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The Science of Health Care and Science for Health

Abstract

Basic research has exerted a profound influence on the content, delivery and conceptual basis of health care. Despite its undoubted benefits, investigator-driven research has favoured an emphasis on hospital as opposed to community-based services, focused attention on selected parts of the spectrum of particular diseases and resulted in the relative neglect of important burdens of ill health.

Remarkably, the powerful shaping influence of science and technology on health services has not been counterbalanced by rigorous attempts to characterise and prioritise health problems as a basis for ensuring best use of scientific opportunity and existing knowledge. In 1991 a Research and Development Strategy, encompassing health services, public health and social sciences, was launched in England to provide a scientific basis for clinical, managerial and policy decisions. The R&D Initiative includes a new programme of applied health research, a strategy for systematically transferring research information to users, and the establishment of mechanisms for relating health priorities to the research councils and other funders of basic research.

Introduction

Science exerts a decisive and pervasive influence on the nature and disposition of the skills, facilities and interventions that collectively constitute health care. The transformation over the past four decades has been profound and the influence of science and technology gathers momentum as health services are presented with the output of a hugely expanded international capacity for technological innovation. Science relevant to health extends well beyond the conventional boundaries of medical research, encompassing biology, biotechnology, engineering, physical science and the social sciences. The conformation of health care has been reactive to the pressure of science and the technology and while there is abundant evidence of progress, there are many anomalies with variations in practise, and the majority of diagnos-

tic methods and treatments unevaluated. In short, the science of health care had been insufficiently distinguished from science for health. The emphasis on the latter and the neglect of the former is likely to be detrimental if there is not a rational basis for deploying scarce health resources to accommodate the fruits of research.

The output of science presents a treat and a opportunity. While some new developments are of worth, others are of marginal or transient value and some turn out to be inferior to existing methods. Hitherto, there has been no coherent approach to the scientific assessment of diagnostic procedures and treatment methods, no concerted attempt to make systematic use of research results, and little interest in the characterisation of health issues as problems for research. Furthermore, the health sector has possessed little capacity for understanding the implications of scientific advances and for determining their likely impact on health care. Consequently an imbalance has grown up between investigator-led research and problem-focused research which has resulted in insufficient attention being paid to issues which most pertain to health sector priorities. There is, for example, a dearth of information on the effectiveness and cost effectiveness of health practice methods. Even simple unevaluated procedures that are widely and unnecessarily applied can result in the consumption of substantial resources. The diversity of approach in routine care will increasingly be difficult to defend unless different approaches to comparable clinical problems are supported by a sustainable and convincing rationale.

There is an assumption that the demand for health care has outstripped available resources and that the gap between demand and supply is widening. It is increasingly the case that technological advances create new demands, sometimes very rapidly and unpredictably, for example, the explosive development in minimal access surgery since the late 1980's. Considerations of cost containment in health in relation to the perceived gap between supply and demand are fuelled by an uncertainty of even scepticism about the usefulness of some aspects of health care, which although consuming substantial resources are of uncertain benefit. There are a number of approaches to bridging the gap between supply and demand including the provision of more resources for health, reduced demand on health services, greater efficiency of operation and enhanced effectiveness of the processes of health care. Rationalisation, defined as 'the scientific organisation of industry', is an appropriate approach to securing the best outcomes for the investment in health services. It also offers the best prospect for sustaining clinical research and for taking advantage of scientific advances.

The scientific organisation of health care

Rationalisation requires a coherent strategy and the capacity to deliver the required information and to implement its use in practise. To provide a

scientific basis for health care and a Research Development infrastructure, strategy and programme has been introduced into the National Health Service (NHS) in England. A prime objective is to base decision making at all levels in the Health Service – clinical decisions, managerial decisions and the formulation of health policy – on reliable research-based information. A second objective is to provide the NHS with the capacity to identify problems that may be appropriate for research. A third objective is to improve the relations between the Health Service and the science base.

Since the programme was launched in April 1991 there has been rapid progress. A national research and development infrastructure has been set in place throughout the health regions and a programme of work established with emphasis on the rapid provision of information relevant to health service problems and the setting in place of a medium and longer term strategy.

It is important to emphasise that the R&D initiative is complementary to, and not in conflict with, basic science. Indeed, emphasis has been placed on close working relationships with the Medical Research Council, Economic and Social Research Council and two new research councils which will come into being in 1994, (biotechnology and biological sciences, engineering and physical sciences). Close working relationships between the health sector and the major charities have also been promoted through the creation of research liaison committees. Thus there is a commitment to encouraging scientists engaged in basis research to follow their instincts and judgements so long as their work is innovative and of high quality. The NHS R&D programme is not in conflict with that objective but seeks to create a more satisfactory balance between research driven by curiosity and research focused on solving specific problems. The attempt is to stimulate activity in applied health research recognising that we depend on speculative research for the occasional truly major advances in health care.

The R&D initiative has required a substantial cultural shift on the part of the scientific community and on the part of health service staff, particularly management. The response of the community has been extremely supportive. Outstanding individuals – predominantly from a biomedical background – have taken up the posts of Regional Directors of R&D. Although some have been in post for less than a year rapid progress has been made. Networks with R&D contact personnel in health authorities and hospitals have been established and working links developed with universities, including not only those with medical schools, but those with strengths in health research and the social sciences. The Regional Directors have placed emphasis on *development* by encouraging the uptake and the use of research in the contracts between providers and purchasers of health care and in clinical guidelines. Indeed some of the early achievements of R&D programme are related to work on the analysis and practical use of existing research information.

There has also been a high level of support from NHS staff. In 1992 health service managers were asked for examples of decisions made during the preceding year in which they judged that research based information had been lacking. The returns provided a substantial list of illustrative examples with one manager commenting that 'it wasn't so much that research information was lacking but that no-one in (his) health authority would have thought that such information could have contributed to decision making.'

This observation served to highlight not only the lack of research data directly relevant to health service issues, but a lack of awareness that research could be directly pertinent to the solution of managerial problems. Since then there has been substantial progress and there is an understanding that R&D is not a luxury, but an essential component of a modern health care system. For example the objective of separating the purchasers and providers of health care is to secure the largest volume of high quality care with available resources. This quest has made the need for research-based information explicit and there is a thirst for reliable data. There is also a clear recognition that such information underpins effectiveness and cost effectiveness in clinical practice. There is an increasing understanding that R&D has potential applicability across the spectrum of health service activities contributing information, analytical methods and introducing a capacity for foresight and scientific intelligence. Previously research has been thought of predominantly in the context of clinical practise but there is a wider range of pertinent issues, for example, the design of hospitals and different models for delivering care.

From problem to research solution

A method for analyzing and prioritising health service problems has been developed, refined, and applied to a range of issues including mental health, cardiovascular disease, physical and complex disabilities and the interface between primary and secondary care. The task of identifying and prioritising problems appropriate for research is undertaken by independent multidisciplinary groups who are provided with background data on prevalence, costs, available research knowledge and information on relevant developments in science. An essential feature is the conduct of an extensive consultation exercise with practitioners, researchers, managers and other – including lay – individuals and organisations. A key aspect is to secure input from those who are working with patients on a day to day basis. Input is derived from written consultation and from workshops. It is important that the groups responsible for setting the agenda for R&D are broadly based. For example, in a recently completed exercise on physical and complex disabilities, the membership of the group included rehabilitation engineers, medical physicists, rheumatologists and other medical specialists, representatives of the therapy professions, public health physicians, social scientists

and representatives of the disabled including voluntary organisations. Often the members of such groups find that they are working for the first time in a truly multidisciplinary context.

An important by-product of these exercises has been the identification of substantial gaps in routine information, for example, in health economics and in epidemiological data. In setting priorities the groups are asked to take into account the feasibility of research and the likely return from an investment in research.

Health service problems appropriate for R&D have been identified in relation to six overlapping perspectives: a disease perspective, management and organisation of services, client groups, consumer issues, health technologies, and research methodologies. Activities in these various areas are summarised in table 1.

The NHS R&D strategy includes a major programme on health technologies. The term health technology in this context describes any method used by health professionals to promote health, to prevent and treat disease and to improve rehabilitation and long term care. The term health technology assessment describes the systematic evaluation of these methods in terms of their costs, effectiveness and broader impact. A striking example of the challenge for technology assessment is minimal access surgery, where only 9 of more than 100 procedures in current use are being systematically evaluated. The number of diagnostic procedures, drugs, biotechnology products, surgical devices and treatments is growing rapidly and information on comparative costs and benefits is scanty. With so many interventions remaining unassessed, the effort must clearly be focused where the returns are likely to be the greatest.

A new NHS Standing Group on Health Technology convened in early 1993, will make its first report in december. The Standing Group is seen as the gateway into the NHS for health practise methods, with the eventual aim of registering technologies, and documenting whether they have or are being evaluated, and whether they have been shown to be effective and cost effective. The Standing Group has been asked to advise the health service on new and existing technologies which should be evaluated as a high priority, and to advise on those which should only be purchased if they have been or are being evaluated. The Group also has a foresight function, advising on new developments likely to arise from science and technology. The Group is advised by six panels dealing respectively with pharmaceuticals, acute sector technologies, chronic and primary care, diagnosis including imaging, population screening and evaluative methodology. The work of the panels has, as for others areas of priority setting, been associated with wide consultation and regional workshops. The first consultation exercise resulted in the submission of more than 1000 priorities. From this list, the standing group has assembled information on 90 technologies from which a ranked list of priorities is being prepared. A 'vignette' has been prepared for each technol-

Perspective	Areas for review	Action
Disease related	Mental health and learning disability	Review complete – first projects commissioned
	Cardiovascular disease and stroke	Review complete – projects being commissioned
	Cancer	Starting october 1993
	Respiratory	Planned
	Dentistry	Regional review by Mersey Regional Health authority
Management and organisation	Interface between primary and secondary care	Report to the CRDV in october 1993
	Purchaser/provider contracting	Commissioned paper and workshop prior to the review
	Accident and emergency	Planned
Client groups	Physical and complex disabilities	Report to the CRDC in july 1993
	Mother and child health	Planned
	Elderly people	Planned, following current MRC field review
	Health and ethnic minorities	Regional review planned
Consumers	Focus on nature, role, and input of users and potential users of the NHS to decision-making	Two papers commissioned, review being planned
Health technologies	Assessment of new and existing health technologies	Standing Group on Health Technologies established February 1993
Methodologies	Identification and development of appropriate methodologies to tackle the whole spectrum of NHS issues	Review planned in discussion with MRC and ESRC

Table 1 (From 'Research for Health')[1]

ogy which includes background information, data on benefits and cost implications along with the envisaged timescale of assessment, implementation issues, the potential returns on research funding and the urgency of the evaluation. The intention is that those responsible for purchasing health care should be made aware of the assessments being undertaken in the R&D programme, and that those intending to buy unevaluated interventions that are currently subject to assessment will need to explain why they are taking such action. Examples of issues identified by the Standing Group are *repeat*

prescribing strategies and the *effectiveness and cost effectiveness of different hip protheses.*

Repeat prescribing relates to medication that on the authorization of a doctor can be repeatedly prescribed by non-medical staff on the request of patients at agreed intervals for an agreed period without requiring the patient to see the doctor. Currently prescribing costs in the primary care sector account for approximately 10% of the health care service budget and repeat prescribing estimated to account for approximately 2/3 of prescribing costs. There has been an annual increase in the number of total hip replacements since 1967 with approximately 18% of the total financial burden accounted for by revision hip replacements. Whereas in 1970 there was only one type of protheses, by 1991 this had risen to 34.

As mentioned above the Standing Group on Health Technologies has a foresight function alerting the health service to likely new developments. In the rapidly evolving field of genetics, an NHS Genetic Group has been convened to advise the Standing Group on the health service implications of genome mapping, genetic interventions, genetic screening and the genetic diagnosis.

The identification of a problem should not automatically signal the commissioning of research. Two questions need to be asked, firstly is there existing research information capable of answering the question? Secondly, is there ongoing research relevant to the problem? If there is either a lack of information or lack of relevant research, bids are invited from the research community to tackle clearly characterised problems. While much of this new work is supported by the NHS itself, some supported by other bodies, particularly the Medical Research Council. The process of inviting competitive bids, conducting peer review and commissioning research is devolved to one of the Regional R&D Directors. As shown in table 2, each directorate is responsible for managing one or more programmes on behalf of the health service. In this way the commissioning, management and conduct of the R&D programme is devolved from the centre while maintaining national coherence.

Making use of research findings

There has been a lamentable lack of emphasis on the use of research information in routine clinical practise. There are many examples of where research findings have not been used promptly or uniformly. One of the most striking has been in thrombolytic therapy for acute myocardial infarction in which there was a twelve year delay between the publication of clinical trials demonstrating effectiveness and the recommendation by experts of thrombolytic therapy[2]. Another recent example has been a systematic overview of trials comparing the treatment of stroke patients in stroke units compared with their treatment on general medical wards[3]. As

Area	Last directorates for NHS R&D
Mental health	Yorkshire
Cardiovascular disease and stroke	Northern
Cancer Health Technology (HT) panel and methodologies	South Western
Respiratory disease HT panel on acute sector	South East Thames
Purchasing/contracting	Oxford
Accident and emergency	North Western
Elderly	East Anglia
Interface primary/secondary care HT panel on chronic community, primary care	North East Thames
HT panel on pharmaceuticals	Mersey
HT panel on screening	North West Thames
Mother and child health	South West Thames
Consumer issues HT panel on imaging	Trent
Physical and complex disabilities	Wessex
Medical equipment	West Midlands

Table 2 (From 'Research for Health')

the British Medical Journal noted, the greatest leap forward in the treatment of stroke has not been neuroprotective agent or a new way of imaging the ischaemic brain, but a publication showing that organised stroke care saves lives[4]. Prior to this analysis the consensus view had been that stroke units hasten recovery but do not reduce mortality or improve longer term outcomes. The review conducted on 10 trials carried out between 1962 and 1993 showed a reduction in mortality by almost 30%, reduced dependency at 6 months, reduced need for long term institutional care and reduced length of hospital stay. This distillate of existing research information provides data highly relevant to the organisation of services and also provides the basis for teasing out in further studies those elements of organised stroke care which most contribute to beneficial effect.

In addition to the conduct of new research and the generation of new data in the medium and longer term for example from clinical trials, it is essential that a health R&D programme delivers practical information in the short term and that effective use is made of currently available research

findings. Accordingly high priority has been given to the establishment of an information strategy to handle existing research data. The first component is the Cochrane Centre, opened in november 1992, which is concentrating on registers and systematic overview of randomised clinical trials. The Centre has stimulated worldwide interest and activity with the creation of an international network known as the Cochrane Collaboration. This important initiative is designed to provide access to the output of high quality research from research groups based in many countries. In december 1993 a new unit at the University of York will open to extend the pioneering work of the Cochrane Centre by commissioning reviews of findings from across the whole range of research. The York centre will also tackle the challenge of disseminating research information effectively, concentrating on the systematic transfer of research findings in appropriate formats to clinicians, managers, policy makers and other users. The objective is to ensure that research is used in purchasing contracts, in clinical quidelines and indeed in other vehicles that transfer new information into routine practice.

Regional Directors of R&D have also been provided with an information tool to allow research projects underway in their regions to be registered under a common format. This will lead to the establishment of a national register of research which will allow for the first time a comprehensive national picture of ongoing work to contribute to more effective decisions about targeting of research resources.

Work on implementing the results of R&D in practice is receiving high priority. The goal is to make available R&D evidence to underpin decisions at all levels and in all sectors of the health service to inform policy, the development of new services, the commissioning and evaluation of existing services and to support routine clinical management practice. The implementation strategy builds on a number of *development* initiatives. For example, one project involves collaboration with a number of health authorities. Here quidelines relating to cardiac services are being developed on subjects identified by health authority staff working with researchers. These subjects may apply to primary, secondary or tertiary care, or to the interfaces between services. The collaborating districts differ in terms of the number of tertiary providers, the availability of coronary care units and the number of physicians with an interest in cardiology. This project, in common with other development studies, is based on a formal protocol with prospective evaluation.

Research skills

Invitations to the research community to bid for funds for various aspects of the programme have shown a high level of enthusiasm, but in some areas a shortage of research skills. For this reason attention is being given to the development of education and training initiatives. This includes training in

health services research and analytical sciences for doctors and other health professionals and the inclusion of R&D in modular training programmes for managers. A new centre for research and development in primary care is being established with training as an important part of its work. The intention here is to create a model dynamic centre for health services research in an aspect of care that previously has received relatively little attention.

Conclusion

A comprehensive R&D infrastructure, strategy and programme have been introduced into the English National Health Service in order to generate this information and mechanisms necessary to develop knowledge-based health care. The goal is to place the health sector in the mainstream of research, to introduce a capacity for the identification of health problems appropriate for research, to focus on the systematic use of research findings in routine practise and to give emphasis to *development* in addition to research. The aim is to base decision making in the health service on reliable and relevant research-based information. The initiative seeks to establish a more appropriate balance between research driven by curiosity and research focused on specific problems. However it is not in conflict with basic science but attempts to fill the lacuna between biomedical research and the health service bringing to bear the experience and commitment of professional leaders with strong track records in research. The R&D programme provides the basis for rationalising health care in relation to the effectiveness of services. Since this is a new venture, the impact cannot be quantified, although anecdotal information gives ground for supposing that the potential for releasing and redeploying resources within the health service may be substantial.

Notes

1. *Research for Health* (1993); Department of Health.
2. Antman et al (1993); *JAMA* Vol. 268, no 2, pg 240-248.
3. Langhorne et al (1993); *The Lancet*, Vol 342, no 8868, pg 395-398.
4. Sandercock (1993); *BMJ* Vol 307, pg 1297-1298.