Perioperative medicine: an emerging science

Gower Street, the home of both UCL and University College Hospital, was the site of the first anaesthetic in England, which was administered by William Squire (a student) in 1846. He used ether to anaesthetise a butler named Frederick Churchill, for a leg amputation. It took the surgeon, Robert Liston (first Professor of Clinical Surgery at University College Hospital) less than a minute to remove the leg and tie off the appropriate vessels. Interestingly, this was not Liston’s most famous case: that was another amputation, which was associated with a perioperative mortality of 300% - the patient, an assistant and a distinguished surgical observer all died as a result of the surgeon’s knife.

Since then, the challenges of delivering safe, effective surgical healthcare have changed, but not diminished. A death on the operating table is thankfully now rare, at least in resource-rich nations. Nevertheless, even in those countries, inpatient mortality after major non-cardiac surgery in adults remains at between 1.5 [1] and 3.6%, [2] and the incidence of complications is probably an order of magnitude higher. [3] The recent estimation that over 230 million surgical procedures occur worldwide each year brings into sharp focus the scale and staggering impact that these adverse postoperative outcomes have on patients, carers and the economy. [4] The challenge of improving surgical outcome is a truly global public health issue.

Even these statistics represent just the tip of the iceberg. Despite advances in critical care and other complex interventions preventing immediate postoperative deaths, short-term postoperative morbidity may still have a lasting effect on patient health and well-being. For example, there is a clear and reproducible association between postoperative complications and reduced long-term survival, which is independent of known preoperative risk factors. [5] [6] [7] Patients may also inadvertently be harmed as a result of the treatments they receive in the perioperative period. A good example of this is...
the increasing data suggesting that opioid-related drugs may influence tumour development and angiogenesis. Such findings raise the possibility that perioperative analgesic management may have profound effect on disease modulation and progression in the long-term. [8] Furthermore, it is not just about survival at all costs: there is a rational, reasonable and appropriate demand from surgical patients that they should be able to return to work and the quality of life they previously enjoyed. Thus, the fact that postoperative morbidity is also associated with a detrimental effect on patients' longer-term health-related quality of life should be of concern to all practitioners of perioperative healthcare. [9, 10]

At the heart of the practice of medicine is the maxim “Primum non nocere” – “first, do no harm.” In an age of rapidly advancing technological innovation, this principle is highly pertinent for the anaesthetist, surgeon and budding perioperative physician. There are now surgical options for curing conditions that would have been considered to be terminal just 20 years ago, such as lung and liver metastases. However, patients presenting for such procedures are increasingly of advanced age, with multiple co-morbid diseases, all of which may predispose them to the development of postoperative complications, with the long-term harm that these may bring. Thus, as technological advancements progressively mean that “we can”, perhaps now perioperative physicians should be more frequently questioning whether “we should”? At the centre of this decision-making must be the patient and an individualized approach to their care. [11]

The challenges of research in perioperative medicine span the entire translational pathway. [12] For example, the data demonstrating an association between postoperative complications and longer-term harm require physiological explanation. One possibility may be that postoperative morbidity leads to (or is caused by?) a low-level inflammatory response that persists beyond the resolution of the overt complication. There are data from animal studies of postoperative delirium and longer-term cognitive decline supporting this notion; [13] however, a more comprehensive understanding remains some way off.
Moving into the world of randomised trials, perioperative physicians should feel heartened by the fact that there are a number of interventions that have been shown to improve patient outcomes. Goal-directed haemodynamic optimization, the subject of scientific study for decades, remains a topic of interest and ongoing inquiry. [14] [15] Even when evidence of mortality benefit is lacking, improvements in complication rates may provide sufficient rationale for other interventions that are generally safe, [16] such as neuraxial blockade. [17] However, intervention is not always the right approach. For example, coronary revascularization prior to non-cardiac surgery is no longer indicated in any but the most severely afflicted patients with ischemic heart disease. [18] [19] Beta-blockade, [20] aspirin [21] and clonidine [22] have all been tested as interventions to improve outcome in non-cardiac surgery and been found wanting.

Observational cohort studies present opportunities for hypothesis-generation that in turn may lead to candidate interventions to be tested in randomised trials. The evidence supporting different anaesthetic techniques in hip fracture for example is conflicting, and therefore requires further investigation. [23, 24] [25] Recent data reveal an independent association between minor rises in serum biomarkers (which previously would have been considered inconsequential) and postoperative mortality: [26] studies of interventions aimed at modulating these biochemical responses, and thereby hopefully modulating the adverse outcomes with which they are associated, are urgently required. [27]

There remain countless unanswered questions related to perioperative medicine. For example, it has been said that postoperative critical care for high-risk patients is such an obvious intervention that there is no need for randomised trials. However, observational data reveal that despite national recommendations, the majority of patients who die in hospital after surgery do so without ever having received the potential benefit that critical care might offer. Is this really because of poor care on the part of the perioperative team, or is it that in the current economic climate in the U.K. at least, the provision of
critical care for all high-risk surgical patients is an impossible dream? [28]
Should there not be a “middle ground” where high-risk patients can receive
closer monitoring and nursing support, rather than being simply left to sink or
swim alongside every other patient in the hospital? Such questions require
more formal academic evaluation. A clear gap in the literature remains the
lack of impact studies testing management strategies for patients identified as
high risk by one of the myriad of tests available for assessing perioperative
risk. [29] [3, 30]

“Evidence-based medicine” was the novel concept in medicine 25 years ago;
now “improvement science” and “personalized medicine” are the new
paradigms. [31] This indeed represents a natural evolution: as the quality of
academic investigation improves, and the evidence to support our practice
becomes more refined, we now embrace the new challenge of encouraging
widespread adoption of best-known practice and of tailoring interventions to
individual patients. Quality improvement itself, through the methods described
by Deming and others, has been demonstrated to be effective when
implemented. However, understanding why people do and don’t do “what they
are supposed to”, developing theories regarding context and its impact on
professional behavior, and forming robust systems for multidisciplinary
engagement in quality improvement are all areas of emerging interest.
Increasingly we must turn to the social sciences to help us turn our ambitions
to improve perioperative patient care into a reality.

Thus, the time is right for a Masters course in perioperative medicine.
According to Wikipedia, a Masters degree is awarded to individuals
“demonstrating a mastery or high-order overview of a specific field of study or
area of professional practice.” [32] The ambition of this degree course, and
therefore hopefully of all who undertake it, is that the student will develop a
rich understanding of the current evidence base relating to the science and
conduct of perioperative medicine, and from there develop their own interests
in how to develop the knowledge base further. The course will cover areas
ranging from the cellular mechanisms of perioperative injury, to the ethics of
consent and the emerging science of improvement. The perioperative
physician must be prepared to take a holistic approach to the care of patients contemplating surgery. [33] The faculty of this MSc. is truly first class, features internationally renowned experts from across the world, and their teaching material will guide you in developing a sound scientific grounding in the best, evidence based management spanning the pre-, intra- and post-operative periods. We hope that it will inspire those who take it to assume a leading role in improving the quality of care for this important and growing patient cohort.

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