

Surgical epidemiology: a call for action

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Background

Surgical approaches are receiving increasing attention as a way to solve many global public health problems. The publication of the Disease Control Priorities monograph initiated discussions of the cost-effectiveness of surgical interventions in developing countries,¹ and many more recent publications have built upon its concepts.² Surgery can play a vital role in helping countries meet their Millennium Development Goals 4, 5 and 6.³ To build a stronger case for surgery as part of the armamentarium of cost-effective interventions in developing countries, epidemiologists need to work alongside their surgical colleagues to develop the nascent field of surgical epidemiology.

What is surgical epidemiology? Unfortunately, there is not yet an agreed definition for this field. This may reflect the emerging nature of the field, or the lack of clarity and consensus about its goals and objectives. A useful starting point is the definition of epidemiology as “the study of the distribution and determinants of health related states or events in specified populations and the application of this study to control of health problems”.⁴ An analysis of this definition in terms of its applicability to surgery suggests that clarity is needed in three components: (i) the distribution and determinants of health-related states or events, (ii) the populations involved, and (iii) its application to efforts to treat health problems.

We focus on developing countries because we feel that discussions about the role and cost-effectiveness of surgery in the therapeutic armamentarium are most active in this setting. In addition, definitional issues and challenges are greater in developing countries, where we wish to encourage the debate on surgical epidemiology.

Definitions

What are the “health-related states or events” that we wish to study? Are they “states” such as obstructed labour? Or are they “events” such as a surgical intervention? From a surgical perspective an event often occurs after a state, so one could argue that we need to study both. In addition, events can also include sequelae and complications of surgery, such as nosocomial infections.⁵

It is evident that a “state” refers to a surgical condition. But what exactly is a surgical condition? The Disease Control Priorities monograph defined this as “any condition that requires suture, incision, excision, manipulation, or other invasive procedure that usually, but not always, requires local, regional, or general anaesthesia”.¹ This definition avoids the challenge of defining *who* is performing the sutures, incisions, etc. and may thus include surgical procedures done by nurses, paramedical staff and general practitioners in addition to surgeons.

Another definition of surgical condition is “any condition for which the most potentially effective treatment is an intervention that requires suture, incision, excision, manipulation, or other invasive procedure that usually, but not always, requires anaesthesia”.⁶ This definition raises more questions than answers. What exactly does “potentially effective” mean? Does this criterion vary depending on clinical or geographic contexts? Yet another definition from a recent publication is that a surgical condition is “a disease state requiring the expertise of a surgically trained provider”.⁷ Here, we are left wondering about the precise nature of the expertise and surgical training required. In addition, we need to consider conditions for which only a minority of patients need surgery. For example, only one out of six persons with a severe head injury needs

a neurosurgical operation. However, the ability to rapidly diagnose patients who need surgery along with the availability of a qualified provider and facilities to safely perform the procedure are critical to lowering overall mortality from severe head injuries. Similar considerations apply to the availability of Caesarean delivery to treat obstetrical complications.

What about our understanding of the “distribution and determinants ... in specified populations”? Unfortunately, most of the literature from developing countries is based on data from a few hospitals in a relatively small geographic area,^{8,9} or even from a single hospital.¹⁰ Are the hospitals and facilities selected representative of all those where the population receives care for a particular condition? Has the entire spectrum of facilities been considered – for example, both private and public facilities in the geographic area? Different usage patterns could lead to selection bias when hospital-level data are used to ascertain the rates of a given condition in the community. For example, patients who seek care at public hospitals may be sicker or have a lower socioeconomic status compared to those who seek care at private facilities, while the destitute (who face the largest barriers, e.g. extreme poverty, travel time and distance) may not have access to care at all. In developing countries it may be impossible to ascertain the direction of this bias, making accurate estimates of the condition impossible to obtain from hospital data. Unless standardized definitions and nomenclature are used, misclassification bias may be another problem, especially when data are pooled from different facilities across a region. For example, is a myringoplasty at one hospital equivalent to a tympanoplasty at another? This bias may be magnified in cross-national comparisons.

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Another challenge related with hospital data is measuring the catchment area, which is often used as the denominator for calculating event rates. In many developing countries this information often comes from census data, which may be out of date or may not be accurate if the hospital serves patients from outside its natural geographic or administrative boundaries. In addition, a significant proportion of persons with a health problem in many developing countries do not receive formal medical care. Household-based and other community-based research is a necessary component of assessments of disease burden.

Lastly, where do we stand with respect to "... the application of this study to control of health problems"? Should the target of our interventions be "incident conditions" (i.e. those that are fatal without surgical intervention) rather than "incident and prevalent conditions" (i.e. disabling but not fatal)?⁶ Should we include the burden of illness in the calculation? Should we factor in the cost-effectiveness of the surgical procedure?¹¹

Why is it important?

Although attempting to define surgical epidemiology may seem pedantic, we are still far from a consensus definition, the importance of which cannot be underestimated. To improve the evidence base for surgery as a cost-effective intervention in developing countries, epidemiologists and surgeons must work

together to agree upon a vocabulary and set of definitions. As the saying goes, the eye cannot see what the mind does not know. The validity and reliability of our estimates depend on clear definitions of what we seek to measure. Otherwise we will end up with biased estimates – undercounts or overcounts of the event of interest – that can result in measures that are inaccurate and are thus detrimental to good health policy.

How much difference would a shared vocabulary or common definition make? Consider the case of severe head injury, in which approximately one person in six needs neurosurgical treatment. The burden of surgical disease would differ by a few orders of magnitude if we defined a surgical condition as "a disease state requiring the expertise of a surgically trained provider"⁷ rather than "any condition ... [or] treatment that requires ... [an] invasive procedure that usually, but not always, requires anaesthesia".⁶

Although the task of achieving commonly-agreed terms for surgical epidemiology seems challenging, there are precedents for success in at least two specific surgical fields – obstetrical care and trauma care. Efforts to promote emergency obstetrical care globally, despite differences of opinion among stakeholders, have produced agreement on concepts such as the need for improved access to skilled birth attendants and safe Caesarean delivery. Efforts to promote these types of care have been aided by a better definition of who is a

skilled attendant and what constitutes rapid access (among other terms), along with improved metrics.¹² Similarly, the field of trauma care in countries at all economic levels has been advanced by better systems to define and characterize the severity of injury. Accepting a common language and an agreed set of definitions of injury severity has allowed more rigorous risk-adjustment for outcomes, and thus more rigorous comparisons of outcomes between different treatment groups.¹³ Another model from the field of nosocomial infection is the work of the International Nosocomial Infection Control Consortium. Their efforts have advanced the epidemiology of device-associated infections by developing standardized definitions and methodologies for surveillance.⁵

Similar achievements in the broader field of surgical epidemiology are feasible through analogous processes of consensus-building among stakeholders. Although these processes were initiated by activities such as the meetings of the Bellagio Essential Surgery Group,³ the Disease Control Priorities Project report¹ and some recent publications,¹¹ much more needs to be done to establish the field of surgical epidemiology on a sound basis. ■

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