

The causal perspective in health services research

Professor Boris Sobolev is working at the forefront of health services and outcomes research. Here, he describes the importance of the field and his current focus on causal inferences



Could you begin by summarising the importance of your research?

Health services and outcomes research has experienced explosive growth in

the past three decades. The field was formed at the interface of a number of disciplines including medicine, statistics, economics, management science and the social and behavioural sciences. The rich, multidisciplinary research developed from this fusion is producing a growing body of clinical evidence and methodology. Its methods continue to benefit from developments in diverse disciplines, while formulating and addressing unique scientific questions.

What are the implications of knowledge on the causal connection between the processes and outcomes of care?

The fundamental discovery was variation in healthcare delivery that cannot be explained by illness level, known benefit or patient preference. The study of medical practice variation gave birth to important themes of inquiry: effectiveness, quality, efficiency, access and disparities. Although a prevailing hypothesis relates this variation to differences in treatment results, the causal connection between the processes and outcomes of care has rarely been shown. As a result, current knowledge offers only limited insights into how changes in delivery of care may affect its outcomes.

Were further findings uncovered from an improved understanding of this causal connection?

Another important discovery was that the results of clinical trials cannot always be generalised to clinical practice, as patient groups enrolled in trials can be narrow. Researchers have been able to identify patients who will definitely benefit from one treatment method, and those who will benefit from another, but there is a third group – the patients for whom optimal treatment is not well defined. Learning what works in real life gave rise to comparative effectiveness research.

Can you explain how you are advancing health services research when experimentation is not feasible?

The causal connection between organisation and outcomes in medical care can be established by comparing patient groups assigned randomly to one of several care alternatives. This balances the groups in terms of known and unknown factors that might affect the outcome. In other words, the researcher forces the study groups to be as similar as possible in all respects except care delivery. As a result, the differences in outcomes observed between the groups can more confidently be ascribed to the intervention rather than to other factors.

In our research, we advance existing knowledge by estimating the causal effects of healthcare interventions when

experimentation is not feasible. We use the framework of causal inference from observational data to examine causal effects in the connection between standards of care and patient outcomes.

As a practical application, we are estimating the health effects of delays in providing coronary artery bypass grafting (CABG), which are common in Canada when demand exceeds capacity. Concerned with the adverse effects of delays, federal and provincial governments have called for standards on access to this type of surgery. In response, experts developed guidelines for the timing of surgery, yet there is little empirical evidence to support these recommendations. Indeed, the current literature offers no estimates of the causal effect of providing needed surgery to all patients within the recommended time.

What other areas do you study?

Using data from routine medical care, we make causal inferences about: the reduction in post-operative mortality expected from providing timely cardiac surgical care; the health effects of receiving hip fracture surgery within the government benchmark; the proportion of hospital readmissions that could be avoided had patients had medication review in emergency department rather than in hospital ward or; the expected reduction of mortality had all coronary obstructive pulmonary disease patients had their second exacerbation prevented.

Comparing treatment outcomes

Around 100,000 coronary revascularisations are performed every year in Canada. Researchers at the **University of British Columbia** are conducting innovative health services research to compare outcomes between methods

HEALTH SERVICES RESEARCH plays an important role in guiding more effective healthcare, producing knowledge to inform policy makers about the best way to deliver care. However, the difficulties associated with conducting empirical research in patient care environments means the link between the organisation of health services and

clinical outcomes is seldom studied. Consequently, understanding of how changes to a health system will impact patient care is incredibly limited.

This is a significant problem in health services research, alongside the fact that current clinical trial methods mean subsets of patients are often

neglected. As a result, growing numbers of health services researchers are looking for new methods to evaluate how changes in delivery of care might affect outcomes. Boris Sobolev, a professor at the University of British Columbia (UBC) and Canada Research Chair for Statistics and Modelling in Healthcare, is one such researcher.

Sobolev is currently focusing on the causal inferences aspect of health services research. His work seeks to estimate causal effects where it is not possible to conduct an experiment. Comparing patient, treatment and system outcomes is a reliable method of assessing the effectiveness of interventions but it has its flaws, as Sobolev explains: "For ethical, safety and economic reasons, such comparisons are rarely carried out using randomisation. A fundamental question is whether one can derive the causal effect of an intervention using non-experimental data". In order to explore this question in the context of coronary revascularisation, his team is using routine care data.

This project represents the first North American study to compare the outcomes of bypass surgery and percutaneous coronary intervention at various times after a treatment decision has been made

AN IMPORTANT KNOWLEDGE GAP

There are two main methods of achieving revascularisation in non-emergency situations: coronary artery bypass grafting (CABG) and percutaneous coronary intervention (PCI). Clinical trials have shown that CABG reduces the need for repeat revascularisation, but in practice PCI is often available immediately, whereas patients may have to wait many weeks for bypass surgery.

In fact, over one-third of patients requiring non-emergency bypass surgery have to wait longer than is considered safe. This delay is one crucial element that has not been examined by clinical trials. As a result, it is unknown whether waiting for surgery is preferable to having an alternative, less invasive procedure immediately.

ACCOUNTING FOR DELAY

To address this important knowledge gap, Sobolev designed a study to compare the outcomes of CABG and PCI across patients groups, defined by the timing of their procedures. Sobolev will test whether repeat revascularisation is still more frequent after immediate PCI than after CABG performed within the recommended time periods.

He also plans to compare incidence of myocardial infarction, stroke and death after bypass, both within and after the recommended times.

This research is truly breaking new ground. No previous clinical trials comparing the two revascularisation methods have included patients who have had to wait to receive treatment. For patients suitable for either procedure, it will be possible to determine if repeat revascularisations are more frequent after immediate treatment with PCI than after delayed bypass surgery.

COMBINING EXPERTISE

The study, as with all health services research, requires an interdisciplinary team: "This ambitious agenda brings together researchers from a wide range of backgrounds to evaluate the effectiveness of timing of treatment procedures," Sobolev explains. "No single discipline can provide a full account of how health systems operation affects treatment outcomes."

The work will involve specialists in cardiac surgery, biostatistics, health services research and comparative effectiveness research, leveraging an existing collaboration between academics, healthcare professionals and policy makers across Canada.

CLINICALLY IMPORTANT RESULTS

This project represents the first North American study to compare the outcomes of bypass surgery and PCI at various times after a treatment decision has been made. But the findings also have relevance for policy. They will inform national benchmarks for the timing of coronary revascularisation procedures and help cardiologists determine the most effective treatment option when a patient must wait for surgery.

The evidence obtained directly relates to the Heart and Stroke Foundation's strategic research plan, which aims to strengthen the effectiveness of cardiovascular care in Canada through policy change. By enabling physicians to consider the implications of delay when making their treatment decisions, patients will receive optimum treatment.

The research will develop a model for determining comparative effectiveness of alternative treatments from observational data. The novel methodology and techniques can be adopted by other comparative effectiveness studies in medical care, facilitating further progress in health services research.

INTELLIGENCE

CAUSAL INFERENCE IN HEALTH SERVICES RESEARCH

OBJECTIVES

Using data from routine medical care to make causal inferences.

KEY COLLABORATORS

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