INVITED EXPERT REVIEW

Risk Aversion and Public Reporting. Part 1: Observations From Cardiac Surgery and Interventional Cardiology

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Risk aversion is a potential unintended consequence of health care public reporting. In Part 1 of this review, four possible consequences of this phenomenon are discussed, including the denial of interventions to some high-risk patients, stifling of innovation, appropriate avoidance of futile interventions, and better matching of high-risk patients to more capable providers. We also summarize relevant observational clinical reports and survey results from cardiovascular medicine and surgery, the two specialties from which almost all risk aversion observations have been derived. Although these demonstrate that risk aversion does occur, the empirical data are much more consistent and compelling for interventional cardiology than for cardiac surgery.

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> *For extreme diseases, extreme methods of cure … are most suitable*—Hippocrates, *Aphorisms,* circa 400 BC
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> *Desperate diseases grown, By desperate appliance are relieved, Or not at all*—Shakespeare, *Hamlet,* Act 4 Scene 3, circa 1600 AD

For some severe diseases and conditions, the only hope for cure may be treatments that have a high-risk of failure, complications, or death. Although we may think of this as a phenomenon of 21st century health care, these familiar quotes from Hippocrates and Shakespeare illustrate the perennial nature of this challenging problem.

The concept that some clinicians might not offer treatment to such patients because of the high risk of failure and its potential effect on their reputations—referred to today as risk aversion—is also not a modern phenomenon. More than a century ago, Ernest Amory Codman, a surgeon at the Massachusetts General Hospital and Harvard Medical School, was one of the earliest advocates for transparent reporting of provider outcomes. Dr Codman was subsequently a cofounder of both the American College of Surgeons and its Committee on Hospital Standardization, a forerunner of the Joint Commission, and he is now widely recognized as the father of the American health care quality movement.

Although an ardent advocate for transparency, Codman also presciently reflected on its potential unintended consequences. In 1913 he presented what is probably the earliest, and still one of the most insightful commentaries regarding risk aversion [1]:

> But if we think too much about mortality, shall we not fail to do desperate operations which we should do?
>
> Who should attempt these desperate operations—the man anxious to make a reputation, or the man who has made one?
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> The operation of gastrectomy for cancer of the stomach is a good example. A mortality even as high as 50 per cent is justifiable, because unfavorable as well as favorable cases should be done. But what surgeon doing private practice has reputation enough to undertake such a mortality? To be successful with this operation a man should have great surgical skill, special training on animals, abundant opportunities to do the operation, and security of reputation, so that his private practice will not be ruined by the necessarily high mortality.
>
> Which of us with cancer of the stomach would not be willing to take a 50 per cent chance in skilled hands?

Like Hippocrates and Shakespeare, Codman notes that serious illnesses sometimes require "desperate" cures, especially when the alternative is almost certain death. But he also observes that not everyone should undertake such risky procedures. Rather, it should be the most experienced and skilled clinicians, with special training and established reputations. He anticipated the value of matching high-risk patients to the most capable

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surgeons, a potentially positive consequence of risk aversion that will be discussed in the next section.

In the current era of transparency and public reporting of health care outcomes [2, 3], with few standards to ensure the adequacy and accuracy of performance measures [4, 5], the issue of risk aversion has never been more relevant or timely [6–16]. In Part 1 of this two-part review, we describe several potential consequences of risk aversion, some of which, paradoxically, might actually be beneficial to patients. We also review observational and survey studies regarding risk aversion in cardiac surgery and interventional cardiology. Part 2 of this review [17] explores the root cause of risk aversion—lack of provider trust in the risk-adjusted outcomes measures used for public reporting—and a variety of mitigation strategies are discussed.

Potential Consequences of Risk Aversion

Denial of Interventions to High-Risk Patients Who Might Benefit

Risk aversion usually refers to the denial of interventions to high-risk patients who might have benefited, specifically when that decision is motivated by fear that worse outcomes among such patients will affect a provider's reputation, referrals, privileges, or reimbursement. This adverse response to public reporting must be carefully monitored and mitigated for the value of transparency to outweigh its unintended consequences. For the overall population of patients with a particular disease to have optimal outcomes, it is necessary that some very high-risk patients receive interventions, and some will likely not survive [18, 19].

Stifling Innovation

Similar to denial of care to high-risk patients, a related concern is that risk aversion suppresses medical and surgical innovation [20, 21]. Promising new techniques and treatments with substantial potential benefit may initially have a somewhat elevated risk. In a public reporting environment, practitioners may be unwilling to accept this risk even if fully informed patients are willing to do so.

Avoidance of Futile Interventions

Although risk aversion is usually regarded as undesirable provider behavior, heightened risk awareness by providers may sometimes have salutary effects. For example, realistic appreciation of insurmountable risk in some cases, combined with thoughtful shared decision making, might spare some patients and their families the ordeal of a hopeless intervention. However, accurate risk estimation and incorporation of the patient's and family's goals of care may prove challenging even in very high-risk cases [22].

Better Matching of High-Risk Patients to the Most Capable Providers

Another potential benefit of risk aversion in a public reporting environment is improved matching of the highest-risk patients to the highest-performing providers (e.g., lower mortality rates or observed-to-expected [O/E] ratios) [23–29]. For example, recognizing their own limitations, surgeons who are less capable or experienced might decline a very high-risk patient; however, the patient may subsequently be referred to a better-qualified surgeon, thus resulting in a better match of patient and provider. Over time, referral patterns adapt, and high-risk patients are preferentially referred to higher-performing providers.

Glance and colleagues [28] studied coronary artery bypass grafting (CABG) procedures between 1997 and 1999 in the New York Cardiac Surgery Reporting System. Patients at higher risk were more likely to be operated on by surgeons with better outcomes. For each 10% absolute increase in the estimated risk of patient death, there was an absolute decrease of 0.034 in surgeon O/E ratios ($p < 0.001$). Much of this effect seemed to be driven by the hospital where the surgeon practiced, but even within hospitals, the higher-risk patients were more often cared for by higher-quality surgeons.

Risk Aversion in Cardiovascular Practice

Virtually all modern studies of risk aversion and public reporting come from the disciplines of cardiac surgery and interventional cardiology. These fields have the requisite combination of high-acuity patients, risky but potentially life-saving treatments, readily measurable outcomes with standardized definitions, and relatively large volumes. Lessons learned in the domain of cardiovascular care should be readily transferrable to other areas of health care as public reporting becomes more pervasive.

Cardiac Surgery Public Reporting

Federal Transparency Initiatives and the Origins of The Society of Thoracic Surgeons Database

The modern era of public reporting began with the short-lived but seminal publication of hospital mortality rates by the Healthcare Financing Administration (the predecessor of the Centers for Medicare and Medicaid Services) from 1986 to 1993, including mortality rates for CABG. Hospitals complained that the reputations of their cardiac surgery programs were being unfairly impugned because Healthcare Financing Administration analyses had inadequate risk adjustment [30–32]. This led The Society of Thoracic Surgeons (STS) to advocate for the use of robustly risk-adjusted outcomes based on clinical registry data. This was the proximate stimulus for the development of the STS National Database and numerous risk models and performance measures based on these data. In 2010 the STS initiated a voluntary public reporting program that, as of mid 2017, has the enrollment of approximately 60% of participants in the STS Adult Cardiac Surgery Database and 67% of participants in the STS Congenital Heart Surgery Database [2, 3, 33].

Statewide Report Cards

During roughly the same time frame, cardiac surgery public reporting efforts were also initiated in several states