KFC (78)215

(23 NOV 78)

KING EDWARD'S HOSPITAL FUND FOR LONDON

King's Fund Centre

OPERATIONAL RESEARCH AND PLANNING

A Report of a Conference held at the King's Fund Centre

on 23 November 1978

King's Fund Centre
126, Albert Street,
London NW1 7NF

March 1979

HIBG:CA (Kin)

OPERATIONAL RESEARCH AND PLANNING

A Report of a Conference held at the King's Fund Centre on 23 November 1978

1. PURPOSE OF THE CONFERENCE

The development of the National Health Service planning system over the last few years has stimulated demand for further enquiry into the way health services operate and a search for the best ways of using available resources. Operational Research scientists have been involved with others in studying patterns of care and helping to clarify options for those who have to take decisions.

The purpose of this conference was to provide an opportunity for those with service planning responsibilities to learn about some current studies and to assess the potential contribution of operational research to the planning process. It was organized in conjunction with the Health and Welfare Services Study Group of the Operational Research Society and was chaired by its Chairman, Dr K Groom, who is also Director of the NHS Operational Research Group of the Royal Institute of Public Administration.

2. THE PRESENTATIONS

The following summaries do no more than highlight the key features of the day's presentations. They are intended as 'aide memoires' for those who attended the conference and an indication of content for those who could not be present. More detailed information on each project discussed is available from the individual speakers.

2.1 Operational Research in Regional Planning

Mr I A Nicholls, West Midlands Regional Health Authority

Regional Planning in the West Midlands includes:

a) The preparation of Regional guidelines;
b) The preparation of Area-Specific guidelines;
c) The provision of support to Areas with their own planning;
d) The planning of Regionally-managed services;
e) The preparation of the Operational Capital Programme; and
f) The preparation of the final Regional Strategy.

Mr Nicholls defined Operational Research (OR) as a particular approach to problem solving. Since its inception during the Second World War, OR has often been closely associated in the academic literature with a set of mathematical tools, and he felt that this sort of definition led potential users of OR to under-rate its value to them. Much OR literature is concerned with optimising techniques, but the scope for such techniques in the NHS was severely limited by the lack of satisfactory measures of "output". Thus OR in the NHS offered a strong challenge to the OR scientist.

He then cited several examples of work undertaken by the OR unit at West Midlands RHA, to illustrate the range of planning-related work which comes under the OR umbrella.

1. Manpower Planning — e.g. the forecasting of movements of staff, wastage rates, and recruitment levels within a simulation model, in order to enable managers to make better plans for recruitment and training of staff.

2. Deprivation Model — This is an alternative approach to relying on the use of norms. It identifies areas of deprivation, using SMRs as a proxy measure of need, access rate as a measure of current provision of beds, and throughput as a measure of the intensiveness of use of existing facilities. These three measures are determined for each speciality in each district, and displayed pictorially. This method of attempting to assess need for services and deprivation is seen as a valuable adjunct to the use of the more familiar bed norms.

3. Capital Programming Model — This model plots the cumulative building and engineering costs over time; the pattern of spending on fees over time, and also the pattern of expenditure on furniture and equipment over time, for all capital schemes in a Region or Area. It then becomes possible to examine the implications of changes in phasing of the schemes, changes in the level of capital available over time, and the amount of capital being devoted to each of a number of important patient groups. The model, being computerised, provides a bank of data which is readily accessed and changed.

4. Demographic Change — The OR section had carried out statistical analysis of demographic change to support Regional planners. Although this is routine work, it is often extremely useful to planners, especially when there is disagreement between the various sources of official demographic statistics (OPCS versus local authorities' own estimates).

5. Medical Manpower Statistics — This involves marshalling all the details on medical and dental manpower and relating it to the population structure, and identifying gross deficiencies.

6. Location and Size of Major New Capital Developments — A model to assess the implications of the location of major capital developments on transport, other hospitals, etc. is now being tested with respect to one particular hospital, and will be developed further as an aid to planning new capital developments.

7. RAWP — The OR Section also provides analytical support to the region's Capital and Revenue Targets Group which is concerned with the application of RAWP principles to regional resource allocation.

8. Support to Area Planners — Current projects include the application of the DHSS Balance of Care model in one Area.

Finally Mr Nicholls stressed the need to recognize that we live in an uncertain world, and working with single value estimates of the future (e.g. populations and norms) can lead to plans that are way out when the time comes to implement them. Too often planners are concerned with trying to find an optimum solution rather than to produce a robust plan, which still is reasonably good for a number of future scenarios.

2.2. Balance of Care in Action

Mr R W Canvin, Institute of Biometry and Community Medicine, University of Exeter

---

The Balance of Care Model was designed originally at national level, and has since been applied in Devon. The caring system is very complex, since,as in the case of the elderly for example, there are two main agencies involved - the NHS and Social Services Departments. These have different management and financial systems and are subject to different pressures; resources are scarce; demand is 'unrestricted'; some resources are common to several care groups. There are alternative ways of caring and decisions have to be made as to which is most appropriate but the policy of one agency affects the other.

Mr Canvin stressed that the model does not produce the plan. It simply provides a structure within which to formulate local opinion and draws together all the resource assumptions to indicate the consequences of options open to managers in terms of: (1) the numbers of each type of client, (2) the amount of each resource to be allocated to each client group, (3) the total quantity of each resource and (4) expenditure, but not in terms of effectiveness of care.

Three main aspects of care are considered by the model:

Cover - the number of patients treated;

Modes - types of care; and

Standards - quantities of resource per patient in each mode.

In the work on the elderly, clients are classified according to four factors - (1) degree of handicap, (2) mental state, (3) social isolation and (4) housing conditions. Altogether, there are 23 different categories of elderly client. Panels of professional advisers have proposed appropriate broad modes and desirable standards of care.

The following data - cover by category, alternative modes of care, desired standards of provision, current provision, revenue costs, capital costs, physical and manpower constraints and budgets - are required by the model. From these it can calculate "appropriate" allocations of key resources for a given care group at a given target date, for different assumptions about financial growth and resource constraints, and also indicate what percentage of desirable standards such an allocation achieves. The planning teams can then review the implications of this combination of resources and, where necessary, adjust the assumptions and rerun the model.

In addition to the elderly, the model also includes the following care groups in detail: the younger physically handicapped, mentally handicapped; mentally ill, maternity, some surgical cases, children in need of social care. Other

groups are included in aggregate. In Devon, the model has been used to guide joint financing, the PSSD three year plan and to some extent the AHAs 10 year Strategic Plan.

2.3. Manpower Planning

Mr G Lind, Scottish Institute for Operational Research - Edinburgh

---

Mr Lind concentrated on the three issues -

- Where does manpower fit into planning ?
- What has OR's contribution been to manpower planning?
- Describing his work in Scotland on nurse manpower planning.

1. His view of planning is:

   - A consideration of problems faced and possible future consequences of actions open now.
   - Aimed at improving the level of confidence in decisions taken.

It is a continuous and messy process because perceptions of problems as well as the problems themselves change while the planning is going on.

2. Manpower Planning is that part of planning which is concerned with decisions about training, recruitment, conditions of service and career structure. OR has made a contribution to manpower planning through:

   1.Helping to identify possible future problems.
   2.Showing how alternative strategies compare.
   3.Suggesting what to do by testing the robustness of various strategies.

3. The Nurse Manpower Planning Study commissioned by the Scottish Home and Health Department was of the factors influencing the supply of qualified nurse manpower. To create a useful manpower model the field had to be narrowed by choosing a limited number of staff groupings. The criteria used for this choice were (a) the staff groupings included should be of policy concern; (b) those included in any group should as far as possible display similar behavior in leaving and joining the service; (c) the numbers involved would have to be statistically significant.

Thus, the profession was divided into hospital and community nurses. Each group was then sub-divided by sex, basic qualifications, (in some cases) whole or part-time and age. The basic model calculation was:

For a particular staff group

$$\text{The No. in Post Next Year} = \text{No. in Post This Year} + \text{No. of Recruits During the Year} - \text{No of Leavers During the Year} + \text{Net transfers into the Group}$$

The model therefore calculated:

Number of staff in post in the future if particular patterns of recruitment and wastage occur.

The Data used by the model: (1) Surveys of all staff in post in hospitals 1972, community 1973; (2) Survey of all entrants and leavers in hospitals 1972-1973; (3) Survey of Entrants and Leavers (Sample) in the Community 1973; plus (4) Students and pupils data from GNC and (5) Health Visitor Trainees from CETHV.

Examples were then given of the sort of calculations the model could carry out. These showed the possible effect on future staffing levels of adopting different recruitment policies by varying the intake to training; the proportion of trainees qualifying; the proportion of qualifiers entering the NHS; recruitment from the pool; and also the increase in recruitment necessary in each staff group to achieve the same effect as reducing wastage rates by a given percentage.

In conclusion Mr Lind stressed that modelling will only be effective if senior officials are involved in the development of the model. In this way they will appreciate how to use it and which questions it should be used to address. It is therefore necessary to avoid too complex a model, if one is going to develop a commitment to the results.

Manpower planning is immensely complex but it needs to be tackled because a) any future development will require the right level and type of staffing and therefore parallel developments for manpower must be co-ordinated and b) manpower decisions affect the hopes and aspirations of staff.

2.4. Computer Simulation Studies

Dr A Clayden, Department of Community Medicine, University of Leeds

---

Dr Clayden posed four questions:

- What is modelling and, in particular, what is simulation modelling?
- Why do we use it?
- How are we using it?

Simulation and Simulation Models

"Simulation" = mimicking the real world.

"A Model" is a device which imitates reality. All models simulate but

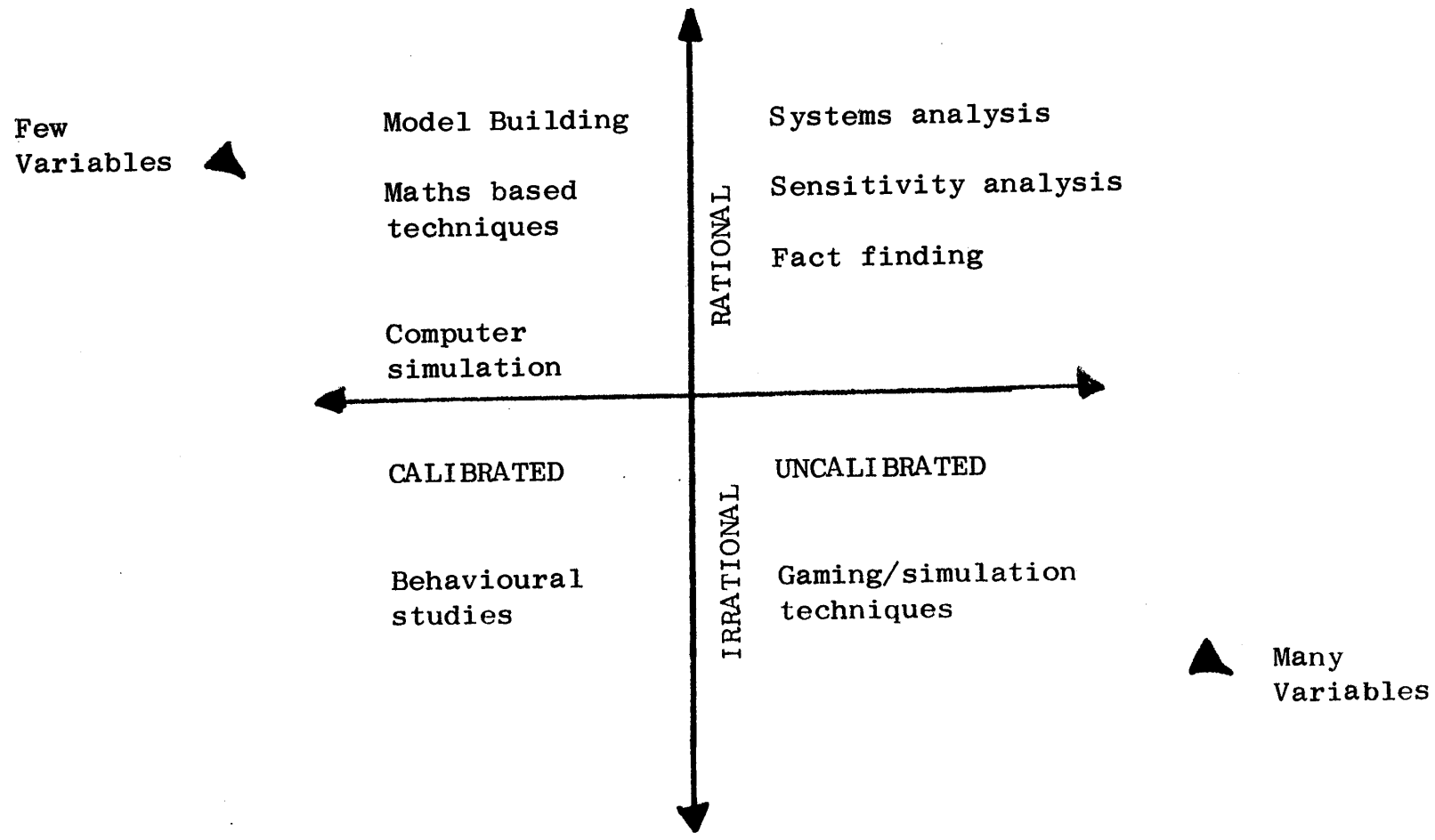
"Simulation Models" are representations which try to explain how some part of the real world functions and 'what happens if' we took some action to change how it currently works. The models are used because there are constraints on experimenting with the real world and one has to rely on an abstraction of the real world.

Reasons for Using Simulation

1) Simpler.
2) Appears to be cheaper.
3) Can avoid problems and dangers of experimenting with the real world.
4) The real world is too complex - it is necessary to abstract the main parameters of the situation.
5) The implications of an innovation can be very long term and a simulation of the process can provide answers more quickly.

How are Models being Used?

The following diagram suggests the types of method which are appropriate in different contexts:



Simulation moves from the North West ⟶ South East quadrant, where the hazier problems about government policies appear. This is the area where one is searching for a means of communication on an issue.

Current Use of Simulation

The OR Society have produced a Register of Current OR Projects in the Health and Welfare Services. Traditionally the main focus of studies has tended to be very limited but OR scientists are now moving out into a broader field and there has been a growth in the number of planning related studies. Dr Clayden discussed at some length the two projects in which he has been involved.

Geriatric care is a very complex issue and it is difficult to measure outcome. The problems in this area include:

- an ageing population
- elderly people occupying hospital beds for longer than medically necessary
- unmet demand for hospital beds and residential home places.

By simulating the throughput of hospital beds over time, starting from empty hospitals, it was possible to test the effects of different scenarios offering a range of provision.

Whole Health Service Modelling. The aim is to relate the amount and nature of illness to the use of a variety of Health Service resources so that alternative medium and long-term strategies can be compared. The model can be used either as: 1) training tools; or as 2) predictive aid.

In the 'Mittinghamshire' Simulation Game participating teams decide what they want to do with their service, feed the decisions into the model and see the possible results. Seeing the implications the teams have to decide whether it is worth adopting the policies.

2.5 Calderdale - Care of the Elderly

Mr C Parker, NHS OR Group, Royal Institute of Public Administration

Mr Parker described a project currently underway in Calderdale. The initiative for the project came from the AHA, because of the symptom - blocked beds- but the underlying problem of providing the right mix of care for the elderly could not be attacked properly without involving the Social Services and Housing Departments. Phase I has largely been concerned with collecting and classifying information. Information about the elderly obviously exists in the minds of the carers, but it is often information about individuals. For planning, a broader system of information about a population is required.

The requirements of a classification system are:

1) To adequately describe and discriminate between types of case for whom different forms of care are appropriate.
2) To be of a form which leads to reliable and consistent assessment of cases.
3) To be amenable to analysis.

The study considered both individual and environmental factors which could be expected to influence the individuals ability to care for him/herself; and for each factor a number of categories were devised.

Having determined the classification system, it was necessary to decide on whom the information should be gathered. The decision was taken to concentrate on those elderly people in Calderdale who are already receiving care in some form. These represent 7,500 of the 30,000 people over 65 in the District. The groups covered were: 1)'bed blockers' in acute wards; 2) Patients in Geriatric Assessment/Rehabilitation Beds; 3) Patients in long-stay Geriatric Beds; 4) Aged Persons Homes Residents; 5) Sheltered Housing Residents; 6) Local Authority Domiciliary Services Recipients; and 7) Community Nursing Patients.

Two surveys were carried out - a snapshot survey - or census - of all groups, and a three month survey of the first four groups to examine the flows and criteria for admission. The assessments were carried out by people who were currently involved in the care of the elderly people, e.g. ward sisters, community nurses, domiciliary care organisers and wardens.

The snapshot survey resulted in assessment profiles for each setting. There were degrees of overlap between settings, but the results produced no major suprises. (If they had Mr Parker suggested there would have been grounds for checking the survey methods). The intention was to quantify judgements on quality and thus provide information to help the HCPTs/JCPT focus on current problems. The information also helped to show up cases where the distribution of care was less than ideal.

It is not intended that this sort of categorization should supplant the professional decisions of individual cases, but it does give a broad indication of what sort of care is appropriate.

Mr Parker summarized the value of this sort of study:

1) The information was a necessary basis for planning.

2) For each particular client group, a common base was required to describe groups of individuals. Members of the JCPT each had their own perceptions of the problems, founded in their experience with individual clients, funding and departmental priorities, and it was necessary to bring these prior assumptions out into the open.

3) The approach has been devised jointly by LA and NHS representatives on the JCPT, so there is a common commitment to the study.

2.6. Operational Research in Area Strategic Planning

Dr R Gibbs*, Operational Research Service, DHSS

Dr Gibbs reviewed some approaches to area strategic planning in which the OR Service at the DHSS has been involved and some of the methods employed.

In Dr Gibbs' view there are two clear stages to planning:

1) the unconstrained stage - the estimation of resources needed to reach an ideal provision of care

2) the constrained stage - the determination of actual resources that can be provided within financial and other constraints.

It is important to carry out both stages separately if one is to achieve a radical rethinking of services. To allow constraints to restrain thinking too early leads to a high risk of disjointed incrementalism which he considered highly dangerous.

* Dr Gibbs was speaking in a personal capacity and the views he expressed are not necessarily to be ascribed to DHSS

Dr Gibbs described three types of method used by DHSS Operational Research Service and gave examples of where these methods had been successfully employed and results used by Area Health Authorities. In each of these methods, as in any approach to planning, one needs to make certain assumptions. The important thing is to state these assumptions clearly and, where possible, test how sensitive the results of the study are to changes in the assumptions. In each case however, various checks can be adopted - checking one method against another, and also discussing the assumptions with the planners and deliverers of care.

1. Balance of Care Approach (e.g. Devon, Dudley, Calderdale).

This method is particularly useful for the joint planning of health and social services and has been used to help authorities plan target levels of provision of services. The key assumptions in this method concern ideal standards of care and relative priorities adopted by clinicians, nurses and social workers in attempting to attain these standards; some of the data required for this is, necessarily, of a 'soft' character.

2. The Normative Approach (e.g. Wirral, Liverpool, Sefton)

This method goes beyond the Balance of Care method in that it is concerned not only with target setting but also the process of implementing changes in services in order to meet targets. The method employs Departmental and other guidelines (or norms) and the key assumption concerns the appropriateness of these guidelines in the local situation.

3. Trend Analysis (e.g. Gwynedd, Dorset)

The basis of this method is an analysis of past trends in service utilisation and an attempt to understand the determinants of these trends so that reasonable projections can be made for the future. One of the main problems here is to distinguish the effects of supply and demand.

Since the Balance of Care method was described earlier in the conference in the paper given by Mr Canvin, Dr Gibbs devoted the remainder of his talk to describing the other two methods.

Normative Method

This method involves the calculation of targets of provision by calculating

1) the future catchment population
2) the Area Targets (by application of norms)
3) the allocation of this target figure of beds to hospital sites
4) the costs of manpower, support services, X-ray, theatres etc
5) testing the cost feasibility of the Area Targets and, if necessary, adjusting them and repeating calculation (2) to (5)

The application of norms should not be done rigidly - it will be necessary to disaggregate and adjust the norms by age/morbidity and medical opinion on changing standards. The important thing is that each stage of the calculation is discussed with the planners and the clinicians.

Dr Gibbs also discussed the difference between planning an optimum and a robust provision of services. He described a case study to illustrate this, where the best option in terms of patient access and other factors, given current norms, would prove extremely costly if the bed demand proved to be lower than currently forecast; accordingly the study team recommended another option which would be less good if the bed demand forecast proved correct but much better if it proved to be wrong.

Attempts have also been made to use norms for budget costing, projecting staffing levels. Here the norm for doctors has been calculated from the current provision of doctors per case per speciality. In the case of nurses, the calculation is made in terms of nurses per bed-day, in recognition of the different working practices.

Trend Analysis

One advantage of trend analysis, as Dr Gibbs pointed out, is that it is relatively easy to understand and discuss the calculation with planners, clinicians, nurses and others so that they gain confidence in the results.

Dr Gibbs gave an example of the application of this method to the question of planning the future requirement for acute beds in an Area. The study progressed through three stages, the results of each stage being fully discussed with planners before proceeding on to the next:

1) Compare current bed use in the Area with that for England and Wales.
2) Identify the reasons for the differences;
3) Calculate the number of beds required, five years and ten years hence, on the basis of projected demographic change in the Area; trends for England and Wales for length of stay, admission rates, etc, local professional opinion about likely developments.

In conclusion Dr Gibbs listed five key features of the OR Approach to Planning:

1) Finance is a constraint, not a norm.
2) Look at the OUTPUTS of the service (and he cited "throughput" as an example) as far as possible.
3) State assumptions and check if possible.
4) Adjust figures for the local situation where justified.
5) Work closely with the planners and when possible, clinicians, nurses, social workers directly concerned with delivery of the service.

3. DISCUSSION

There was a general discussion after both the morning and afternoon sessions. Many of the questions asked were specific points about individual projects but more general issues were also aired.

The speakers all emphasized the importance of carrying clients along very closely with the work. It was often necessary to talk to a wide range of people and teams and to be prepared to explain points at length to many different people. (In Calderdale for instance, they are producing a broadsheet to circulate to all those who have been involved in the project). There were great dangers in overselling the OR approach, disappearing back to the ivory tower and then reappearing with the "results". People were

not likely to be convinced. In the end, however, the use made of OR findings remained a matter of personal predilection and at times, this was less than the OR team might hope for. The speakers could only be hopeful that this sort of work would gradually change attitudes to planning and the tools necessary to carry it out.

At the same time, the panel of speakers stressed that OR in itself did not produce solutions, but its use of models formalizes issues and focuses attention on the underlying problem, much better than 'back-of-the-envelope' calculations can. It is this modelling approach that enables OR to assist managers in their decision making. An OR exercise makes the assumptions clear and should help people face up to those assumptions.

There was some discussion on the process of validation and whether it was possible to look back now on earlier OR studies to see how accurate the forecasts had been. Several speakers argued that it was not possible to validate the end product of the planning process but it was important to validate the planning process itself. One was operating in an uncertain environment and it was to be expected that the exact pattern of events would be different, because there were quite likely to be some changes that the model did not take account of. The importance here, was that one was dealing with a variety of mental models, and by using the OR models, these could be made explicit and the level of confidence in the decisions taken could be increased.

Someone asked where the initiatives for operational research should come from - OR scientist or planners? Dr Groom said that conferences such as this one should help to make people in the Service aware of the skills that are available and who to approach. The OR scientists themselves have quite a good network but the links into the field are more of a problem. As Dr Gibbs pointed out the DHSS OR service can be approached through Regional Liaison Groups and the Standing Group on Planning may also be used as a vehicle for disseminating information on OR to planners. Dr Clayden said that university based researchers relied on personal contacts and he would welcome more initiative from the NHS. There are also commercial consultancies which advertize. Organizations such as the OR Society organize conferences which are circularized through the NHS and advertized in the journals. Some OR studies are also published (Mr Lind's study on nursing manpower, for instance, has been published by the Scottish Home and Health Department; and work on the Balance of Care Model has been published in the OR Society's Journal and the more popular professional press, such as the Health and Social Services Journal). The NHS Management Education Centres and the King's Fund Centre Library also act as information brokers. Finally it was mentioned that a Joint NHS/DHSS Committee is currently looking at the future of operational research in the NHS and this committee is expected to report fairly soon.

Joy Reynolds
King's Fund Centre
March 1979

Requests for further information about this conference or suggestions for further related activities should be directed either to individual speakers or to: David Hands, Assistant Director, King's Fund Centre, 126 Albert Street, London NW1 7NF