Evidence-based anaesthesia

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Introduction

When considering evidence-based anaesthesia, the following questions need to be asked:

- *Does it work?:* Is there reliable evidence that this intervention provides patients with benefits that they think important?
- *Can I use it?:* Can I, and the system in which I work, deliver this intervention so that patients realise these benefits?
- *Should I use it?:* Does this particular patient, when informed of the potential harms and benefits, want me to use it? Does the society in which I work want me to use this intervention, as opposed to other competing interventions?

Does it work?

All interventions will cause harm. Hopefully, most will result in benefits, although the third most common cause of death in developed nations follows iatrogenic injury, after cardiovascular disease and cancer.

A single net measure of effect for an intervention cannot be calculated. The importance that people attribute to different outcomes, whether harmful or beneficial, varies. In addition, the effects of an intervention may differ with the context. In turn, these two levels of variation are dependent upon the efficacies of the intervention, i.e. how much harm and benefit that it causes in an experiment.

Randomised controlled trials (RCTs) are the experiments used to measure the efficacies of an intervention. The control group in an RCT allows changes in outcomes caused by the intervention to be determined, as opposed to changes caused from conducting an experiment.

The methodology reduces systematic error or biases in three of five domains:

- Selection.
- Performance.
- Detection.
- Attrition.
- Reporting.

Biases in the last two domains are inadequately limited by RCT methodology. Both are reduced by publishing trial protocols and open-source data.

Systematic errors generate incorrect (inaccurate) answers, which may be precise or imprecise. Random errors generate imprecision, regardless of whether or not the answer is accurate. Large studies in respect of a common outcome measure efficacies to high precision. Small studies may measure efficacy to a higher precision than that of a larger study when the outcome is more common. This is one reason why studies of postoperative nausea and vomiting use emetogenic anaesthetics in susceptible participants.

RCTs estimate different efficacies for the same intervention because of random error or "noise". Blaming methodological differences between RCTs as the cause of differences in outcome should be avoided, at least until the probability has been quantified that chance caused the differences.

Meta-analysis: exploring chance and quantifying uncertainty

Thus, it can be concluded that the estimation of an intervention's efficacies requires quantification of accuracy and precision, which is best achieved through meta-analyses of RCTs. In the process, the uncertainty in efficacy between RCTs that cannot be explained by statistical "noise" (for instance, because of inaccuracy introduced by methodological flaws in different RCTs), can be quantified.

It is this capacity to explore the relationship between RCT methodology, efficacy and chance that gives meta-analyses pre-eminence in the hierarchy of evidence, as much as the generation of a pooled estimate of effect. Another potential strength is analysis by authors who might have fewer preconceptions and biases than authors of RCTs. Even the most stringent RCT methodology can be circumvented by a combination of intelligence, perseverance and investment in a particular outcome which supersedes ethical probity.

Can I use it?

The efficacy of an intervention (determined in RCTs) is not necessarily replicated when it is applied as a component of standard care. It is isolated from the indirect effects of experimentation and is surrounded by different confounding factors and interacting factors, including those that are a consequence of time having passed since the RCT was performed and published.

It is not known whether or not the system in which one works would impede or facilitate the actions of an intervention. Patient outcomes improve when technical interventions are practised and familiar, for instance ultrasonographic techniques and airway skills. Therefore, the introduction of a new technique to avoid patient harm exceeding patient benefit has to be carefully planned.

An efficacious intervention has to be applied systematically for it to be effective. The power of the reliable delivery of care to patients in determining their outcomes has become increasingly appreciated. The systematic application of the World Health Organization perioperative checklists has transformed patient safety without a single new intervention being invented or applied. It is sobering to consider that evidence-based anaesthesia is most successful when "boring" interventions are applied well, rather than spending considerable time and money using new interventions.

Should I use it?

The ethical and economic delivery of health care depends on patients making choices, and not on clinicians doing so. It is unethical and illegal to treat a patient with an effective intervention if the patient does not want it, even if the patient dies, or is damaged as a consequence of his or her choice.

The Royal College of Anaesthetists in the UK has established a working party to develop the anaesthetist as a perioperative physician beyond the roles that are recognised as being necessary to safely deliver anaesthesia, postoperative critical care and pain palliation. The effective preoperative delivery of information about the choices that a patient with surgical pathology has, including the choice of declining any intervention, is one aspect of this role. Supportive counselling follows, without the duress of a schedule, or duress caused by the clinician having a vested interest in the patient making a particular decision.

It is both good medicine and good economics to ensure that patients make their own choices about their health care. Collaborative or shared decision-making by patients with surgical pathology reduces the number of scheduled surgeries by approximately 20%. This has been shown with coronary artery reperfusion, transurethral resection of the prostate and total hip replacements.

Summary

Patients benefit from the systematic and effective provision of efficacious interventions, but only when they make choices without duress, following informed counselling and collaborative decision-making.

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