Chapter 2
Quality and Safety

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ABSTRACT

Quality improvement is a goal of all institutions but effective quality improvement programs have been difficult to create and sustain. Cardiac surgery has long been a pioneer in the quality improvement process through protocolization, large database analysis, and evidence based research. This chapter will discuss the theoretical foundation for quality improvement in medicine, and address current quality improvement strategies in the cardiothoracic ICU including care bundles, large database review, and externally promulgated quality programs such as the Surgical Care Improvement Project (SCIP) or the Physician Quality Reporting Initiative (PQRS). Controversies from national quality improvement programs including SCIP, extended staffing, and the value of quality culture will be discussed.

INTRODUCTION

Cardiac surgery has been a high risk endeavor ever since its inception. Although John Gibbon is credited with developing the first artificial oxygenator, and his first procedure (an atrial-septal defect closure) was a success, the next 4 patients Dr. Gibbon operated on did not survive and Gibbon never again performed open heart surgery (Gott, 2005). Of the first 10 ventricular septal defects closed by the pioneering cardiac surgeon Walt Lillehei in 1954 only 6 survived (Moller, Shumway, & Gott, 2009). Although morbidity and mortality were significant when surgical techniques and post-operative care were still in their infancy, progressive refinement of surgical techniques, strategies for heart preservation, and advances in cardiopulmonary bypass and overall perioperative care have made cardiac surgery routine enough for overall coronary artery bypass graft (CABG) mortality to fall to 2% (Ferguson, 2012).

Physicians have taken advantage of these incremental improvements in cardiac surgery techniques by performing more difficult procedures on sicker patients. Combined coronary bypass and multiple valve procedures, mechanical assist device insertion, and minimally invasive cardiac surgery have dramatically increased both the complexity and risk of modern cardiac surgery. Patients undergoing these

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procedures are routinely exposed to numerous therapeutic and diagnostic interventions that increase the risk of harm including central venous access, mechanical ventilation, and arterial pressure monitoring. Increasing numbers of consultants and medications also increase the complexity of care and raise the likelihood of adverse events.

That such complex care can be delivered so effectively is no accident. Cardiac surgery has a long history of focusing on quality improvement. In addition to frequent use of protocols and a limited set of procedures, cardiac surgeons have relied heavily on large clinical databases such as those created by the Society of Thoracic Surgeons (STS) and the New York State Department of Health to better understand risk factors and outcomes. The STS database in particular, to which 95% of cardiac surgeons send data, has been risk-adjusted for >20 years and has undergone multiple updates of the risk adjustment algorithm. Finally, government-sponsored initiatives such as the Surgical Care Improvement Program have led physicians to focus on quality and safety in care processes, including glycemic control, appropriate use of beta blockade and antibiotics, and best practices with respect to central line, and urinary catheter use. This chapter will discuss theoretical approaches to quality improvement, review current strategies for creating and maintaining quality and safety in the cardiac ICU, including safety culture, bundles, the influence of external quality programs, and large database analysis. Future strategies for maintaining and improving cardiac surgery quality will be discussed.

Theories of Quality

Organizations outside of medicine have developed two broad theoretical approaches to improving and maintaining quality performance. The first, a "one best way" approach, was first developed by the 20th century industrialist Frederick Taylor. In his 1911 book, The Principles of Scientific Management, Taylor argued that breaking a complex task into many smaller ones and then using comparative science to identify the "one best way" to perform each of them was the best route to optimal performance (Taylor, 1911). Among Taylor's examples were identifying the optimal weight for shoveling material by a worker (21 lbs), and using different sized shovels for different densities of material for optimal efficiency. Taylor believed that too much worker autonomy was bad for quality, and that emphasizing more managerial control was critical to improving quality. While "Taylorism" was controversial and led to strikes from skilled workers, Taylor was one of the first to focus on improving the system versus the individual workers.

The other approach was characterized by Dr. W. Edwards Deming, a physicist and statistician. Deming also emphasized system improvements, but unlike Taylor believed in worker input to quality improvement. As an example, Deming might seek a nurses understanding of how wrong medication errors occur in the ICU rather than just physician input. Such a "deep" understanding of workflow, Deming believed, was essential to optimizing complex systems. Among Deming's other recommendations were removing blame as a driver of quality and a culture that encourages the identification of errors and innovative solutions.

Today, organized medicine most commonly uses the Donabedian model, which incorporates elements from both Taylor and Deming. First described in 1966, the Donabedian model divides medical care into three distinct categories, structure, process and outcomes (Donabedian, 1966). These three categories are then used to identify areas to focus on for quality interventions and also to measure improvements in quality.

"Structure," describes the attributes of the settings in which care occurs. Examples of "attributes" that pertain to the cardiothoracic intensive care unit include the physical layout of the ICU, types of monitors,