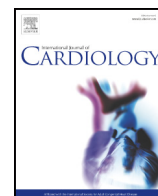




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Systematic review and directors survey of quality indicators for the cardiovascular intensive care unit

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ABSTRACT

Background: Quality indicators (QIs) are increasingly used in cardiovascular care as measures of performance but there is currently no consensus on indicators for the cardiovascular intensive care unit (CICU).

Methods: We searched Medline, CINAHL, EMBASE, and COCHRANE databases from inception until October 2016 and websites for organizations involved in quality measurement for QIs relevant to cardiovascular disease in an intensive or critical care setting. We surveyed 14 expert cardiac intensivist-administrators (7 European; 7 North American) on the importance and relevance of each indicator as a measure of CICU care quality using a scale of 1 (=lowest) to 10 (=highest). Indicators with a mean score $\geq 8/10$ for both importance and relevance were included in the final set.

Results: Overall, 108 QIs (70 process, 18 structural, 18 outcome, 1 patient engagement, and 1 covering multiple domains) were identified in 30 articles representing 23 agencies, organizations, and societies. Disease-specific QIs included myocardial infarction ($n = 37$), heart failure ($n = 31$), atrial fibrillation ($n = 11$), and cardiac rehabilitation ($n = 1$); general QIs represented about one-quarter ($n = 28$) of all measures. Fifteen QIs were selected for the final QI set: 7 process, 2 structural, and 6 outcome measures, including 6 general and 9 disease-specific measures. Outcome measures chosen to evaluate general CICU performance included overall CICU mortality, length of stay, and readmission rate.

Conclusions: Numerous QIs relevant to the CICU have been recommended by a variety of organizations. The indicators chosen by the cardiac intensivist-administrators could serve as a basis for future efforts to develop a standardized set of quality measures for the CICU.

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1. Introduction

Despite attempts by professional societies to standardize care in acute cardiovascular medicine through the use of guidelines, registries, and appropriate use criteria, substantial variation in practice exists [1,2]. To bridge the gap between actual and evidence-based care, quality indicators (QIs) are increasingly being used in cardiology to measure

healthcare improvement, to hold providers and institutions accountable, and to incentivize care [3–5].

There is a need to identify, endorse, and track quality measures in the cardiovascular intensive care unit (CICU) [6]. The modern CICU care environment has become increasingly complex due to an older patient population with more comorbidities, availability of advanced life-sustaining technologies, and strained resource availability [7]. Traditionally, outcome measures have been used by regulatory bodies, oversight agencies, and payers to track common acute CV conditions, such as readmission rates following heart failure (HF) hospitalization and mortality post-myocardial infarction (MI) [8]. More recently, quality measures from other quality domains, such as patient engagement and experience, have been proposed as potentially relevant care markers in acute care cardiology.

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² Specific contribution: data analysis, interpretation, and discussion.

There has been limited discussion regarding which existing QIs could be used to measure the quality of care in the CICU. Thus, we performed a systematic review of proposed and recommended QIs in acute care cardiology that are relevant to the CICU. We then surveyed expert cardiac intensivists–administrators regarding the importance and relevance of each measure and the relevance to CICU care quality.

2. Methods

2.1. Search strategy

We conducted a systematic literature search of Medline, CINAHL, EMBASE, and COCHRANE databases from inception to October 1, 2016. We used a search term composed of a CICU-related keyword or an acute cardiovascular condition combined with a term related to QIs or outcome measurement (see Supplement 1 for the detailed search strategy). References of selected articles were screened for other potentially eligible articles. We also searched the Internet for gray literature and websites of organizations involved in QI measurement, as well as national clearinghouses for QI standards. We reviewed all American College of Cardiology Foundation/American Heart Association (ACCF/AHA) [9] and European Society of Cardiology (ESC) [10] guidelines. The comprehensive search strategy was developed in conjunction with a medical research librarian.

2.2. Study selection

The titles and abstracts of extracted studies were screened by two independent reviewers (M.G., L.B.). Articles deemed as potentially relevant by at least one reviewer were extracted as full-text articles for assessment of eligibility. Articles meeting inclusion criteria were included in the study. Disagreements were resolved by consensus. If an organization had multiple sets of QIs for a specific cardiovascular condition, only the most recent article and QI set was used in the analysis.

Articles were included if they proposed or recommended QIs relevant to the CICU care environment. There was no language restriction. QIs were excluded if the measures were intended for a pediatric population (age < 18), involved measures of pre-CICU care (i.e. emergency department triage and initial management), post-CICU care (i.e. outpatient care, cardiac rehabilitation), subspecialty settings where CICU care plays a minor role in outcome determination (i.e. electrophysiological procedures), cardiac surgery, or if the measures were country, region or hospital specific. All forms of quality measures, such as quality metrics and performance measures, were considered “quality indicators.” The systematic review was performed according to the PRISMA guidelines [11].

2.3. Quality indicator selection

We classified QIs based on the National Quality Forum's framework into the following categories: process, structural, outcome, patient experience or multiple domains [12]. We sent individually-linked surveys hosted on SurveyMonkey (Palo Alto, CA) to an expert panel of 7 North American cardiac intensivist–administrators (all current CICU directors from academic medical centers with a mean 12 years mean experience, 3 in the United States and 4 in Canada) and 7 European cardiac intensivist–administrators (6 previous or current CICU directors, 4 from academic tertiary care, 3 from non-academic tertiary care medical centers, with a mean 22 years mean experience, representing 5 different countries). Evaluators were blinded to each other's responses. Experts scored each indicator on a Likert-type scale ranging from one (=lowest) through to ten (=highest) based on two criteria: (1) the indicator's importance as a measure of care quality and (2) the indicator's relevance to the CICU care environment [13,14]. An indicator was included in the final QI set if the mean score for both criteria

was $\geq 8/10$, a cut-off chosen to limit results to higher impact measures, for both the North American and European cardiac intensivist–administrator cohorts.

3. Results

3.1. Systematic review

There were 108 QIs identified from 30 articles representing 23 agencies, organizations, and societies (Fig. 1; Table 1). Fifteen articles were found in the peer-reviewed literature and 15 articles were found in the online search. Organization types included CV professional society (n = 6), governmental agencies (n = 3), non-profit organizations (n = 9), accreditation organizations (n = 1), physicians consortium (n = 2), international agencies (n = 1), and academic research institutions (n = 1). Country or region of origin included the United States (n = 18), Canada (n = 5), Europe (n = 3), international (n = 2), and Australia (n = 2).

Seventy QIs (64.8%) were process measures, 18 (16.7%) were structural measures, 18 (16.7%) were outcome measures, 1 (0.9%) was a patient engagement measure, and 1 (0.9%) was a measure covering multiple domains (see Supplemental Table 1 for complete search results). Disease-specific QIs included MI (34.3%, n = 37), HF (28.7%, n = 31), atrial fibrillation (10.2%, n = 11), and cardiac rehabilitation (0.9%, n = 1); general QIs represented 26.0% (n = 28) of all measures. Only 4 QIs (3.7%) were composite measures.

There was a mean of 1.9 organizational recommendations per QI. A total of 80 QIs (74.1%) received only one organizational recommendation. The most commonly recommended measures were post-MI mortality (n = 9), beta-blocker prescription (n = 9), angiotensin converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB) prescription for left ventricular (LV) dysfunction (n = 7), LV assessment (n = 6), and aspirin prescription on discharge (n = 6), as well as aspirin prescription on admission for MI (n = 6). For post-MI mortality, QIs differed on measurement period, data collection, and/or risk-adjustment methodology (Supplemental Table 2).

3.2. Survey results

Fifteen QIs received a mean score ≥ 8 from both groups and therefore represent the final indicator set (Fig. 2; Table 2). The final indicator set included 7 process measures, 2 structural measures, and 6 outcome measures including 6 general measures and 9 disease-specific measures. General outcome measures chosen were overall CICU mortality, CICU length of stay, and the overall readmission rate to hospital following CICU stay.

There were 26 QIs receiving a mean score ≥ 8 from the European cardiac intensivist–administrators, but not the North Americans (Supplemental Table 3). Highly-rated measures included process measures for acute myocardial infarction (AMI; n = 3), HF (n = 8), atrial fibrillation (n = 2), and general unit performance (n = 1), as well as structural measures for AMI (n = 1) and general (n = 10). There were 5 QIs receiving a mean score ≥ 8 by the North Americans, but not the Europeans. These included 1 process measure (protocols for common acute cardiac conditions), 2 structural measures (electronic prescribing and medication safety and CICU admission volume), and 2 outcome measures (readmission for AMI and HF).

4. Discussion

In a systematic review and evaluation of published cardiovascular QI metrics, we adjudicated the importance and relevance of these measures for quality of CICU care. We found that nearly three-quarters of indicators were proposed by only one organization and, when an indicator was recommended by several organizations, key differences in outcome definition or measurement methodology often existed. We

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