



Current state of quality improvement research across cardiac ICUs: a Pediatric Cardiac Intensive Care Society (PCICS) survey

Original Article

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Abstract

Background: Outcomes for children with heart disease improved over the past decades. Quality improvement (QI) research in paediatric cardiac critical care is a key driver of improvement. The availability and variability of QI research across the field is unknown. This project represents a step in understanding the role. The Pediatric Cardiac Intensive Care Society (PCICS) can serve to support institutions' needs, drive collaborations, and utilise available infrastructure at member institutions for improvement work. **Methods:** The PCICS Quality Improvement and Safety Committee developed a survey to assess the state of QI research. The survey was disseminated over several months and available via QR code at the World Congress of Pediatric Cardiology and Cardiac Surgery in 2023. **Results:** Fifty-eight respondents completed the survey representing at least 38 unique institutions. Most respondents participated in QI research (52/58, 90%). Most QI projects were single centre (41% of respondents), and of those, the majority were from a minority of institutions (13 institutions [34% of total institutions]). QI support is available at slightly more than half of units, and 55% (32/58) have access to a QI specialist. QI support and rate of publications is significantly lower for small/medium units as compared to large units. Respondents suggested most interest from PCICS in networking with other members with similar project ideas (50/58, 86%). **Conclusion:** PCICS member institutions are committed to QI research, with limitations in support, local specialists, and networking. Increasing connectivity and accessibility to QI resources may reduce burden to individual members and institutions to achieve QI research.

Introduction

Outcomes for children with acquired and CHD have improved dramatically over the past decades.^{1,2} Quality improvement (QI) research in paediatric cardiac critical care is a key driver of this evolution. Utilisation of protocols, learning collaboratives, and multicentre data registries such as the Pediatric Cardiac Critical Care Consortium (PC⁴) have catalysed QI efforts.^{3,4} However, opportunities still exist for improvement, at individual centres and across the field. There remains significant variability in outcomes across centres, inconsistently measured and benchmarked longitudinal outcomes, and a lack of wide-reaching improvement efforts for many of the most challenging morbidities.^{5–7}

While variability in outcomes is clear, there is less clarity on variability in QI research infrastructures across heart centres. Recently, recommendations have suggested the need for QI infrastructure in heart centres, including dedicated personnel and resources necessary to support continuous learning and improvement.⁸

The centre-level QI infrastructure amongst Pediatric Cardiac Intensive Care Society (PCICS) member institutions is unknown. The goal of this project was to identify the current state, gaps, and needs in QI research within PCICS member institutions. This is a first step in understanding the role PCICS can serve to support institutions' needs, drive collaborations, and utilise available infrastructure at member institutions for improvement work.

Methods

A survey was developed by members of the PCICS Quality Improvement and Safety (QI-S) Committee as a means of assessing the state of QI research in paediatric cardiac critical care. *Quality research* was defined as methods to design and test changes to systematically improve

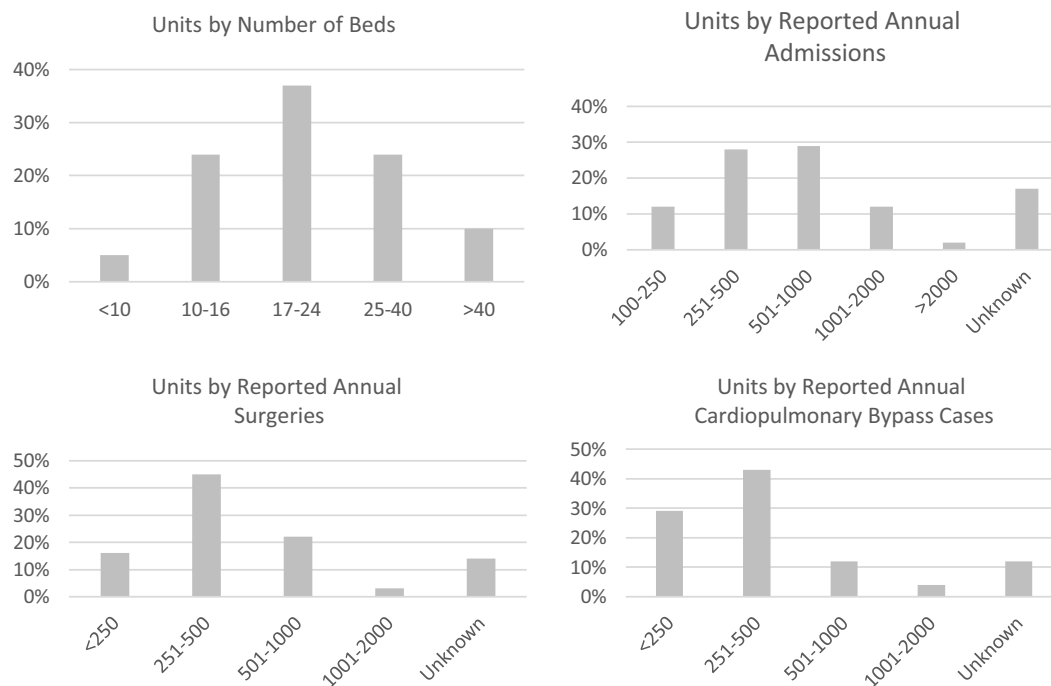


Figure 1. Demographics by respondent units.

quality performed with the intent to disseminate via publication or to collaborate at multiple institutions. This definition was made clear to respondents in the cover letter of the survey.

Questions were developed by the PCICS QI-S Research and Development Subgroup. The survey was iterated following review by the larger QI-S committee, survey experts, and a pilot group of faculty. The survey was disseminated via a REDCap link to attending physician and advanced practice provider members of PCICS from March to September 2023. Distribution occurred via links embedded in monthly PCICS updates, and then additional responses were collected from attendees at the World Congress of Pediatric Cardiology and Cardiac Surgery in August 2023 via an accessible QR code. Data were stored within a protected REDCap account.

Data were analysed via simple statistical methods, including averages, rates, and normal distributions. Comparisons of unit size to survey results was conducted via unpaired *t*-test. Calculations were audited by analysis being conducted by multiple authors.

Results

Fifty-eight respondents completed the survey, representing at least 38 unique institutions (6 unknown) from 4 countries. Given the PCICS listserv is disseminated to 149 institutions, the responses represent a minimum of 26% of sites.

Demographics of centres

Of those responding, 77.6% ($N = 45$) were from freestanding children's hospitals, 89.7% ($N = 52$) from academic centres, and 98.3% ($N = 57$) from dedicated cardiac ICUs. Unit demographics are displayed in Figure 1.

Quality improvement research

Most respondents participated in QI research in the past (52/58, 90%) and currently (44/58, 75.9%). Respondents reported at their institutions, most have 0–5 attendings leading QI research ($N = 37$, 63.8%; 6–10 attendings $N = 14$, 24%; >10 attendings $N = 6$, 10%; 1 unknown). For completed QI research projects, 24 (41.4%) were single centre, 11 (19%) were multicentre, and 18 (31%) were both single and multicentre (5 unknown). Of those that were single centre, most were from a minority of institutions (13 institutions reported single centre projects [34% of institutions]). Most participants who completed QI research projects published their work (33/58, 56.9%). For current QI research projects, most are single centre (24/44, 56.8%). Sixteen respondents (27.6%) had used a registry for QI research, with most using the PC⁴ Registry (13/16 [81%] used PC⁴), which represented the majority of published research within the cohort (11/14 [79%] published work was via PC⁴).

Quality improvement support

Respondents indicated QI support was available to individuals through various mechanisms, as shown in Figure 2a and b. A slight majority of respondents reported hospital-based support and departmental/divisional support, and more than half of respondents (32/58, 55%) had access to a dedicated QI specialist in their unit, whose roles are outlined in Figure 2b. In addition to support, more than half (31/58, 53%) reported institutional QI training opportunities, with opportunities displayed in Figure 2c. QI training had been completed by 53% (31/58). Forty-four (75.9%) reported that QI could be used for promotion within their organisation. When asked how PCICS could help support members, respondents were most interested in network connections to other PCICS members with similar ideas/projects

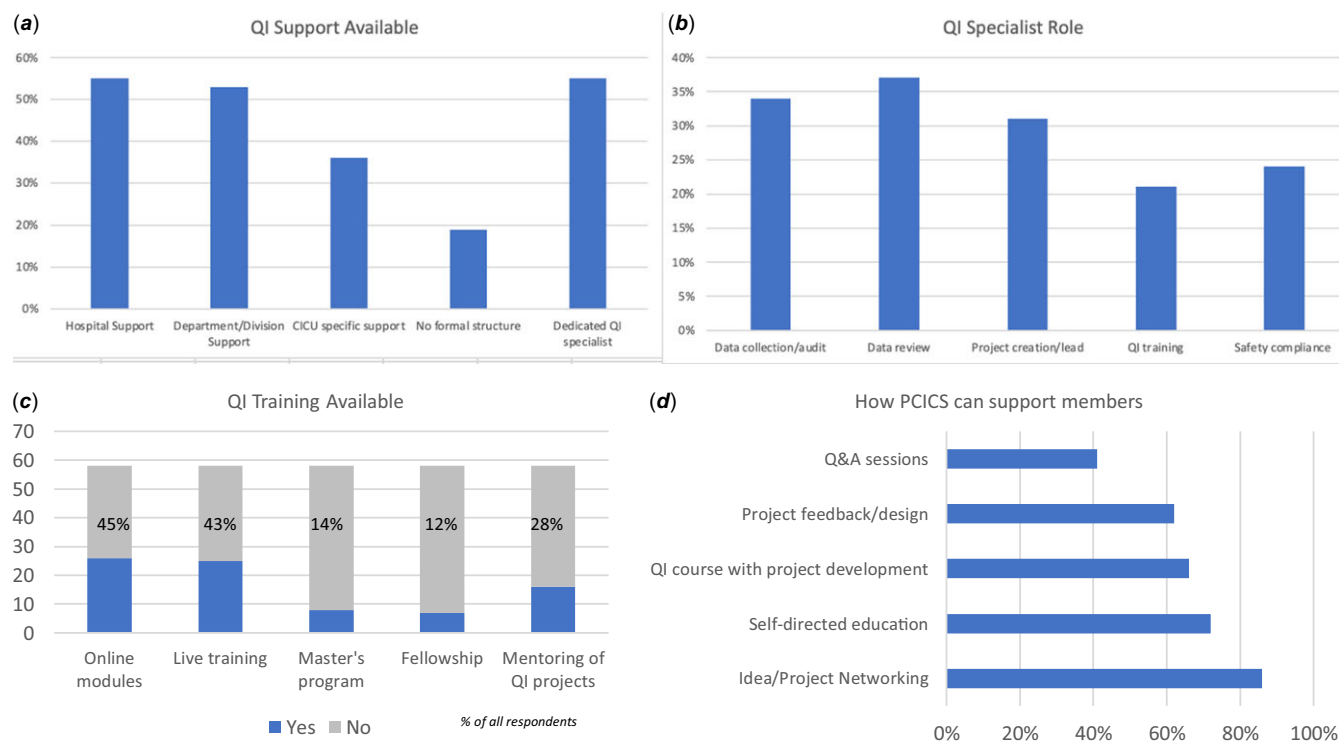


Figure 2. Quality improvement support, including 2a) support available, 2b) QI specialist role, 2c) QI training available, and 2d) support sought from PCICS.

(50/58, 86.2%) and self-directed education/resources (42/58, 72.4%) (Figure 2d).

Quality improvement research relative to unit size

When stratified by number of beds, participants that represent units with a large number of beds (≥ 25 beds, $N = 13$ units represented by 24 respondents), as compared to those from medium or small units (≤ 24 beds, $N = 25$ units represented by 28 respondents), had higher participation in QI research (large units 96% participation, small/medium units 86% [$p = 0.23$]), with statistically significant higher rates of publication of QI research (large units 88% of participants with publications, small/medium units 39% [$p = 0.0002$]) and access to a dedicated QI specialist in their unit (large units 83% with access, small/medium units 36% [$p = 0.0003$]).

Discussion

In this study, we demonstrate substantial heterogeneity in the quantity and type of QI research being conducted in cardiac critical care across institutions, and we highlight opportunities to fill gaps in QI support. To our knowledge, this is the first comprehensive report quantifying QI research in cardiac critical care.

Backer et al, in a wide-ranging consensus statement of recommendations for centres performing congenital heart surgery, outlined minimum recommendations for QI infrastructure within centres. While the recommendations extend beyond the ICU setting, they can be applied locally to guide cardiac ICU quality structure, especially given the essential role that cardiac ICUs have in supporting congenital heart surgery programmes. Recommendations included quality and safety staffing, processes, benchmarking, practice guidelines, quality reviews, and integration of QI throughout heart centres.

Quality improvement research

QI research requires reliable data, personnel for implementation, and infrastructure to track iterative changes. If any components are lacking, work is less likely to sustain, drive change, and be published.⁹ The results indicate a tendency towards siloed QI work, with the majority being single centre projects, in contrast to the productivity described with most published work coming from multicentre and/or registry work. Fortunately, resources exist to reduce variability and build lasting collaborations, sustainable changes, and academic productivity. The introduction of PC⁴ (and more broadly, Cardiac Networks United), CoRe-PCICS, and other collaborative learning projects have reduced variability in the field.^{3-5,10-12}

Quality improvement support

QI, assurance, implementation, and research is a specialised domain. It is unrealistic and inefficient for all cardiac ICU providers to maintain this expertise. Instead, support structure within units or organisational infrastructure is critical. Only half of the respondents reported departmental, divisional, or hospital-based support, with fewer indicating unit-level support. A dedicated QI specialist or a QI team within the critical care and/or heart centre teams can guide project development, implementation, data collection and review, and sustainability of programmes. Notably, the majority of access to QI specialists was within larger centres, which also had representatively higher rates of publications; this suggests opportunity for smaller units to embrace this role or work with partner institutions or PCICS to share resources to QI expertise.

In a sample likely biased by members interested in QI, only approximately half reported QI training opportunities within their institution. Training programmes are widely available online from

quality organisations, such as the Institute for Healthcare Improvement, and specialty-specific opportunities via PCICS. Organisational support for cardiac ICU providers to develop these skills is important in continued growth in the field.

Future steps and the role of PCICS

The role PCICS can serve in the advancement of QI research across organisations is timely and important. Data for QI research are widely available and can both inform unit-level real-time decisions and be disseminated across the collaborative. There is robust overlap in member institutions and leadership between PC⁴ and PCICS and utilising strengths from both will synergistically raise all efforts.

Quality expertise that exists within PCICS has and will continue to develop education for members. In-person and virtual QI training sessions, both independently and connected to annual conferences, will help fill the gap in training opportunities. Recently, PCICS has taken the next step in providing QI support through the Quality Improvement Learning Think Tank (QILT²) which is a service recently developed within PCICS to provide quality advising, a “thinktank” approach for project development and to link members and institutions with shared interests.

Finally, PCICS can support members and institutions by specifying recommendations for QI infrastructure within the critical care setting for centres performing congenital heart surgeries. Applying expertise and localising the recommendations from Backer et al will provide a more usable framework for cardiac ICUs to best support their providers, collaborating teams, and patients.⁸

Notable limitations exist to this report. The representative sample is likely inherently biased by those with an interest in QI, given their response to the survey. In addition, while efforts were made to assess an international population, there is a large majority of North American sites. Finally, the distinguishing QI research from QI clinical work may exclude the reporting of QI projects that others may consider QI research.

PCICS member institutions responded to this survey with a demonstrated commitment to QI research within their units, despite limitations that exist in terms of support, local specialists, and networking among similar centres to advance QI work. Limited access to support was particularly notable among smaller sized units. Increasing connectivity and accessibility to QI resources may reduce burden to individual members and institutions to utilise quality in research and daily work.

Supplementary material. The supplementary material for this article can be found at <https://doi.org/10.1017/S1047951124026234>.

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