

Value-based medicine and precision medicine in anaesthesia

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Evidence-based medicine has become the part and parcel of the practice of medicine nowadays.¹ It integrates patient preference with evidence and clinicians' experience, leading to the improvement in the length of life.¹ However, concern arises that it does not consider quality of life; hence, the concept of value-based medicine has become increasingly popular. Value-based medicine incorporates patient-perceived values that emphasise quality of life.² In addition, it also considers the cost of intervention, the goals of which is to improve the quality of health care and efficient use of resources.¹ The concept was first introduced by Brown *et al.*,³ who defined it as "the practice of medicine incorporating the highest level of evidence-based data with the patient-perceived value conferred by health care interventions for the resources expended."⁴

Value-based medicine has many benefits, including lower costs and better outcomes for patients, better care efficiencies and controls, higher patient satisfaction, and eventually, better overall health for society. Patients' perceived value includes improvement in quality of life and/or length of life.³ Length of life can be measured objectively by various means; however, quality of life is much more difficult to measure and define. The focus should shift from quantity of life as measured by lifespan to quality of life as measured by health span.⁵ Financial value includes the medical costs, and the overall costs involved for society, such as caregiver and employment costs. Value is defined as the ratio of quality or outcomes over cost.

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Precision medicine is a medical treatment tailored to the patient's individual characteristics, such as disease susceptibility and drug metabolism.⁶ Advanced genomic studies and deep machine learning allow deeper understanding of a patient's disease to develop more targeted therapy. Patients can be classified into subgroups that differ in their susceptibility to specific treatments or diseases, and the medical management will focus on treatment that is beneficial to the patient. Precision medicine's strength lies in its ability to guide health care professionals to make appropriate decisions in providing the most effective treatment to a particular patient. As a result, it will lead to improved quality of care while reducing the need for unnecessary diagnostic testing and therapies.

Anaesthesiologists have always been at the forefront of patient safety, and we utilise precision medicine in the daily management of our patients. All drugs administered to the patient are tailored to each patient's characteristics and attributes. Therefore, translating the modern-era definition of "precision medicine", which is interpreting a large amount of clinical data for critical and timely decisions in the delivery of anaesthetic and critical care, is a strength of the anaesthesiologist.⁷

What is the role of anaesthesiologists in delivering value-based medicine and precision medicine? Anaesthesiologists play an important role in improving the health outcomes of patients via approaches throughout the perioperative periods.⁵ Preoperatively, visits can be used to proactively improve outcomes via optimisation of patients' health status such as weight reduction and smoking cessation, which may reduce perioperative complications. Proactive medicine becomes more important than reactive medicine.⁵ Continued patient engagement perioperatively would likely lead to improvement in the patient's overall health status. Encompassing the patients' responsibility toward their health and continued engagement to stay healthy could be an important approach to improve health outcomes at population level. All preoperative patient data including blood and tissue can be fed into an artificial intelligence-driven algorithm, which can then be used as predictive analytics to stratify the patient's risk. The predictions could benefit clinical teams in anticipating and preventing any significant events perioperatively such as stroke, myocardial infarction, acute kidney injury, bleeding arrhythmias, cognitive decline, and sepsis.

As anaesthesiologists provide care for a wide spectrum of patients, targeted interventions could be implemented to each identified group of patients, *e.g.*, based on the American Society of Anaesthesiologists' physical status score.⁸ Identification of patients who will benefit from targeted interventions, for example, patients who need better presurgical preparation may improve outcomes. Stratification of patients to different risks (*i.e.*, low *versus* high risk) allows for the standardisation of processes for care that could improve hospital efficiency. In addition, per-

sonalised care could be delivered based on patients' comorbidities and surgical complexity. Anaesthesiologists can be leaders as perioperative physicians in driving value-based care and precision medicine with the triple aims of (1) improving patients' experience of care, (2) improving health population, and (3) reducing costs.⁸ This can be achieved through continued interaction with the patients as well as collaborative relationships with our surgical and medical colleagues and deep machine learning experts.

Algorithms of delivery of care such as enhanced recovery after surgery (ERAS) protocols have been used to improve perioperative outcomes and reduce costs.⁹ As such, a value-based model protocol has been suggested that can be used similarly. This has been developed in 2,122 patients undergoing bariatric surgery and is incorporated in the perioperative management, in addition to the ERAS model.¹⁰ Patients' perceived value includes excess weight loss, better control of comorbidities, quality of life improvement, and positive experience, while clinicians' perceived value is the optimisation of clinical parameters via engagement of patients to reduce hospital stay and readmission rate. Incorporation of patient-perceived value in the outcome of the surgery improves compliance with the therapy, which results in better outcomes for the patients and reduces cost. The model has been shown to be sustainable and can be replicable in the perioperative management of other conditions.

As medicine is a constantly evolving profession, changes are inevitable. Changes in the health care environment could be due to societal changes, which include changes in demographic changes (greater elderly demographics), social changes (higher expectations of medical care, greater emphasis on patients' safety, and work-life balance), and technological changes (advances in technology). Value-based medicine and precision medicine are the change that all health care providers should embrace for overall better health for society.

References

1. Bae JM. Value-based medicine: concepts and application. *Epidemiol Health*. 2015;37:e2015014. <https://doi.org/10.4178/epih/e2015014>
2. Brown GC, Brown MM, Sharma S. Value-based medicine: evidence-based medicine and beyond. *Ocul Immunol Inflamm*. 2003;11(3):157-170. <https://doi.org/10.1076/ocii.11.3.157.17355>
3. Brown MM, Brown GC. Update on value-based medicine. *Curr Opin Ophthalmol*. 2013;24(3):183-189. <https://doi.org/10.1097/ICU.0b013e32835ff189>
4. Brown MM, Brown GC, Sharma S, Landy J. Health care economic analyses and value-based medicine. *Surv Ophthalmol*. 2003;48(2):204-223. [https://doi.org/10.1016/s0039-6257\(02\)00457-5](https://doi.org/10.1016/s0039-6257(02)00457-5)

5. Mahajan A, Esper SA, Cole DJ, Fleisher LA. Anesthesiologists' Role in Value-based Perioperative Care and Healthcare Transformation. *Anesthesiology*. 2021;134(4):526-540. <https://doi.org/10.1097/aln.0000000000003717>
6. Iravani M, Lee LK, Cannesson M. Standardized Care Versus Precision Medicine in the Perioperative Setting: Can Point-of-Care Testing Help Bridge the Gap? *Anesth Analg*. 2017;124(4):1347-1353. <https://doi.org/10.1213/ane.0000000000001663>
7. Jalilian L, Cannesson M. Precision medicine in anesthesiology. *Int Anesthesiol Clin*. 2020;58(4):17-22. <https://doi.org/10.1097/aia.0000000000000297>
8. Boudreaux AM, Vetter TR. A Primer on Population Health Management and Its Perioperative Application. *Anesth Analg*. 2016;123(1):63-70. <https://doi.org/10.1213/ane.0000000000001357>
9. Ljungqvist O, Scott M, Fearon KC. Enhanced Recovery After Surgery: A Review. *JAMA Surg*. 2017;152(3):292-298. <https://doi.org/10.1001/jamasurg.2016.4952>
10. Goretti G, Marinari GM, Vanni E, Ferrari C. Value-Based Healthcare and Enhanced Recovery After Surgery Implementation in a High-Volume Bariatric Center in Italy. *Obes Surg*. 2020;30(7):2519-2527. <https://doi.org/10.1007/s11695-020-04464-w>