

Impact of Accreditation on Quality in Echocardiograms: A Quantitative Approach



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Background: Accreditation through the Intersocietal Accreditation Commission (IAC) is believed but not proven to increase quality in imaging. The goal of this study was to use quality metrics to evaluate the impact of accreditation on quality in pediatric echocardiography.

Methods: This is a retrospective study comparing quality metrics in 236 pediatric transthoracic echocardiograms in patients with congenital heart disease from (1) California Pacific Medical Center (CPMC), a community hospital, before and after IAC accreditation, and (2) the IAC-accredited Lucile Packard Children's Hospital (LPCH), an academic children's referral center, during equivalent eras. Consecutive patients who required cardiac intervention were matched between sites based on age, complexity, and time period. Two raters independently evaluated echocardiograms for image quality and study comprehensiveness. A third rater reviewed echocardiogram reports and medical charts for report completeness and diagnostic accuracy. Diagnostic error characterization was performed by consensus among the three raters. Report completeness was an IAC tool approved for maintenance of certification. The remaining quality metrics were developed by the American College of Cardiology Adult Congenital Pediatric Cardiology Quality Metrics Working Group initiative.

Results: At each site, 74 echocardiograms in the era before CPMC accreditation and 44 echocardiograms in the era after CPMC accreditation were included. There was no significant difference in image quality and diagnostic accuracy at CPMC before and after accreditation. Study comprehensiveness and report completeness improved at CPMC after accreditation ($P < .001$).

Conclusions: Accreditation through the IAC leads to increased study comprehensiveness and report completeness. Image quality and diagnostic accuracy did not differ significantly before and after IAC accreditation. We recommend further studies to assess the effects of accreditation on quality in echocardiography and patient outcomes. (*J Am Soc Echocardiogr* 2017;30:913-22.)

Keywords: Accreditation, Congenital, Echocardiogram, Quality metric

INTRODUCTION

Accreditation through the Intersocietal Accreditation Commission (IAC) is a widely accepted method to promote quality in imaging and is supported by multiple cardiovascular professional societies

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including the American College of Cardiology (ACC), the American Society of Nuclear Cardiology, and the American Society of Echocardiography.¹⁻³ Facilities exert substantial effort to fulfill IAC standards in application preparation and to establish ongoing quality improvement activities to maintain accreditation.^{4,5} Despite the widespread acceptance of accreditation as a mechanism to maintain quality standards across a variety of practice settings, there is a paucity of literature demonstrating the effects of accreditation on quality in imaging.^{6,7}

The quality and comprehensiveness of the echocardiographic study directly impact the management of complex and life-threatening cardiac diagnoses in infants and children. Echocardiography is the initial and primary diagnostic tool for infants and children with congenital heart disease and is often the sole imaging study prior to cardiac intervention (catheterization and/or surgery). In the majority of pediatric patients with congenital heart disease, echocardiography has supplanted cardiac catheterization for diagnostic purposes and surgical decision-making.⁸ Although the pediatric echocardiogram is indispensable in characterizing cardiac anatomy and function prior to intervention, there has been limited evaluation of quality for this important noninvasive procedure. Current literature regarding quality in pediatric echocardiography is limited to analyses of diagnostic errors⁹⁻¹¹;

Abbreviations**2D** = Two-dimensional**ACC** = American College of Cardiology**CPMC** = California Pacific Medical Center**IAC** = Intersocietal Accreditation Commission**LPCH** = Lucile Packard Children's Hospital**MOC** = Maintenance of certification**QM** = Quality metric

taxonomy of diagnostic accuracy for pediatric echocardiography is defined and used to assess increased risk of adverse events.^{9,12}

There is a significant shift in health care toward quality improvement through quality metrics (QMs), maintenance of certification (MOC) requirements, and accreditation.¹³ The ACC has workgroups dedicated to developing tools to analyze imaging studies and to provide a measure of quality in a standardized fashion. These QMs require trial, refinement, and validation. MOC has come under intense scrutiny

for several reasons, including doubts regarding its relevance to quality of patient care.¹⁴ For the health care providers required to undergo an increasing number of quality improvement activities, actual evidence that these processes increase quality and improve patient outcomes could help validate the time, money, and effort spent on these activities. Even though surveys of IAC-accredited facilities suggest that providers perceive accreditation as being important, these surveys are limited by low numbers of participants, particularly physician responders.^{15,16} The impact of accreditation on quality in pediatric echocardiography has not been previously reported. The objective of this study was to use QMs to assess the effect of accreditation on quality improvement in imaging.

METHODS

In this retrospective study to evaluate the impact of accreditation, we applied QMs developed separately by the ACC and IAC to pre- and post-IAC accreditation echocardiograms performed in infants and children with congenital heart disease at California Pacific Medical Center (CPMC) in San Francisco and compared them with echocardiograms performed at the IAC-accredited Lucile Packard Children's Hospital (LPCH) at Stanford University during equivalent time periods. As there is no established standard for these QMs, the LPCH comparison was undertaken to provide a standard for applying the metrics to studies from an institution with long-standing accreditation.

Study Institutions

CPMC is a community-based Sutter Health-affiliated hospital with noninvasive pediatric cardiology services including inpatient and outpatient echocardiograms. Cardiac sonographers who perform pediatric echocardiograms at CPMC are credentialed as Registered Diagnostic Cardiac Sonographers with an adult and/or pediatric specialty. The pediatric echocardiography laboratory was initially accredited through IAC in April 2013. In 2013, the volume of all pediatric echocardiograms at CPMC was 2,016.

LPCH at Stanford University School of Medicine provides comprehensive pediatric cardiology subspecialty services, including cardiothoracic surgery, and is one of the major pediatric cardiac referral centers in the United States. Cardiac sonographers (credentialed as Registered Diagnostic Cardiac Sonographers pediatric) and physician trainees (assisted by sonographers) perform echocardiograms at LPCH. It has been accredited through IAC since 2004. In 2013, the

volume of all inpatient and outpatient pediatric echocardiograms at LPCH was 10,604.

Study approval was obtained from the institutional review boards of Sutter Health and Stanford University.

Study Population

Preaccreditation echocardiograms from CPMC were included from the time period October 2009 to April 2012. To account for potential bias during the CPMC IAC application preparation and consideration time period, echocardiograms from May 2012 to April 2013 were excluded. Postaccreditation echocardiograms were included from May 2013 to April 2015. Consecutive CPMC patients with congenital heart disease who required cardiac intervention (catheterization or surgery) were identified prospectively and had diagnoses confirmed by cardiac catheterization, computed tomography, magnetic resonance imaging, and/or cardiac surgery during the CPMC pre- and postaccreditation time periods. The CPMC cases were matched with the LPCH cases for age, complexity, and time period. Echocardiograms from LPCH during equivalent time periods were selected, all of which represented postaccreditation studies (Figure 1). The most complete preintervention echocardiogram was selected. Exclusion criteria included normal echocardiograms, echocardiograms performed between May 2012 and April 2013, and a few extremely limited echocardiograms due to agitated/unstable patients. Categorization of cases for complexity was performed based on this study population on a scale of 1 to 3 (1 = minor complexity, 2 = moderate complexity, and 3 = severe complexity), and examples of cardiac diagnoses are delineated in Table 1. Category 1 included minor complexity defects generally requiring a single catheterization or surgery, Category 2 included moderate complexity defects with two ventricles requiring surgical repair in infancy and possible subsequent surgery, and category 3 included severe complexity defects with one ventricle and/or complex anatomy requiring multiple catheterizations and surgeries.

Data Collection

The demographic data obtained from the echocardiogram reports and medical records included age, weight, gender, cardiac diagnoses, history of prior intervention, performing sonographer/physician, interpreting physician, study location, date of study, time of study, and date of intervention. Comments regarding agitation, poor acoustic windows, and sedation were also recorded.

Four QMs were used to evaluate echocardiograms for (1) diagnostic accuracy, (2) image quality, (3) study comprehensiveness, and (4) report completeness. The diagnostic accuracy, image quality, and study comprehensiveness metrics were developed by the ACC Adult Congenital Pediatric Cardiology Quality Metrics Working Group initiative. Permission was obtained from the ACC administration to trial the metrics in this study. Report completeness was an IAC tool for a MOC Part 4 quality improvement activity approved by the American Board of Pediatrics.

Diagnostic Accuracy

The diagnostic accuracy metric is based on a taxonomy developed by Benavidez *et al.* for error categorization and risk factor identification.⁹ For this study, the most complete preintervention echocardiogram was selected. The echocardiogram images and report were compared with findings in the medical record from the date of the echocardiogram until 2 weeks after intervention (e.g., inpatient/outpatient progress notes, subsequent echocardiograms, computed tomography/magnetic resonance imaging reports, cardiac

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