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Review Article

The Financial Incentives Leading to the Overutilization of Cardiac Testing and Invasive Procedures

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The overutilization of cardiac testing and unnecessary referrals to invasive coronary angiography are significant clinical and health policy concerns. Inappropriate imaging cardiac stress tests are estimated to cost the U.S. healthcare system $500 million annually and expose many patients to unnecessary radiation. The unjustifiable use of diagnostic tests to screen for cardiac disease in asymptomatic and low-risk chest pain patients may lead to further testing and invasive procedures that are costly and potentially harmful, and have no clear outcome benefits. The principal trend in the treatment strategy for stable ischemic heart disease (SIHD) over the past two decades has been the utilization of percutaneous coronary intervention (PCI) and diminishing utilization of medical treatment and coronary artery bypass surgery (CABG). Despite these long-term changes in strategy, overall mortality has not improved significantly while costs have risen exponentially. One deleterious consequence has been an increasingly greater dependence on testing and interventional volume to maintain the revenue stream of cardiology practices.

Historical Background

The origins of this dependence are related to the original PCI learning curve. PCI quantity became a surrogate for quality: at an early stage, the standard was that "the more you do, the better you are". This misconception persisted long after it was demonstrated to not be an accurate measure of quality despite the proposal of better metrics. There were several reasons for this tenacity. First, with the high reimbursement for PCI, cardiology sections and departments of medicine had found a "cash cow" in an era of "cost containment" that financed program expansion and higher compensation. Interventional leaders at first rigorously maintained high evidentiary standards of case selection. But then, as fellows were trained and entered outside practice with their newly minted skills, the potential income to physicians and hospitals became apparent. Teaching hospitals suddenly were in competition with previously small community hospitals, including those that previously were established referral sources. More and more interventionists entered practice, and competition expanded further; maintaining high volume meant moderating standards of case selection.

Another factor was an inherent uncertainty and unpredictability with balloon angioplasty. It was accepted that there was a risk of dissection and acute closure requiring urgent CABG, and thus only those who were surgical candidates could be PCI candidates. Some pioneers pushed that envelope with great success in otherwise hopeless cases. With the introduction of stents, the incidence of acute closure requiring CABG became zero. And with this fantastic tool, there was suddenly no contraindication to any patient with a severe lesion, including those with no symptoms at all.

Impact of Financial Incentives

Thereafter, the volume of procedures increased exponentially, and with it, revenue to hospitals, doctors, and programs at a time of diminishing reimbursements for cognitive skills. Hospital administrators, with the bottom line fully in focus, insisted on even more volume. As hospital systems increasingly acquired practices, these non-physicians became physician-leaders, and their bottom line was income generation. Any physician who wanted to see the science that showed evidence that all of these patients were getting benefits were suddenly no longer considered to have high standards, but rather naïve. The cardiology department and cardiac catheterization laboratory directors were expected to increase cath lab volumes.

In parallel, an entire lesion detection infrastructure sprung up with various forms of high-volume, moderately well-reimbursed stress testing being performed on any patient with even the most atypical symptoms. In a patient with a low pretest probability of coronary artery disease, a positive stress test is more likely to be a false positive than a true positive. Cardiologists developed an entire system to detect CAD that was revenue generating, even though the evidence suggesting it saved lives or improved quality of life was lacking. Finding disease to prevent sudden death is an attractive concept and was used to justify the liberalization of testing.

The fact that this testing strategy has led to millions of procedures with no scientific evidence to support it is unwelcome news to many. Science has taken a back seat to dogma in the promotion of procedures designed for a paradigm (obstructive lesion → ischemia → MI → mortality) that is known to be highly simplistic and incorrect. Any suggested harms became controversial and subjects of debate, in particular, whether a "small myocardial infarction" related to microthrombi and embolization during the procedure has long-term prognostic implications.

With academic leaders in interventional cardiology promoting PCI for MI prevention, it should have been no surprise that certain physicians with large practices of SIHD patients were doing

unnecessary procedures on non-significant lesions, and sometimes, with no visible stenosis at all. A significant culprit of this time told the media that his 7-figure income was not an influence for placing 30 stents in a day. A few physician reputations were destroyed, but no hospitals went out of business—others, to keep that volume coming in, acquired them. The blame was placed on the "bad apple", not the tree.

Guidelines

Rather than undertake a serious introspective evaluation at what was transpiring, an indirect evaluation was proposed. The cardiology societies collaborated to develop appropriateness criteria to classify which indications for revascularization were acceptable and which were not. The idea was to self-police and control the destiny of medical practice rather than allow outside agendas, clearly not attuned to the patient, control the procedure. Hospitals became interested in developing and paying for quality assurance programs as a defense against obvious malfeasance. These criteria were most notable for posing a temporary obstacle for clever interventionists to work around rather to assure that the right procedure is done for the right patient.

The flaws in these criteria were clear to many from the outset. Improved survival is not the only benefit a treatment strategy can offer, just the easiest to measure. Most patients prefer improved quality of life to longer survival alone, especially in regard to symptom status, but these are less objective in their assessment. If subjective improvement in symptoms is considered a benefit, then there was no way to generalize classifications, and they could also be subjectively influenced, so they weren't included. Nearly all interventionists were displeased with a cookbook approach to case selection without reference to the individual patient. And with every new tweak of devices and technique, there was a disregard for prior studies that failed to show a benefit, even when new studies continued to show almost identical results. It is no coincidence that the most important PCI trials of the last 15 years (COURAGE, BARI2D, and ISCHEMIA) were not led by interventional cardiologists.

Contemporary Practice

Today, cardiologists can no longer compensate for declining reimbursement for their services by increasing the number of services they provide. The volume of coronary interventions performed in most institutions and by most interventional cardiologists is declining, just as the number of heart surgeries has been declining for years. Insurance companies require pre-approval for coronary CT angiograms, nuclear imaging, and other procedures. The pressure for interventional cardiologists to do as many cases as possible is motivated by demand from hospital and practice administration to increase revenue, which seems to conflict with the scientific evidence provided by randomized trials and summarized in practice guidelines.

Intervention has devolved to that of a commodity, a service provided on order as if there was no downside risk, with great benefits, and as if no alternative exists. Medical therapy remains the implied least attractive treatment modality, resorted to only when PCI or CABG are not favorably viewed from a technical standpoint. Standard management remains that invasive procedures always yield information that benefits the patient's outcome. Discordant clinical trials are characterized as flawed in design.

As cardiologists, we see the patients referred to us to consider if a procedure is indicated, then we do the procedures, for which we are compensated; but receive only the fee for office visit if we do not advise the procedure be performed. That is self-referral, and the inherent conflict of interest this business model incorporates has had a substantial influence on modern practice. The pressure to do more cases is constantly applied from the administrative hierarchy: to prove quality, to generate income, to develop new referrals.

The response of third-party payors to the exponential rise in procedures was to suggest non-payment when the physician's guidelines were abrogated. The physician's response was to liberalize the criteria, eliminate the term "inappropriate" so that no case could be said to be not scientifically based, and denounce lack of payment for services in a fee-for-service environment. Consequently, the insurance companies now pay decreasing amounts for the procedure, currently at laughably low levels, because they realized that doctors and hospitals have no incentive to become partners in trying to control costs.

The decreased payment per case, of course, adds further pressure to do even more cases and procedures, of even less proven benefit to the patient, to generate more revenue. Hypothermia, ventricular assist devices, multivessel stenting in MI and shock, and specific treatment devices, have been advocated in these guidelines despite no studies showing benefits and even some showing a lack of benefit and even harm. Cycles of increasing indications for procedures following diminishing reimbursement have resulted.

Can This Be Fixed?

As Deming said, "Every system is perfectly designed to get the result that it does"; so to change the outcome, it would be necessary to change the system and its component parts which derive profit from these circumstances. One place to start is how trainees are taught. It's not just what is said to fellows and housestaff, but how their teachers actually act. If they see their attendings say one thing and do another, with a wink and a nod, they get it. The practice of today has to reflect the values medicine should optimally follow in the future.

Incorporating the results of the ISCHEMIA Trial into practice guidelines is a significant challenge. The finding that SIHD with moderate-to-severe ischemia treated by revascularization had no benefit beyond OMT in preventing major cardiovascular events after 4 years challenges all of our preconceived notions. The premise that severely symptomatic SIHD should be treated invasively to improve mortality is incorrect: since worsening severity of ischemia is associated with increased mortality, logically it would seem to follow that procedures that reduce ischemia should improve survival, but this was not the case. Moreover, the traditional teaching that revascularization does not prevent MI in SIHD may be incorrect: the rate of spontaneous MI during 4-year follow-up was lower in the revascularization subgroup (HR 0.67 (0.53, 0.83), $p<0.01$), suggesting that perhaps PCI may reduce type I MIs.

For most patients with SIHD but without left main coronary disease or severely reduced left ventricular function, shared decision-

making about revascularization should be based on discussions of symptom relief and quality of life and not about reduction in mortality.

As better evidence is developed, more definitive appropriateness criteria should be implemented to ensure we deliver effective, valuable care — and contain costs.

This change would have immediate repercussions, as the entire medical payment system would have to re-equilibrate after decades of deception on all sides. It will mean less revenue in an environment in which over-utilized procedures are underpaid. Professional societies must take on the hard battles, showing responsibility and leadership. Mechanisms to self-regulate are needed. Those who repeatedly take advantage of the lack of objectivity in testing, without regard to costs to the patient, have to be discouraged, not rewarded, by their practice pattern.

Hospitals and physicians must agree to allow oversight of quality by outside, objective agencies and methods, and welcome it. The alternative is to continue down the current path, where costs are rising, reimbursement diminishing, income is threatened, and procedures are done with modest reference to clinical trials that determine what really helps the patient. The delivery of optimal clinical benefit requires an ongoing self-assessment structure comparing actual results to accepted benchmarks, with timely modification of practices when deficiencies are identified. The critical quality elements include adhering to evidence-driven case selection, ensuring proficient technical performance, and monitoring clinical outcomes [1-4].

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