

Chapter 1

Epidemiology of Cardiac Surgery and the Cardiac Surgical Patient

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ABSTRACT

While the timeline has been relatively abbreviated, there has been significant evolution in the field of cardiac surgery. These changes have been driven by a combination of operative innovation, changing patient demographics, and novel critical care resources, all of which have allowed today's surgeons to treat a myriad of conditions among increasingly higher risk patient cohorts. At the same time, this has forced providers to expand their clinical skill sets, embrace multidisciplinary collaboration, enhance postoperative care, and intensify the rigor by which outcomes and quality are being measured. In spite of this increasing complexity, however, mortality in cardiac surgery continues to improve. In this chapter, we highlight key historical events and describe an unprecedented trajectory and evolution in care practices that have helped shape modern cardiac surgery. We also make an appeal for additional research efforts which are needed to ensure sustained and innovative growth.

INTRODUCTION

There has been remarkable growth in the field of cardiac surgery, driven largely by transformative technological advancement and changing patient characteristics. Buttressed by an evolving evidence-base focusing not only on operative outcomes but also on the provision of cost-effective care, cardiac surgery today is vastly different than ever before. Increased utilization of hybrid therapies, multidisciplinary partnerships, and interventions for the extremely high-risk patient are all now commonplace. In addition, the contemporary care of the cardiac surgical patient is no longer isolated to the operating room (OR), but rather has extended into the intensive care unit (ICU) and beyond. The burgeoning use of mechanical

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circulatory support (MCS) in particular has, in many ways, made the ICU an extension of the OR and has forced providers to quickly expand their skill set in response to increasing critical care demands. Fortunately, despite this mounting complexity, mortality after cardiac surgery continues to decrease.

The following chapter will highlight pivotal historic and epidemiologic events that have helped to shape the face of modern cardiac surgery. Through an exploration of the current landscape and a clearer understanding of the trajectory of care, we hope to inform today's providers so that they may better anticipate the future needs of this increasingly complicated patient population. In addition, the importance of augmenting the current evidence-base through timely and collaborative investigation will be discussed throughout the text.

EVOLVING CARE FOR THE PATIENT WITH CORONARY ARTERY DISEASE

The foundations of cardiac surgery date back to the late 1800s when the treatment of angina pectoris became a focal point for operative innovation. While ligation of pain pathways and creative approaches to sympathectomy did seem to improve the symptoms of ischemia (Harken, Black, Dickson, & Wilson, 1955), these interventions did little to attenuate the other deleterious effects of progressive epicardial coronary disease (i.e. myocardial infarction, arrhythmia, and heart failure). As a result, the development of novel methods for improving collateral blood flow to the ischemic myocardium became strong motivation for evolving surgical care. In 1903, for instance, Thorel (1903) proposed a mechanism by which pericardial adhesions could improve myocardial perfusion. Through the use of either irritant therapies or mechanical intervention, other like-minded surgeons soon created and shared their unique methods for augmenting blood flow using a pericardial substrate (Moritz, Hudson, & Orgain, 1932). Shortly thereafter, muscle (Beck, 1935), omentum (O'Shaughnessy, 1936), and even intestinal grafts were employed to treat ischemia through collateralization (Key, Kergin, Martineau, & Leckey, 1954).

It wasn't until the mid-1960s, however, that vascular conduits were finally used as a means for mechanically bypassing obstructive coronary lesions. Vasilii Kolesov (Olearchyk, Vasilii, & Kolesov, 1988) was believed to have been the first to perform anastomosis of the internal mammary artery to the left anterior descending (LAD) vessel. Following closely on the heels of Kolesov's report, others described the use of saphenous vein grafts for surgical revascularization (Garrett, Dennies, & DeBaakey, 1973). By many, however, Rene Favaloro is considered the "father of modern bypass surgery" – while not the first to describe this operation in detail, he was one of the first to perform the coronary artery bypass graft (CABG) procedure with consistent rigor, and one of the first to share and publish his reproducible outcomes (Favaloro, 1969).

It is, in fact, this sharing of outcomes that has been most instrumental in the widespread dissemination and ongoing evolution of CABG care. Supported by three pivotal trials espousing the benefits of surgical revascularization over medical therapy, the use of CABG for patients with coronary disease reached historical peaks in the 1980s. The Veterans Administration Cooperative Study (Detre, Murphy, & Hultgren, 1977), the European Coronary Surgery Study (European Coronary Surgery Study Group, 1979), and the National Heart, Lung, and Blood Institute (NHLBI)-sponsored Coronary Artery Surgery Study (CASS) (National Heart, Lung, and Blood Institute Coronary Artery Surgery Study, 1981), together formed the basis for contemporary surgical guidelines to treat the ischemic patient (Gibbons et al, 2003). For those with advanced disease, concomitant left ventricular contractile dysfunction, and other high-risk features, it is now acknowledged that CABG carries a demonstrable and durable survival advantage over

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