

Quality Anesthesia

Medicine Measures, Patients Decide

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ABSTRACT

Quality has been defined by six domains: effective, equitable, timely, efficient, safe, and patient centered. Quality of anesthesia care can be improved through measurement, either through local measures in quality improvement or through national measures in value-based purchasing programs. Death directly related to anesthesia care has been reduced, but must be measured beyond simple mortality. To improve perioperative care for our patients, we must take shared accountability for all surgical outcomes including complications, which has traditionally been viewed as being surgically related. Anesthesiologists can also impact public health by being engaged in improving cognitive recovery after surgery and addressing the opiate crisis. Going forward, we must focus on what patients want and deserve: improved patient-oriented outcomes and satisfaction with our care. By listening to our patients and being engaged in the entire perioperative process, we can make the greatest impact on perioperative care. (*ANESTHESIOLOGY* 2018; 129:1063-9)

QUALITY care is the goal of all clinicians and of health care. Quality was defined in the 2001 Institute of Medicine report titled “Crossing the Quality Chasm” as “the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge.”¹ In that report, the authors identified six domains of quality: effective, equitable, timely, efficient, safe, and patient centered (table 1). Anesthesiologists have been lauded for their accomplishments in the domain of patient safety, as well as being focused on the first four domains of quality. However, to ensure quality, we must increase our focus on patient-centeredness. The focus of this Rovenstine lecture was to describe the history and importance of quality measurement and the need to move to more measures of patient-oriented outcomes and patient satisfaction (table 2).

Measurement Is Critical to Improvement

Within the framework of measurement, Albert Einstein has been attributed with saying, “Not everything that counts can be counted, and not everything that can be counted counts,” suggesting that we need to be careful to measure something of utility. However, W. Edwards Deming, the father of performance improvement, has been attributed with saying, “You can’t improve what you don’t measure.” Therefore, to provide the best care, it is critical to choose outcomes carefully and use measurement to improve care.

The concept of measuring hospital performance was first established more than 150 yr ago. One of the first recorded

hospital report cards was created by Florence Nightingale.² Rates of mortality varied between the hospitals in London and those in the countryside (fig. 1). Although the concept of reporting is important, it brings up the question of whether the differences in mortality observed by Florence Nightingale are a function of differences in quality of care or differences in the baseline risk of the patient population served. Today, most hospital report cards include risk-adjustment techniques to appropriately compare quality, a technique not available 150 yr ago.³ A more detailed discussion of quality measurement, including the inclusion of risk adjustment, can be found elsewhere.⁴

The next major figure in quality measurement is Ernest Codman, a surgeon who lived from 1869 to 1940. He said, “Hospitals, if they wish to be sure of improvement, must find out what their results are, must analyze their results, and must compare their results with those of other hospitals.”⁵ Unfortunately, his ideas were not well accepted by his colleagues at the time, which led him to resign from the Massachusetts General Hospital, but his ideas were later accepted and eventually led to the founding of The Joint Commission. The epitaph on his gravestone, erected by the American College of Surgeons, reads, “It may take a hundred years for my ideas to be accepted.” He was correct in his assumption.

Measurement has been a key component of modern anesthesia practice, with the initial focus being on anesthetic mortality. Shortly after the first reported use of an anesthetic, the first reported death from the administration of an anesthetic

This work was presented as the 2017 Rovenstine Lecture at the American Society of Anesthesiologists Annual Meeting in Boston, Massachusetts, October 23, 2017.

Submitted for publication February 5, 2018. Accepted for publication July 2, 2018. From the Department of Anesthesiology and Critical Care, Perelman School of Medicine, University of Pennsylvania, and Leonard Davis Institute of Health Economics, Philadelphia, Pennsylvania. Copyright © 2018, the American Society of Anesthesiologists, Inc. Wolters Kluwer Health, Inc. All Rights Reserved. *Anesthesiology* 2018; 129:1063-9

Table 1. Institute of Medicine: Six Domains of Quality

Domain	Description
Safe	Avoiding harm to patients from the care that is intended to help them
Effective	Providing services based on scientific knowledge to all who could benefit and refraining from providing services to those not likely to benefit (avoiding underuse and misuse, respectively)
Patient centered	Providing care that is respectful of and responsive to individual patient preferences, needs, and values and ensuring that patient values guide all clinical decisions
Timely	Reducing waits and sometimes harmful delays for both those who receive and those who give care
Efficient	Avoiding waste, including waste of equipment, supplies, ideas, and energy
Equitable	Providing care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographic location, and socioeconomic status

Adapted from Reference 1.

occurred. According to burial documents, Hannah Greener died from the effects of chloroform.⁶ However, it took almost a century before anesthetic mortality was measured in a large systematic study. Beecher and Todd⁷ measured death directly attributable to anesthesia in 10 centers between the years 1948 to 1952 (fig. 2). The rate of mortality was shown to decrease dramatically between their initial report and subsequent studies with a currently frequently quoted rate of 1 in 185,096 based on data from 1982 from the Confidential Enquiries into Perioperative Deaths.⁸ The field of anesthesiology's focus on developing systems of care and checklists clearly had a profound effect on mortality, particularly for healthy individuals. The accomplishments of the field of anesthesiology were lauded in the 1999 Institute of Medicine report titled, "To Err Is Human," which stated, "few professional societies or groups

have demonstrated a visible commitment to reducing errors in health care and improving patient safety. ... The exception most often cited is the work that has been done by anesthesiologists to improve safety and outcomes for patients."⁹

Anesthesiology has successfully reduced mortality directly attributable to anesthesia care from two deaths per 10,000 anesthetics administered in 1952 to one death per 200,000 to 300,000 anesthetics administered in 1982. The most recent rate of direct-anesthetic mortality is consistent with six-sigma quality. Although overall surgical mortality in healthy individuals has decreased, there continue to be high rates of anesthetic complications such as hospital-acquired infections, postoperative nausea and vomiting, and adverse drug events. However, Lagasse¹⁰ has questioned the overall safety of anesthesia when additional studies and definitions of perioperative mortality are used. Nonetheless, high-quality anesthetic care can reduce these rates of complications and should be every practitioner's goal. As Ludwig Wittgenstein said, "Resting on your laurels is as resting when you are walking in the snow. You doze off and die in your sleep." Anesthesiologists should be cautious in remaining complacent with current complication rates and strive to improve all surgical outcomes.

Anesthesia-related Complications

In reviewing the history of measurement of anesthesia-related outcomes, Macario *et al.*¹¹ published a study asking anesthesiologists' expert opinion of those outcomes attributed to anesthesia care which patients value. They plotted the importance of the outcome against the frequency. For example, death and recall with pain are very important but of low frequency. Pain at the intravenous site is not very important but of high frequency. All of the outcomes cited were almost entirely within the control of the anesthesiologist.

In the United States, the National Quality Forum endorses measures that can be incorporated into federal value-based purchasing programs. National Quality Forum-endorsed measures represent a group of outcomes on which the field

	Number of SPECIAL INMATES on the 8th April, 1861.	Average Number of INMATES in each HOSPITAL.	Number of DEATHS registered in the Year 1861.	MORTALITY per Cent. on INMATES.
IN 106 PRINCIPAL HOSPITALS OF ENGLAND	12709	120	7227	56.87
24 London Hospitals	4214	176	3828	90.84
12 Hospitals in Large Towns ...	1870	156	1555	83.16
25 County and Important Provincial Hospitals	2248	90	886	39.41
30 Other Hospitals	1136	38	457	40.23
13 Naval and Military Hospitals ...	3000	231	470	15.67
1 Royal Sea Bathing Infirmary (Margate)	133	133	17	12.78
1 Dane Hill Metropolitan Infirmary (Margate)	108	108	14	12.96

Fig. 1. Rate of mortality in 106 hospitals in England, based on location, created by Florence Nightingale in 1863. Reproduced with permission from Reference 2.

A Study of the Deaths Associated with Anesthesia and Surgery

Based on a study of 599,548 anesthetics in
10 institutions, 1948-1952, inclusive

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Fig. 2. Beecher and Todd: *A Study of the Deaths Associated with Anesthesia and Surgery*. A copy of the monograph in the Dripps Library. In the public domain.

of anesthesiology is willing to be measured. The anesthesiology measures were initially focused entirely on processes of care, such as the Surgical Care Improvement Project goals of antibiotics administered within 1 h before incision.¹² There initially was minimal willingness on the part of the American Society of Anesthesiologists House of Delegates to be measured on outcomes that can be shared with our surgical colleagues and the hospital, although shared outcome measures have been endorsed more recently. Most of these outcome measures represent postoperative complication rates as well as mortality. There are clearly some complications that can be attributed uniquely to the anesthesiologist, such as failed intubation, or attributed uniquely to the surgeon's skill, such as cutting through the bile duct, and each practitioner should be measured on those outcomes. With respect for more general morbidity, such as pneumonia or mortality, we should focus on what matters to patients and share the accountability for these outcomes with the surgeons.

The probability of developing a complication is determined in part by patient comorbidities. Clearly, the clinical skill of the anesthesiologist, nurse anesthetists, and anesthesia assistants in managing comorbidities is critical to outcome. Finally, anesthesiologists have been shown to positively impact the rate of failure to rescue or the likelihood of death after developing a complication. This likely reflects the anesthesiologist's role in the postanesthesia care unit, intensive care unit and ward.

Shared Accountability

Measuring individual anesthesiologist performance was first reported by Slogoff and Keats¹³ in their paper on the relationship between the presence of preoperative myocardial ischemia and perioperative myocardial infarction and death.

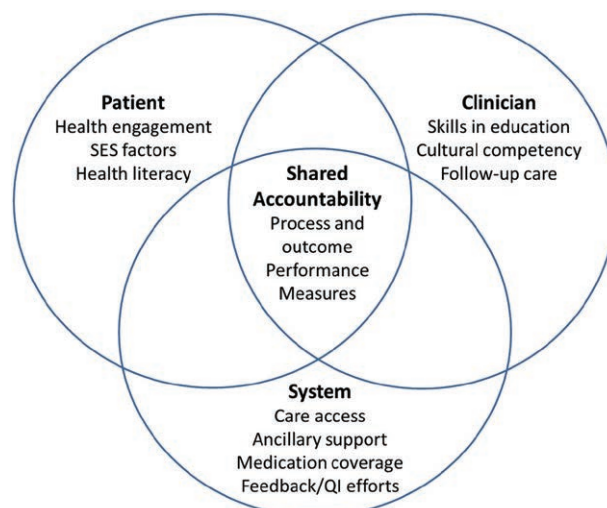


Fig. 3. Shared accountability is a function of patient, clinician, and system factors. QI, quality improvement; SES, socioeconomic status. Reproduced with permission from Peterson ED, Ho PM, Barton M, et al. ACC/AHA/AACVPR/AAFP/ANA concepts for clinician-patient shared accountability in performance measures: A report of the American College of Cardiology/American Heart Association Task Force on Performance Measures. *Journal of the American College of Cardiology* 2014; 64:2133–45. Reproduced with permission.

One anesthesiologist, number 7 in the paper, had significantly higher rates of tachycardia and associated myocardial ischemia and infarction. Measuring outcome on an individual basis is critical for quality improvement, and education should be the first strategy for those providers who are outliers. One example of using local outcome metrics for quality and performance improvement is the Multicenter Perioperative Outcomes Group and the ASPIRE (Anesthesiology Performance Improvement and Reporting Exchange) quality initiative. Using data from the electronic medical record, the ASPIRE team is able to provide individual practitioners with their own dashboard of quality metrics and compare them with the rest of their department or national norms. They are currently going beyond process measures and using *International Classification of Diseases* (10th edition) codes and laboratory data to develop quality reports on outcomes such as perioperative myocardial injury and acute kidney injury.

If anesthesiologists are to be viewed as perioperative physicians, then they must be engaged in improving all aspects of surgical and anesthetic outcomes. As discussed earlier, anesthesiologists should be measured on intraoperative outcomes directly attributed to their care as well as be jointly accountable for postoperative outcomes. Essentially, perioperative care is a team sport, and shared accountability of all perioperative outcomes is key (fig. 3). Improvements in surgical morbidity and mortality occur when measurement and feedback is provided. The Veterans Administration National Surgical Quality Improvement Program was commissioned because of concerns regarding increased mortality associated with surgical care at the Veterans Administration Hospitals.

With implementation of National Surgical Quality Improvement Program outcome-based assessment and report card back to the hospitals, there was a marked improvement in both mortality and complication rates during the implementation phase.¹⁴ During a period of increasing transparency of perioperative outcomes in nonfederal hospitals, Finks *et al.*¹⁵ used Medicare data to demonstrate reductions in surgical mortality over a 10-yr period in major abdominal and thoracic procedures. Despite the improvement in the public and private sectors, 30-day mortality remained high in this group of high-risk surgeries, which suggests room for improvement, as opposed to the ambulatory surgery population where rates of complications are much lower. Because complications are a function of the interaction of patient factors, system factors, and clinical skills, it will require attention to all three domains to achieve optimal patient outcomes. If all groups assume joint ownership, including patients, hospitals, and providers, then outcomes will be improved.

The Journey from Anesthesiology to Perioperative Medicine

Anesthesiologists, as perioperative physicians, can impact care preoperatively, intraoperatively, and postoperatively to change the trajectory of the outcome. There are several strategies that have been implemented by anesthesiologists and anesthesiology departments to lead to improved outcome by being engaged in perioperative medicine. There are multiple such examples. The preoperative cardiovascular evaluation based on perioperative guidelines has been used in clinics as screening tools to optimize medical management, and strategies continue to evolve with the production of new evidence.¹⁶ There is increasing evidence of the value of prehabilitation and exercise on outcomes after surgery, and prehabilitation clinics and protocols are being developed.¹⁷ Anemia clinics and the use of preoperative erythropoietin and intravenous iron supplementation are other strategies that anesthesiologists can use in their preoperative clinic to improve perioperative outcomes.¹⁸ Postoperative critical care has been an integral part of our departments since the development of the specialty.

Anesthesiologists can also impact patient care through efforts to address the opiate crisis. There is a great deal of attention on the risk of prolonged opiate use and the conversion to opiate substance disorder after surgery.¹⁹ This concern has sparked a movement toward developing opiate-free or sparing techniques and the increasing use of regional anesthesia. Patients themselves are increasingly interested in more active participation during surgery, and patients are opting to be more awake, especially during orthopedic procedures. Globally, anesthesiologists are demonstrating leadership in developing postdischarge pain management strategies. For example, members of the faculty at the University of Pennsylvania Department of Anesthesiology and Critical Care are redefining discharge prescription order sets within the electronic medical record for opiates. The new order sets have

THE LANCET]

ORIGINAL

ADVERSE CEREBRAL EFFECTS OF ANÆSTHESIA ON OLD PEOPLE *

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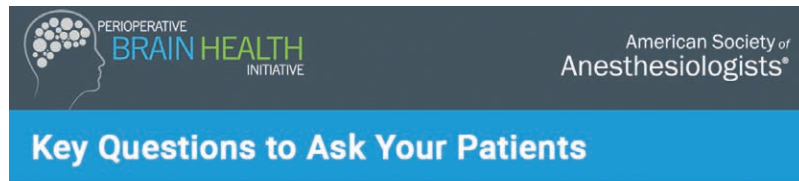
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Fig. 4. The 1955 article by P.D. Bedford described postoperative delayed neurocognitive recovery after surgery in *The Lancet*. Reproduced with permission.

demonstrated similar patient satisfaction with pain management while reducing the number of dispensed, and therefore unnecessary, opiates.

A major area of interest, particularly in the elderly, is the issue of postoperative delayed neurocognitive recovery. There are stories of patients developing cognitive changes, delirium, and even hallucinations after surgery, with memory deficits for up to three months, or in some cases longer. There is interest in the role of neuroinflammation and the impact of surgery and potential impact of anesthesia in patients with a vulnerable brain who already demonstrate some degree of mild cognitive impairment.^{20–22} The effects on cognition have been known for more than 60 yr and have been reported in the geriatric literature (fig. 4).^{23,24} As described earlier, anesthesiologists should stop resting on their laurels and embrace new patient safety opportunities, hence the development of the American Society of Anesthesiologists Perioperative Brain Health Initiative. The mission of this Initiative is to arm anesthesiologists and other clinicians, hospitals, patients, and their families with tools and resources necessary to optimize the cognitive recovery and perioperative experience for adults 65 yr and older undergoing surgery. The Perioperative Brain Health Initiative website (www.asahq.org/brainhealthinitiative) includes tools and resources that clinicians can use to implement change locally. It includes a series of questions to ask patients preoperatively, which will help identify those at risk as well as remind patients to bring cognitive aids (*e.g.*, hearing devices, glasses) to the hospital (fig. 5). The Perioperative Brain Health Initiative is requesting that patients and providers submit stories of delirium and cognitive problems postoperatively as well as hospital-based improvement strategies so that these stories can be shared with others and allow anesthesiologists to lead through this patient safety initiative.

In the context of defining the cause and treatment of perioperative complications, it is critical that anesthesiologists continue to perform research that will help our patients. Without such innovative research, we will become extinct as a profession.²⁵ For example, anesthesiologists are actively engaged in both basic and clinical science, trying to understand the underlying pathophysiology as well as develop strategies to reduce the incidence and potential harm of postoperative delirium and delayed neurocognitive recovery.



Below is a series of questions that providers need to ask their patients prior to surgery. M.E.D.I.A. refers to Memory, Episode, Drugs, Items and Aides.

A positive response to items 1-3 (M.E.D.) indicate risk for adverse cognitive outcomes and should trigger a preoperative cognitive evaluation, while items 4 and 5 are designed to reduce delirium.

1. Memory

Have you ever had a problem with your Memory or thinking ability after hospitalization or surgery before?

2. Episode

Have you ever had an Episode of confusion, or imagining things that were not real?

3. Drugs

Are you taking Drugs to help your thinking or memory such as Namenda (memantine) or Aricept (donepezil)?

4. Items

Are there personal Items, such as photos or a favorite music CD, that you can bring to remind you of home and family?

5. Aides

Do you have Aides, such as eyeglasses, hearing aides or dentures that you can bring to help you reorient after surgery?

Fig. 5. The American Society of Anesthesiologists Perioperative Brain Health Initiative includes numerous resources on the website. These include key questions that elderly patients should answer regarding memory issues and items and aids patients should bring to the hospital. Reproduced with permission.

Table 2. Key Messages

1. Measurement is good!
2. Anesthesiologists should be engaged in improving all surgical outcomes.
3. Anesthesiologists should take more ownership of the journey.
4. Patients' expectations have changed.

It will be important for the profession to advocate in the U.S. Congress to ensure continued funding and maintain interest in perioperative research through support for the National Institutes of Health budget.

Patient Expectations and Satisfaction with Care

Patients traditionally visit physicians and hospitals based on reputation and recommendations from colleagues and friends. Quality measurement and public reporting have been advocated by both consumers and insurers as a means of helping patients decide where to receive care. Multiple

studies have shown that only a small percentage of patients actually look at quality ratings on websites, although this is changing, particularly with the publication of patient satisfaction ratings and comments.²⁶

As these quality metrics are increasingly viewed by the public, the traditional medical metrics are being reevaluated. For example, readmission penalties are included in many value-based purchasing programs.²⁷ Although well-being and the incidence of being admitted after hospitalization is of concern to the patient, a more patient-centered outcome would be the number of days patients spend at home after surgery.²⁸ Using that metric, a short readmission is viewed very differently than a prolonged readmission. In addition, using other types of acute or postacute care besides the hospital are taken into account by such a measure.

It is clear that we are in an age of healthcare consumerism. Patients are looking for physicians to be more engaged in listening to their concerns. This can be accomplished through the development and assessment of measures that

matter, including those that are important and meaningful to the patients themselves. These measures can drive both the national aims as well as local quality improvement. By the National Quality Forum definition, a patient-reported outcome is any report on the status of a patient's health condition that comes directly from the patient, without interpretations of the patient's response by the clinician or anyone else.²⁹ Patient-reported outcomes are increasingly being used to evaluate and improve patient care and experience through assessing factors such as functional status. Patients also want to ensure that they understand their risk and have truly informed consent. This may include understanding the quality of their recovery and return to baseline function or improvement in their activities of daily living. The American Society of Anesthesiologists is engaged in furthering the development of measures as a member of The National Health Council Patient-Centered Value Model Rubric.

Patient satisfaction with care is another form of patient-reported outcome measure. Increasingly, patients are viewing patient comments on Yelp and are viewing Press–Ganey survey comments posted voluntarily on health system websites. The University of Utah has demonstrated the effect of publication of the Press–Ganey physician ratings and comments on their health system website and demonstrated that with public transparency the physician ratings markedly improved.

One clear example of using patient satisfaction in value-based care is the Geisinger Healthcare System (Danville, Pennsylvania) and its “Proven Experience” program. This program includes a “warranty” on the experience of care received within their system. If patients believe that an aspect of care did not meet expectations, they can open an app on their smart device and request a refund of a percentage of their copayments. Ashish Jha, M.D., M.P.H., a Harvard health policy expert, has suggested that a percentage of Medicare payments be linked to patient satisfaction with care measures.³⁰

Are We Ready to Be Measured by Our Patients on Satisfaction with Care?

Measurement of satisfaction with anesthesia care has been proposed in academic publications, but such measurements have focused on defined procedures such as monitored anesthesia care for cataract surgery. One domain of satisfaction with anesthesiologists, certified registered nurse anesthetists, and anesthesia assistants is our level of empathy. As a specialty, are we ready to be measured by our patients on the empathy that we project? Many providers would feel a strong sense of vulnerability in such a paradigm. Brene Brown, Ph.D., L.M.S.W., has written extensively on the importance of vulnerability as the birthplace of creativity, innovation, and change. Candace Morrissey, M.D., M.S.P.H., an anesthesiologist at the University of Utah, wrote a piece for the *NEJM Catalyst* in which she said: “Countless eyes glazing over helped me realize that to explain what we do medically was not precious time well spent. Patients assumed I'd be technically competent. What they wanted to know was

that we cared.”³¹ Although the competency and excellence of the anesthesiologist remains paramount, Morrissey's essay emphasized the importance of empathy to many patients.

As an anesthesiologist, I am constantly amazed at how poorly focused the rest of the operating room personnel are on the patient during that period when they are awake before induction. How can empathy be taught? The Cleveland Clinic has produced a video that is internally facing for their providers to remind them of the importance of empathy for their patients, providers, and staff. I urge all to view it at https://www.youtube.com/watch?v=cDDWvj_q-o8.

Summary

In summary, medicine has moved from metrics of medical outcomes to patient-reported outcome measures and assessing patient satisfaction. As anesthesiologists, it is critical for us to continue to provide exemplary and safe care while also listening carefully to what our patients are interested in and deserve. We will remain relevant only if we ensure that we do both.

Research Support

Support for this study was provided solely from institutional and/or departmental sources.

Competing Interests

The authors declare no competing interests.

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