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Rethinking “Good Quality Anaesthesia”: Beyond Surrogate Endpoints to Meaningful Outcomes

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INTRODUCTION

Defining endpoints and outcomes is important for research planning, execution, and publication. Historically, anaesthesia-related research has focused mainly on surrogate endpoints such as pain scores, opioid consumption, haemodynamic stability, time to discharge, length of hospital stay, etc. (1,2) The use of such surrogate outcomes primarily depends on their ease of measurement, timeliness, statistical responsiveness, and feasibility within a short study window. Though these markers may seem feasible, simpler, and more practical, the critical question is “whether these markers truly represent quality in anaesthesia care, or merely approximate fragments of it.”

Why do surrogate markers not translate to true benefit as perceived by the patient?

The use of surrogate markers for various outcomes in research has its inherent limitations:

Weak linkage to patient perception: Surrogate markers, such as pain scores [visual analogue score (VAS)], record pain intensity. However, recording only pain intensity may not accurately reflect the impact of intervention-related pain management on other patient-perceived factors like functional recovery, emotional distress, or the possibility of

persistent post-surgical pain. Similarly, opioid consumption in research endpoints is interpreted as improved analgesia, but this may reflect protocol-driven restrictions rather than patient comfort. Lower opioid use does not always equate to better pain relief.

Context dependency: The impact of the research intervention may be measured by the length of hospital stay as an endpoint. However, this remains a surrogate marker for interventions such as good analgesia and the implementation of enhanced recovery after surgery (ERAS), and institutional policies, social factors, or non-clinical logistics may influence it. It also does not truly reflect the quality of patient care or patient satisfaction. Thus, it is a noisy endpoint with limited specificity for anaesthetic and perioperative care quality.

Failure to capture multidimensional care: Most surrogate markers or endpoints are unidimensional and may not truly reflect the composite effect of the intervention on the patient. Anaesthesia quality is the combined effect of many perioperative factors, including safety, efficacy, patient experience and long-term outcomes. No single surrogate captures this multidimensional construct.

Interaction among the individual outcome surrogates: at times, an individual surrogate may

indicate benefits, but at the cost of other adverse events or related to affecting some other patient-related outcome. For example, adding an adjuvant may improve sensory analgesia but raises concerns about long-term impact, cost, and other factors that may not have been accounted for in a particular study concluding a beneficial effect.

Are We Measuring What Matters?

The main problem with using a single surrogate measure is that it may not accurately capture what it is supposed to measure, or, in other words, what is required by the patient overall for his/her care in perioperative management. Quality care or overall patient satisfaction in the perioperative period is not just related to a single measure, but it is assessed through many observable indicators. Presently published research based on single outcome isolated measures has limitations, as it may lead to overinterpretation of marginal differences as per statistical analysis. Also, it may be difficult to translate into clinical practice.

Composite and Patient-Centred Outcomes

The need for present-day research is the use of composite endpoints and patient-centric outcomes, inclusive of considering long-term impact as well

Composite Endpoints: These utilise multiple relevant outcome parameters in a single assessment tool as a single measure, thus assessing various domains comprehensively. Many composite endpoints have been used in research and include postoperative quality of recovery scores such as QoR-15. The advantages of composite endpoints for research include reflecting multidimensional care, improving clinical relevance and its better clinical translational value, and capturing clinical parameters more effectively, such as analgesia versus side effects. Identification and application of composite endpoints should ensure that components are clinically meaningful, of similar importance, and not dominated by trivial outcomes.

Patient-Centred Outcomes: There is a paradigm shift towards outcomes that matter directly to patients, such as functional recovery (mobility,

independence); cognitive outcomes [postoperative delirium, postoperative cognitive dysfunction (POCD)], health-related quality of life (HRQoL), etc. Frameworks such as the Standardised Endpoints in Perioperative Medicine (StEP) have advocated not only its use but also standardising these outcomes for better comparability among research while pooling these studies for quantitative synthesis and meaningful conclusions. (3)

Long-Term Outcomes: Interventions in anaesthesia and perioperative care are intended to have immediate and short-term beneficial effects, and thus outcome tools are used to assess outcomes over a shorter time frame. However, many interventions may have long-term beneficial or harmful effects. These are not followed up on, making it difficult to infer their long-term impact, such as the occurrence of chronic pain, cancer recurrence, and neurocognitive concerns.

Quality Framework in Anaesthesia Research

Given the above, the solution is to use research outcome parameters that are more meaningful and patient-centric, leading to real overall benefit for the patient and helping to create policies for better patient care. This may be considered in different layers. Layer 1 may focus on immediate physiological or procedure-related outcomes. These outcome parameters may include intraoperative haemodynamic parameters, depth of anaesthesia, etc. Layer 2 may consider early postoperative outcomes, such as pain scores, recovery scores, etc. Layer 3 may include long-term and patient-centric outcomes, such as functional recovery, persistent post-surgical chronic pain, quality of life, and cognitive outcomes. Appropriate use of these layers shall ensure an outcome approximating “quality.” An appropriate statistical tool may also be considered to better infer the outcomes when surrogate markers are used’ (4, 5).

Methodological Implications for Future Research

Although the use of individual surrogate endpoints may continue, they should be considered supportive endpoints and need to be linked to other meaningful outcomes. It is the right time to consider hierarchical

or composite outcomes and longer follow-up periods (6). The core outcome sets and integrating patient-reported outcome measures (PROMs) need to be considered as outcomes in research (3,7,8). Finally, the aim of conducting research is to report the beneficial effect of an intervention by a specific individual metric, but to demonstrate whether it leads to overall patient satisfaction and improves long-term health.

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