ and crafted frameworks for program optimization and systems of care.¹³ We envisioned a not-too-distant future of ambulatory surgical centers for transcatheter structural heart intervention, provided that emergency care protocols and U.S. reimbursement concerns could be thoughtfully mitigated. These strategies may be more favorable for transcatheter mitral edge to edge repair,^{18,19} left atrial appendage occlusion, and transcatheter closure of patent foramen ovale or interatrial septal defects, which have decreased risk of conduction disorder/permanent pacemaker or vascular complications as compared to TAVR. There will be more, not less, reevaluation of clinical pathways; the COVID-19 pandemic has forever changed health care and the health care workforce. The overarching lesson learned is that innovation in technology must be matched with dynamic innovation in self-care, care for each other, and care delivery.

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