Title: Building High Levels of Performance into Congenital Heart Centers

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Central Message

High performance in a Congenital Heart Center requires optimization of Mission, Structure, Process and Culture.

Central Picture Legend

Publicly reported STS Observed/Expected mortality rates are plotted against annualized 4-year volume.
Abstract

Congenital heart centers are expected to deliver high quality care for a complex group of patients requiring optimal interaction of a wide variety of multi-disciplinary teams, in a rapidly changing and highly transparent environment – with high stakes for patients, families, caregivers, and hospitals. Although clinical volume is easily measured and commonly cited as an important determinant of outcomes, other parameters of inter-team function are less easily measured but likely to have an important impact. Specifically, mission alignment, structure, process, and culture are discussed below. Optimization of outcomes requires optimization of team performance and reaching full potential may require critical self-reflection and commitment to change.
Feature Editor’s Introduction – Feature Editor Note – Leaders in surgery are expected to deliver the highest quality clinical, academic, and educational outcomes. At the same time the surgical leaders must deal with a very complex administrative environment around them to bring the momentum and often the intensity to propel the program forward. Herein, two world renown surgeons with an extensive leadership experience discuss the complexity and challenges of building a high level of performance into congenital heart programs.

- Igor E. Konstantinov, MD, PhD, FRACS
Introduction

Congenital heart centers are unique clinical care entities due to the extensive variety of clinical challenges which must be addressed by teams from multiple specialties in a high-stakes environment. Success (and failure) has important ramifications for patients, families, clinicians, and the financial health of the institution. The stakes are high with double-digit mortality rates for some of the more complex lesions (1). Furthermore, the extensive variety of lesions also makes it difficult for a team to develop proficiency with rare lesions – even in high volume centers and this difficulty is accentuated when examined at the level of an individual surgeon who may be called upon to treat a rare lesion fewer than a few times a year (e.g. Ebstein’s anomaly presenting for neonatal repair)(2). Despite these challenges, overall mortality rates continue to fall and are typically in the 2-3% range when examining all patients treated in a high performing center. Favorable outcomes are a direct result of the development of highly proficient multi-disciplinary teams – and the optimization of surgical teams is a major determinant of the quality of care delivered in the modern era (3).

Patterns of performance

Because of the unfortunate fact that mortalities after congenital heart surgery are sufficiently frequent to inform risk prediction models, extensive mortality data has been collected and survival rates after congenital heart surgery can be predicted. The ratio of observed to expected mortality rates (O/E ratios) can be examined using the Society of Thoracic Surgeons (STS) methodology. Although there are many caveats in the interpretation of O/E ratios, the O/E ratio is currently published on the STS web site (4) and can be misinterpreted as a tool to compare the performance of institutions. The US News and World Report (USNWR) publishes additional
analysis of O/E ratios within the context of an array of other performance indicators and
publishes these outcomes in a ranking on an annual basis (5). Using the STS O/E ratios or the
USNWR rankings to compare between institutions can divert attention away from the primary
benefit of comparison which is to drive institutional self-reflection, assessment, and development
of performance improvement initiatives. Some of the unintended consequences of these public
scoring systems are discussed in a separate publication (6). In general, an O/E ratio of >1.39
places an institution in the quartile of programs with the highest (most unfavorable) O/E ratios
and O/E ratios near this arbitrarily defined threshold should prompt deep introspection and, in
some cases, consideration of obtaining external perspective to identify avenues for improvement
(further discussed below).

A common approach to evaluation of O/E ratios across the nation is to examine the relationship
between O/E ratios and surgical volume. Taken as a whole, there is an inverse relationship
between surgical volume and O/E ratios (lower mortality at higher volume institutions). This
regression, however, is not always fully informative as recent analyses have demonstrated that
the volume-outcome relationship is more complex. Recently, Anagnostopoulous et al (7) and,
later this year, Welke et al (8) have noted that volume-outcome relationship was most notable for
high complexity procedures (e.g. Norwood procedures) but there was markedly less volume
effect when evaluating lower complexity procedures. These observations suggest that optimal
case selection may be an important method for smaller volume programs to maintain favorable
O/E ratios. It is clear, however, that surgical volume is an easily measured metric, but the
relationship between volume and outcomes is complex and effort should be made to define the
attributes that lead to superior outcomes in small, mid-sized, and large programs alike. Both
authors emphasize that other factors that remain incompletely defined may be important
determinants of high (or low) performance. Furthermore, it is clear that there are multiple
dimensions to assessment of high performance (e.g. morbidity, length of stay, failure to rescue
etc…), but for the purpose of the current manuscript, the discussion will be framed within the
context of publicly reported O/E ratios.

Taken at face value, however, there are important inferences that can be obtained using these
scoring systems. Using publicly available information, Figure 1 depicts O/E ratios for
participating institutions extracted from the publicly reported STS website plotted against the
four-year cumulative volume of STS index cases in each institution (reported September 2023
(4)). The red dots indicate institutions that were ranked in the top 10 by USNWR for 2023 (5).

An interesting pattern emerges which suggests that the data can be interpreted as three separate
clusters of Heart Centers based on surgical volume:

1. Mid-sized Heart Centers

There is a prominent cluster of high-performing “mid-sized’ Heart Centers with an annual
volume of index cases of 200-400 cases per year. It is tempting to speculate that the excellent
performance in this cluster of Heart Centers is related to fact that this volume of activity that can
be managed by a relatively small group of expert clinicians with direct hands-on participation for
the majority of patients (e.g. a small central group with surgical, cardiology, intensive care, and
anesthesia expertise). Although the entire teams within these mid-sized Heart Centers include a
larger group of caregivers, it is still possible for a small central group to maintain close
supervision, oversee consistent patterns of care, and directly impact every patient’s care. In other
industries (e.g. the military and athletic teams), evaluation of optimal team size supports the
notion of optimal size for a small cohesive group is in the range of 15-20 participants. As the
group gets larger, communication becomes an important challenge and teams begin to lose “oneness” (9) with subsequent degradation of team performance.

2. Large Heart Centers

In Figure 1, there is also a group of the largest Heart Centers (400-1000 index cases per year) with O/E ratios that tend to cluster around 1.0. Although there is a single favorable outlier, the majority of institutions in this size range are delivering ‘average’ survival performance (O/E ratios of ~1.0) or, in some cases, notably less than ‘average’. There can, of course, be many reasons for less favorable outcomes in these institutions when compared to the high-performing mid-sized Heart Centers noted above. These institutions may preferentially attract referral of ‘risk-adjustment orphans’ (patients in whom surgical risk is not adequately quantified with current risk adjustment models (6)). Nevertheless, it is interesting to speculate that Heart Centers of this large size may lose their ability to have every patient managed by a very small group of individuals and, therefore, they must rely upon systems of communication and care delivery across a much larger groups of caregivers. Under these circumstances, the system of care becomes the prime determinant of outcomes - and the challenges of sharing data, empowering execution, and monitoring outcomes in real time become dominant challenges for the leadership.

Although initially developed within the context of military teams, the McChrystal group has identified the four competencies of high performing teams in high-stakes environments that are very applicable to congenital heart centers. These competencies (common purpose, shared consciousness, trust, and empowered execution)(9) must be optimized for large systems to manage complex challenges. To the authors’ knowledge, these competencies are rarely assessed within the context of congenital heart centers and represents an area ripe for further research. For the very large Heart Centers, the leadership must rely upon a well-developed system of care to
maintain quality and this system becomes dependent upon the interaction between teams within
the congenital heart center.

3. Small Heart Centers
Finally, there is a cluster of high-performing Heart Centers with low volumes (75-200 index
cases per year). For the subset of small Heart Centers that consistently maintain low O/E ratios
(e.g. not due to random variation from year to year), the factors responsible for this high level of
performance are not known and have been rarely studied. Possibly, in these Heart Centers there
are a few exceptional clinicians that maintain tight control of every case. Possibly, the Heart
Center is adept at maintaining excellent triage practices with transfer of cases to larger
institutions when appropriate. Possibly, there are other unknown factors at play which are not
easily defined in existing databases but serve to differentiate these Heart Centers from poorly
performing low-volume Heart Centers. Some potential structural and process-related factors that
could be investigated might include having two staff surgeons scrub on every case, abundant
dedicated cardiac resources, high levels of team experience working together, leadership training,
alignment with hospital administration etc… Because these important factors have not been
identified, the CHSS Quality and Outcomes Committee is currently studying these Heart Centers
to identify the important contributors to excellent performance.

Pathways to Programmatic Improvement
Public reporting and transparency are crucially important to maintain trust among the team
within a Heart Center and between caregivers and patients/families. In addition to promoting
trust, one of the desired effects of public reporting is to promote the incentive for quality
improvement initiatives. The methodology and design of specific quality improvement initiatives
is not the subject of this review but examples are well-described elsewhere (10). Some of the
pathways to programmatic improvement through the optimal design of a Heart Center are described below.

Regionalization

Among centers without extensive experience with high-complexity cases, modulation of referral patterns to reflect the volume reality of a Heart Center can maximize patient/family benefit by referring cases with high complexity to a high-volume center while caring for patients locally with case complexity commensurate with the capability of the lower volume Heart Center. The term ‘volume reality’ denotes acceptance that regardless of personal training or the size of a Heart Center, there are specific clinical problems that may be rarely treated in an individual center and the consideration of referral to a center with greater expertise should be entertained. In general, regionalization can maximize patient/family benefit while minimizing unnecessary travel for those patients who can safely be managed in the referring center. An important balancing factor in these decisions, beyond the arithmetic of mortality rates, is the duress imposed upon a family when obtaining surgical care remote from home-based financial and social support (11,12). Resistance to regionalization may also be a result of negative financial incentives to refer patients away from a center in the current US health care system. Despite these complex issues, two sub-types of regionalizations should be recognized:

Asymmetric regionalization

The prototype example that most often comes to mind when discussing regionalization is an asymmetric model where a well-developed relationship exists between a smaller and a higher volume institution. Through a triage process, the smaller volume institution selectively manages patients with less complexity and refers patients with greater complexity to the higher volume institution. The exact ‘complexity cutpoint’ to trigger referral is often co-managed by both
institutions. From the perspective of the small volume center, there is potential to become vulnerable to unfair burdens when the larger center takes the smaller center’s referrals for granted and provides less substantial ‘customer service’ to referring physicians. Also, there is potential for the smaller center to become less proficient than ideal because referral for complex patients becomes the norm. On the rare occasion when a referral is not immediately possible, de-training may have degraded the smaller center’s capacity to manage a clinical issue (e.g. ECMO proficiency when transport is not clinically feasible).

Symmetric regionalization

There are, however, more symmetric models where both centers maintain significant overall clinical volume, but each center has dominant clinical expertise in different clinical areas. These relationships are often not formalized. Symmetric regionalization addresses the ‘volume reality’ that is present in large institutions when addressing patients with rare lesions where another center might have considerably more clinical experience with a specific lesion. For example, in a real-life example: a high-volume Heart Center (“Center A”) might find it appropriate to refer a patient with pulmonary atresia and major aortopulmonary collaterals and unusually complex anatomy to a second high-volume center with extensive experience with this lesion (“Center B”). Conversely, Center B might recognize the extensive experience of Center A with treatment of pulmonary vein stenosis and refer a patient in the reverse direction. The point to be made is that all Heart Centers (low volume and high volume) can improve outcomes by recognizing the ‘volume reality’ of their experience with specific lesions and should refer patients in an appropriate manner.
Regionalization example

A review of infant mortality due to congenital heart disease in the years 2006 through 2015 identified Kentucky and Mississippi as two states having the greatest proportion of counties with a predicted infant mortality rate above the 95th percentile. (13) That same study identified a correlation between lower mortality risk and closer proximity to one of the top 50 ranked pediatric cardiac centers. To improve outcomes in Kentucky, a joint pediatric heart care program between Cincinnati Children’s Hospital Medical Center and Kentucky Children’s Hospital was launched in 2017. Cincinnati Children’s Hospital Medical Center is larger (four cardiac surgeons, 55 cardiologists and 750 hospital beds) while Kentucky Children’s Hospital has 220 beds. The overarching goal was to develop a joint pediatric heart care program which would be “one program at two sites” and improve outcomes and access to care. (14).

After implementation of this regionalization plan, staffing at Kentucky Children’s Hospital includes two cardiac surgeons, three pediatric cardiac perfusionists, two pediatric cardiac anesthesiologists, two pediatric surgery advanced practice providers, and 10 cardiologists with a dedicated cardiac catheterization lab with two interventional cardiologists, one pediatric electrophysiologist, one advanced imaging CT / MRI cardiologist, two pediatric cardiac intensivists, and multiple echocardiogram physicians.

The case mix of patients treated at Kentucky Children’s Hospital includes STAT 1-3 and a limited number of STAT 4 cases. STAT 5 cases, heart transplants, or ventricular assist device implantaions are referred for transfer. There is a robust transfer system for complex cases which relies heavily on three weekly zoom conferences. All patients undergoing cardiac surgery or interventional cardiac catheterization at Kentucky Children’s Hospital are discussed at the joint conferences. Mini conferences are set up for emergency situations on an ad hoc basis.
During the past five years over 404 total operative cases have been performed at Kentucky Children’s Hospital with three mortalities. There has been no mortality on benchmark procedures. The STS O/E ratio in the most recent STS Public Reporting document is 0.71. The length of stay at Kentucky Children’s has been consistently below the STS benchmark. There is an average of one transfer from Kentucky Children’s to Cincinnati Children’s Hospital per month. The cardiac congenital catheterization volume has steadily increased to over 130 cases per year.

The program combining Cincinnati Children’s Hospital Medical Center and Kentucky Children’s Hospital is now five years old. The ‘one program - two site’ model has improved access to high-quality congenital heart care for the state of Kentucky. This model of regionalization demonstrates how excellent outcomes can be achieved when a small volume center partners with a high-volume center to optimize outcomes while maximizing the opportunity for patients to be managed closer to home when surgically appropriate.

The Challenge for Heart Center leadership – Maximizing quality through optimizing Mission, Structure, Process, and Culture

The challenge faced by a Heart Center (of any size) is to deliver high quality patient care, support the well-being of caregivers, and maintain responsible stewardship of the Hospital’s financial status. In the age of public reporting, an additional stress has been placed on Heart Centers to perform in these dimensions while under intense public scrutiny with mortality rates expressed to two decimal points (major league baseball publishes batting averages with three decimal points…). The rate limiting factor in the optimization of outcomes is not resolved by hiring better people (typically the members of a Heart Center are extremely well-trained). Nor is the solution to ask people to work harder (typically the members of a Heart Center are highly
dedicated and burn-out is an ever-present concern). Thus, optimization of team interactions
remains the dominant opportunity for improvement.

Strategies to achieve desired outcomes have commonly been focused on the Donabedian model
which was originally developed in 1982 (15). The Donabedian model links Structure to Process
and then to Outcomes in a linear manner. In the current era where team-based performance is
critical to outcomes in a high-stakes, rapidly evolving, and complex environment, the factors in
the Donabedian model are expanded to include: Mission, Structure, Process, and Culture (16)
depicted in Figure 2):

Mission
Is the mission in your Heart Center aligned and properly directed? Although the mission to
provide excellent patient care is given lip service in nearly every mission statement, in day-to-
day life the mission can become misaligned between individuals, between teams, and between
the Heart Center and the Hospital. Through direct interviews, examples of misaligned missions
which have come to the attention of the authors include caregivers stating that the actual mission
drives their day-to-day working life is ‘to not get fired’, ‘avoiding embarrassment in
conference’, and ‘keeping my head down’. Clinical teams have indicated that their day-to-day
mission is to ‘fight for resources’ with the Hospital, compete with other teams, or to ‘get
administration off my back’. What drives the daily activity of caregivers in your Heart Center?
Without deliberately probing this important question, a rote supposition that the actual mission is
aligned with the printed statement on the wall of the Hospital might be incorrect. Mission
statements are nice, but the actual mission is lived on a day-to-day basis - with direct impact on
Structure, Process, and Culture.
Structure

Structure relates to any relationship between resources that can be shown on an organizational chart or a blueprint. Organizational charts are illustrative of the relationship between teams in a Heart Center. Although the professed ideal of ‘patient-centered care’ is commonly included as part of a mission statement, examination of the organizational structure demonstrates that Heart Centers are often poorly designed to accomplish this mission. Many Heart Centers are a webpage construct with a series of ‘dotted line’ relationships between teams which is superimposed upon an organizational chart of century-old academic units (e.g. Department of Surgery, Department of Pediatrics etc…). The organizational chart for General Motors in 1921 is not very different than the organizational chart of many current academic Heart Centers (Figure 3). The siloed relationship between functional groups has negative implications in the alignment of mission and priorities between clinical groups (e.g. cardiac surgery and cardiology). A service line model aligns hospital and clinician interests and can improve quality of care, patient satisfaction, and financial efficiency (figure 4) (17,18). Nimbleness in responding to external (and internal) challenges is degraded in a top-down ‘command and control’ structural architecture (7). A Team of Teams approach utilizes multi-disciplinary teams focused on complimentary aspects of a central mission to improve alignment, and maximize lateral connectivity, shared consciousness, and empowered execution – resulting in enhanced overall Heart Center performance (Figure 5).

Processes can be used to mitigate/bridge flawed structural design, but the capability of these process-related patches to durably overcome structural design obstacles is often limited. The departure of a key Heart Center leader can often undo a process-related patch that temporarily held a Heart Center together – exposing a gap in structure that can inflame cultural tensions.
Basic elements of architectural structure (cardiology and cardiac surgery offices in separate buildings) and organizational structure (chiefs of Cardiac Surgery and Cardiology reporting to different Department Heads with differing priorities) can have important impact on culture—and processes are required to partially mitigate these gaps.

Process

Processes relate to how the components of structure interact with each other to ‘get things done’ as part of the daily business of the Heart Center. Processes overcome deviations from ideal mission-defined structure by creating interactions between elements of structure. For example, a process whereby patients are presented for consideration of intervention in a multi-disciplinary conference mitigates differences in academic structure to achieve the objective of the conference—team-based decision making. In this example, the ‘process’ includes multiple tasks: ‘cardiology’ presents a case, ‘echocardiography’ presents an echocardiogram, ‘radiology’ presents a CT scan, and ‘surgery’ collaborates in discussion and consensus is raised to proceed with an intervention. In this example, the process knits together the structure around a purposeful patient-centered action.

Culture

Culture is the amalgamation of behaviors expressed in the milieu of Mission, Structure and Process. Culture, however, can differ widely between Heart Centers—even when the Mission, Structure and Processes are identical. For a theoretical example: In two structurally identical Heart Centers multi-disciplinary conferences are held as described above and the same exact process occurs when presenting a case for decision. In one setting (Center A), however, a well-developed culture of safety is present with a vibrant discussion, differing but respectful opinions are raised, and a consensus is reached to proceed with a plan of care (even without complete
agreement). Meanwhile, in Center B, the same discussion is punctuated with discord, a climate of intimidation, silenced dissent, after-meeting corrosive chatter, and the subsequent degradation of team interactions results in real risks to patient safety (19). Between these extremes, it is the responsibility of the Heart Center leadership to manage the translation of Structure and Process into the Culture of day-to-day life – and the success of this translation has an important effect on outcomes.

Avoiding Pitfalls in Communication with Hospital Administration

Close alignment between the Hospital Administrative leadership and the Heart Center leadership is a critical factor in achieving optimal outcomes. Alignment, however, requires communication - and the ability (or failure) to communicate effectively is a common pitfall for surgical leaders in a Heart Center. All too often, the refrain that ‘the Hospital Leadership doesn’t understand what we do’ is invoked in frustration when some collaborative initiative fails to gain traction. Yes, the comment that ‘they don’t understand what we do’ may be correct, but the converse statement ‘the surgeons don’t understand what the Hospital Leadership does’ is equally likely to be true. How many of our surgical colleagues seek to understand the pain points and pressures that our administrative colleagues are managing on a daily basis? The key opportunity here is to develop trust in the relationship through demonstration that the surgical leader appreciates the role of the Heart Center as a part of a larger organization. To build trust, a simple tactic is to ask about pain/pressure points and seek to find how the Heart Center can be a better citizen within the milieu of the entire hospital. Successful organizations are built on trust between teams, and trust arises through effective communication that demonstrates mutual respect and shared objectives.
Limits to optimization in a Heart Center

Quality improvement is hard work (20). There are, however, some problems that cannot be effectively solved from within the organization due to perceived threats to vested interests and, therefore, these larger (often structural) problems tend to remain unaddressed with a demoralizing effect upon the Heart Center team. These thorny problems are often at the interface of the Heart Center and the remainder of the Hospital and, to be addressed properly, these tenacious problems sometimes require external perspective from professionals with content expertise and the capacity to understand the differing perspectives of the Hospital Administration and the clinical Heart Center leadership. The external perspective, however, is limited in impact depending upon the level within the Hospital hierarchy from which the approval for the engagement arises. As a rule of thumb, the engagement of an external perspective will have the most impact on the group providing the funding and the reporting relationships ‘downstream’ from the source of funding. If the dominant problem is upstream of the source of funding, the consultation process is not likely to be effective. Consequently, optimization of the chances for success requires buy-in at the level of the dominant problem, or higher, in the organizational structure.

The Up-Game approach

In the world of Heart Centers, calling for the participation of an external perspective to guide optimization (e.g consultation) is most commonly reserved for rare situations of desperation – and it is exceedingly rare that a Heart Center simply wishing to ‘up their game’ calls upon an external consultant to guide optimization. This reticence may be related to a perception that obtaining external perspective is an admission of failure (rather than a clear demonstration of a desire to improve). This reticence to obtain external perspective is distinctly different than the
world of professional athletics where players and teams routinely utilize coaches and trainers to improve their performance. A notable exception to the typical reticence to obtain external consultation is the Heart Center at Texas Children’s Hospital which was entirely redesigned in 2021 in collaboration with an external consultant while at the same time the Heart Center was ostensibly recognized as one of the top centers in the United States. This willingness to actively address the potential to optimize performance through radical review and subsequent redesign reflects extremely well upon the vision of the Hospital’s leadership and the Heart Center leadership involved in the reorganization that ensued. The prerequisite for working with an external consultant, however, was a trial period where the consultant earned the trust of the Heart Center and Hospital Administration leadership through a lengthy process of working together and demonstration of benevolence, capability, and reliability. Once trust was earned, the consultant was empowered to coordinate communication between the Heart Center and Hospital leadership on topics that had previously been off-limits. A skilled external consultant can deliver messages in both directions that are highly effective and, with time, can become part of the new normal – with attendant improvement in mission alignment and culture.

There may be room in our specialty to adopt a more aggressive stance to seeking external perspective to guide improvement and release untapped potential – even when things are going well. (21,22)

Conclusions

Building a high level of performance into a Congenital Heart Center is a complex process – the stakes are high for patients, families, clinicians, and the hospital. The commonly cited relationship between clinical volume and outcomes is complex and does not entirely determine the quality of delivered care. The optimal size and design of a Heart Center is unknown. Mission,
Structure, Process, and Culture all contribute to Outcomes and optimization of these parameters should be considered in a Heart Center’s quest to improve performance. External perspectives may help to fully identify opportunities to improve in distressed Heart Centers, but should also be considered in high performing centers with the dedication – and courage - to seek further improvement.
Figure 1. STS risk adjusted mortality rates published on the STS Congenital Heart Surgery Database website plotted against 4-year volume for STS Index Cases (September 2023). Red dots depict the top 10 Heart Centers listed in USNWR 2023 (4,5). High performing mid-sized and small-volume heart centers are denoted by a dotted line box which includes centers with O/E ratios in the lowest quartile compared to all other centers (recognizing that the selection of a quartile is an arbitrary delimiter). (Plot courtesy of Alysa Kalustian, MD)
Figure 2: Modified Donabedian model (15) depicting the complex relationships translating mission into outcomes in a Heart Center. Structure, process, and culture are highly interrelated, influenced by mission, and directly responsible for outcomes (21, 22).
Figure 3: Organizational chart from General Motors in 1921. The diagram is courtesy of James Huggins (Ret).
Figure 4: Organizational chart depicting a cardiovascular service line at the University of Wisconsin Hospital & Clinics (18). CCU: Cardiovascular care unit; CNE: Chief Nurse Executive; CT: Cardiothoracic; CTICU: Cardiothoracic intensive care unit; CV: Cardiovascular; CVP: Cardiovascular patient; FTE: Full-time employee equivalent; HVC: Heart and vascular care; VP: Vice president.
Figure 5: Organizational chart depicting application of a Team of Teams approach to the Heart Center at Texas Children’s Hospital. The seven strategic teams were created with membership from widely representative disciplines and administrative partners to create lateral connectivity in a large Heart Center. Teams were expected to focus on their aspect of the central mission while supporting all other teams. Teams were co-led by clinical and administrative leaders. The overall Heart Center Leadership included three co-Directors (cardiac surgery, cardiology, hospital administration) who maintained alignment between the Hospital and the Heart Center while providing guidance and support for the Team leaders. This model was superimposed upon the previously existing traditional academic model in 2021.
Central Figure

Building High Levels of Performance into Congenital Heart Centers

Greater volume is not the sole contributor to high performance. Mission, Structure, Process and Culture should be optimized.
References


4. https://publicreporting.sts.org/chsd


Building High Levels of Performance into Congenital Heart Centers

![Graph showing Observed to Expected (O/E) Mortality Ratio Plotted Against Annualized STS Index Cases/Year.]

Greater volume is not the sole contributor to high performance. Mission, Structure, Process and Culture should be optimized.
Building High Levels of Performance into Congenital Heart Centers

Publicly Reported Observed to Expected (O/E) Mortality Ratio Plotted Against Annualized STS Index Cases/Year

Greater volume is not the sole contributor to high performance. Mission, Structure, Process and Culture should be optimized.