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Methodology

Executive summary

Using routine data to complement and enhance the results of randomised controlled trials

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Health Technology Assessment
NHS R&D HTA Programme

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Background

Randomised controlled trials (RCTs) are widely accepted as the best way to assess the outcomes and safety of medical interventions, but are sometimes not ethical, not feasible, or limited in the generalisability of their results. In such circumstances, routinely available data could help in several ways. Routine data could be used, for example, to conduct 'pseudo-trials', to estimate likely outcomes and required sample size to help design and conduct trials, or to examine whether the expected outcomes observed in an RCT will be realised in the general population.

Objectives

The project was undertaken to explore how routinely assembled hospital data might complement or supplement RCTs to evaluate medical interventions:

- in contexts where RCTs are not feasible for defining the context and design of an RCT
- for assessing whether the benefits indicated by RCTs are achieved in wider clinical practice.

Methods

The project was based on the system of linked Scottish morbidity records, which cover 100% of acute hospital care episodes and statutory death records from 1981 to 1995. Three case studies were undertaken as a way of investigating the utility of these records in different applications.

First, an attempt was made to analyse the link between the timing of surgery for subarachnoid haemorrhage (SAH) and subsequent outcomes (a question not easily susceptible to RCT design). A subsample was derived by excluding patients for which a diagnosis of SAH may not have been established or that may not have been admitted to a neurosurgical unit, and the data were assessed to attempt to inform the design of a trial of early versus late surgery.

Transurethral prostatectomy (TURP), the second case study, has become the surgery of choice for benign prostatic hyperplasia without systematic assessment of its effectiveness and safety, and an RCT would now be considered unethical. However, there is a need to investigate long-term effects and the influence of co-morbidities on outcomes. A retrospective comparison of mortality and re-operation following either open prostatectomy (OPEN) or TURP was, therefore, undertaken. Patients for whom it was not possible to establish the initial procedure were excluded.

The third case study compared coronary artery bypass grafting (CABG) with percutaneous transluminal angioplasty (PTCA) for coronary revascularisation. RCTs have been conducted in limited patient subgroups with short follow-up periods. A meta-analysis of RCTs could be augmented by routine data, which are available for large populations. This would allow assessment of subgroup effects, and outcomes over a long period. A subgroup of patients was therefore constructed for whom relevant routine data were available and who reflected the entry criteria for major RCTs, thus enabling a comparison between the results expected from this subgroup and those of the general population.

Results and conclusions

The uses of routine data in these contexts had strengths and weaknesses. The SAH study suggested a means of assessing outcomes and survival rates following haemorrhage, which could have value in informing the design of more precise trials and in evaluating changes in outcome following the introduction of new treatments such as embolisation. However, the potential of the data was not realised because their scope and content were insufficient. For example, lack of data on the time of onset of symptoms and patients' conditions at hospital admission made it difficult to establish the link between timing of surgery and the outcome, and there was insufficient information on patients' conditions at discharge to enable a comparison of outcomes.

The prostatectomy study was able to address questions not answered by RCT literature because the large number of cases it included allowed exploration of subgroup effects. The data indicated that younger patients and those with previous hospital admissions for cardiovascular, respiratory or ischaemic disease were more likely to have TURP, suggesting that these may influence treatment decisions. However, the risk of re-operation was higher in patients who initially underwent TURP, and, although mortality at 90 days was higher in patients who had OPEN initially, the difference seen from the routine data was not significant at 1 and 5 years. The records for this study were more satisfactory than for the SAH study. However, lack of data on the severity and complexity of patients' conditions limited the potential of the data.

The study of coronary revascularisation supported findings of the earlier meta-analysis, but with more prolonged follow-up and a broader population. Of the three studies, the data for this study were the most satisfactory, although lack of precise information on the complexity and severity of patients' conditions made it difficult to establish the full extent of subgroups. Patients who had an initial PTCA were more likely to require re-intervention than those who had CABG and, as expected, there was a lower rate of death and myocardial infarction (MI) in the RCT-like subgroup than in patients excluded from this sample. Using the routine data, the rates of death and MI at 1 year were significantly higher in patients who had an initial CABG, whereas this difference was not significant in the RCTs, but the difference was not significant in both at 5 years. A Bayesian comparison of the two interventions illustrated that Bayesian analyses can provide a link between RCTs, which are unbiased by design but may not reflect real populations, and routine data, which reflect reality but may be biased. This can facilitate better evaluations of outcomes associated with new technologies.

In general, linked data have value in two main ways. First, they relate to complete populations of cases and might thus clarify issues relating to patient selection. Second, by linking episodes of care to each other and to deaths, it is possible to gain information about prior medical histories, longer-term outcomes and the place of treatment, providing a context for more focused RCTs and multicentre comparisons of new techniques and their outcomes. Both of these are probably a prerequisite for comparable work; however, the shortcomings in the content and quality of current data limit these applications. Indeed, three further intended studies – laparoscopic versus open cholecystectomy, modes of treatment for breast cancer, and colorectal surgery by specialist versus generalist surgeons – proved impossible to undertake because of inadequacies in the routine data.

Implications for healthcare and recommendations for research

The shortfalls in the available data appear to be related to the largely administrative uses of the data at present. As the NHS moves closer to clinical governance, and as clinical audit develops, there are strong arguments for increasing the potential of routine data systems to complement information provided by RCTs. Ways in which the data systems might be improved include:

- publication of audits and feedback to those recording the data
- a stronger link between providers of care and those who generate and use routine records to monitor the extent to which the data reflect clinical practices
- expanding and updating coding systems to reflect new procedures and treatments
- adding more focused data collection to records for current clinical interests as a way of answering predetermined questions.

Publication

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NHS R&D HTA Programme

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The views expressed in this publication are those of the authors and not necessarily those of the Standing Group, the Commissioning Board, the Panel members or the Department of Health. The editors wish to emphasise that funding and publication of this research by the NHS should not be taken as implicit support for the recommendations for policy contained herein. In particular, policy options in the area of screening will be considered by the National Screening Committee. This Committee, chaired by the Chief Medical Officer, will take into account the views expressed here, further available evidence and other relevant considerations.

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