

Pragmatic Techniques for Service Evaluation: A Hospital-at-Home Case Study

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Introduction

Hospital-at-Home (HaH) schemes are not a new phenomenon. The practice of using teams of nurses, physiotherapists, occupational therapists and other health professionals to provide patients with services they would have received in hospital, in their own homes, originated as “Hospitalisation a domicile” in France during the 1950s^{1,2}. HaH was first piloted in the UK in 1978, when the concept was used to prevent the admission to hospital of patients with varying medical conditions in and around Peterborough and Northamptonshire². Since then, there has been a gradual increase in the number of HaH schemes operating in the UK, intended either to facilitate the early discharge of patients from hospital, to prevent admission or for both purposes³⁻⁸.

Assumed improvements in the social and psychological well being of the patient, cost containment, and the recommendation by the Tomlinson Committee⁹ that health service resources in London should be transferred from over-resourced acute care to primary and community services, have been the justifications and drivers behind the successive waves of HaH schemes in the UK. The Government’s 1997 ‘winter bed pressures’ policy accounted for the most recent wave; £300 million was made available to the NHS and HaH was one strategy advocated for easing bed pressures¹⁰,
11.

Background to the evaluation

The HaH service upon which this case study is based, was a product of the extra financial resources allocated to the NHS in 1997, and was set up in Hillingdon Hospital, Hillingdon in November. Eligibility for the Hillingdon HaH scheme

(known as the Rapid Response Scheme - RRS) consists of the following criteria: aged 65 or over, live in the London Borough of Hillingdon, have access to a telephone, have a cognitive/physical state that is manageable at home, have suitable home circumstances, and have an anticipated length of stay not longer than 14 days. Referrals to the RRS come from various sources. Patients attending Hillingdon Hospital's A&E department may be referred by the A&E consultants (prevention of admission). Patients on Care of the Elderly wards may be identified as suitable for early discharge onto the RRS, as might elderly orthopaedic patients (mainly patients recovering from hip or knee replacements), or patients in the Care of the Elderly day hospital or outpatient clinics.

Without any information on likely cost consequences, Hillingdon HA, the commissioning authority felt unsure about the role of the RRS in future financial years. The Health Authority, therefore, arranged for the Public Health Division within the Authority to embark upon a prospective evaluation of the RRS and for a complementary economic evaluation to be undertaken by HERG.

This paper examines the pragmatic techniques used in the two evaluations of the Hillingdon RRS, and compares the aims and objectives of the two research teams. The interpretations of the aims of the two evaluations are then considered, and the reasons for differing interpretation are discussed. The success with which the aims are achieved is also presented. Finally, the incremental cost-effectiveness of the two evaluations is considered.

Aims and objectives of the two evaluations

Both studies clearly identified their initial aims and objectives. The overriding aim of the HA evaluation was to "advise Hillingdon HA, Hillingdon Hospital and Social Services for the London Borough of Hillingdon on the possible continuation of the scheme." Four broad categories of objectives were defined: to describe RRS activity, to describe outcomes, to determine the effectiveness of the service in terms of impact on hospital activity and cost-effectiveness, and to establish the acceptability of the scheme to patients.

The HERG evaluation was initiated specifically to inform the HA with respect to the continuation of the RRS scheme. The main objective was the calculation of the cost-effectiveness of the scheme. Within the economic evaluation, areas of particular interest were identified as: the impact of the RRS on the costs saved in the hospital, and/or the possible health gains from the treatment of additional patients as a result of freeing-up hospital beds; the effect of RRS on post discharge readmissions to hospital and entry to nursing homes or residential accommodation; and the feasibility of using Discrete Event Simulation (DES) modelling to evaluate such services.

Techniques adopted for the two evaluations

The Hillingdon Health Authority (HA) evaluation

A “cost-outcome description”¹² is the term which most appropriately describes the methodology employed for the HA evaluation. This largely descriptive approach is seen as the basis upon which public health administrators have traditionally based resource allocation decisions.

Specification of the viewpoint to be taken for an evaluation, is an important, initial decision, which must be addressed prior to the commencement of any cost-related research. As the commissioner of the RRS, Hillingdon HA’s obvious concern was over the direct costs involved in maintaining the scheme, and, consequently, the public health researchers adopted a narrow perspective, concentrating solely on the costs incurred, and potentially saved by the HA as a direct result of the RRS service.

The HA evaluation covered prospectively all 213 patients referred to the RRS during the first six months of 1998 (122 of whom were admitted to the scheme). Pro forma completed by service personnel and routine recording systems were used to collect descriptive data on all 213 patients and resource use data for the 122 patients who entered the scheme. The main outcome measure was the routinely administered Barthel Index, which measured the physical capabilities of patients both upon admission to, and discharge from the RRS. A patient satisfaction questionnaire was also sent to all RRS patients.

The HA evaluation was not in a position to identify a comparator group. So, to enable conclusions to be reached on the cost consequences of the RRS a proxy variable was employed. When admitting patients to the RRS, the consultants estimated the amount of time each RRS patient would have spent on an inpatient ward before being routinely discharged, if the scheme were not available. These predictions were used to estimate the hospital bed days saved by the scheme. Average lengths of stay (LOS) in the RRS for both early discharge and prevention of admission patients were also calculated.

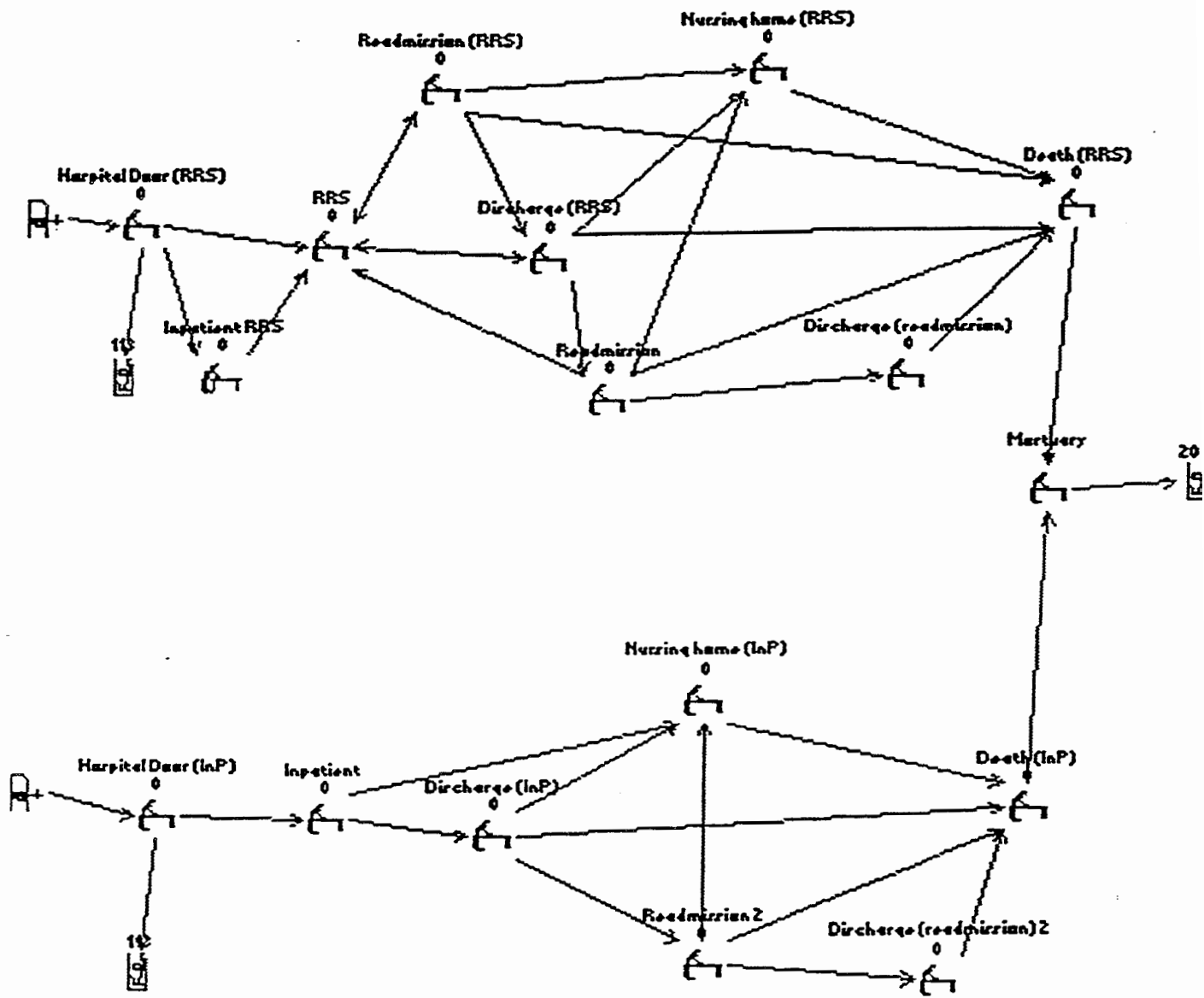
The approach used for costing reflected the fact that costs to the HA were the sole concern of the evaluation. Total costs for the RRS in the first six months of 1998 were used to calculate an average cost per patient day in the scheme, and the price paid by the HA for an acute bed in Hillingdon Hospital (£150 per day) was assigned to the estimate of bed days saved. Information was collected on the arrangements made for RRS patients to receive services following discharge from the scheme (e.g. social services, district nursing, physiotherapy and outpatient appointments etc.). Information was collected also on the number of RRS patients readmitted to hospital within four weeks of discharge from the scheme was obtained. But these post-discharge data were not used for costing purposes.

Results obtained from this evaluation suggest that the Hillingdon RRS does save hospital bed days, but is broadly cost neutral in terms of HA expenditure. The Barthel Index profiles indicated that the majority of RRS patients made progress in terms of the physical activities they were able to perform, and, likewise, the majority of patients who returned the questionnaires were satisfied with the care that they received. Concerns were raised about the hospital readmission rate of the “prevention of admission” category of patient (26 or 56% of whom required hospitalisation either whilst being treated by the RRS or within four weeks of discharge from the scheme). The comparative figure for the 76 “early discharge” patients was 14 or 18%.

The HERG evaluation

HERG chose to undertake an economic evaluation, which, by definition, involves the comparative analysis of alternative programmes of care¹². At the outset, the most obvious comparators appeared to be patients who were eligible to receive care from

Figure1 - The Hillingdon DES Model.



the RRS, but who were admitted instead to inpatient care in Hillingdon Hospital. The perspective taken for the evaluation covered the expenditures incurred by the health service and the social services.

The preferred method of collecting the necessary data would have been via an RCT, but since the scheme was already operational, an RCT was not an option. So HERG used the opportunity to test a simulation modelling technique - discrete event simulation (DES). To identify the key parameters in the DES, a framework was developed to identify all possible resource impacting events which might be experienced by RRS patients and comparator patients at some point during the phases of study (Figure 1).

Data for inputting into the DES model were obtained from a sample of 30 RRS patients who entered the scheme consecutively during a one-month period, and from 21 comparator patients admitted to hospital wards, most of whom had to be identified retrospectively. For each of the 30 patients receiving RRS care, all components of resource use during the RRS treatment period were collected and costed. For comparator patients, a specialty-specific cost per Hillingdon Hospital bed day (inclusive of staff, medications, investigations, equipment and overheads etc.) was applied (£103 for a care of the elderly bed, £142 for a general medical bed, and £263 for an orthopaedic bed). All resources used by both groups of patients during a 28 day follow-up period were also costed, the information being obtained from various sources including RRS case records, hospital inpatient records, Community Trust records, and Social Services information systems.

The HERG evaluation measured outcomes (using the Barthel Index and the EuroQol EQ-5D) for the majority of HaH patients, but only for the few inpatient comparators identified prospectively. Costing data only were entered into the purpose-built DES model, and the outcome data, which were obtained, were analysed separately.

The timescale of the HERG evaluation was constrained by the need to complete an MSc dissertation for one of the authors (HC). However, follow-up on all patients in both the RRS and comparator groups will continue for a minimum of 6 months, and the results will be updated accordingly.

The initial results generated by the DES model revealed that the Hillingdon Hospital RRS is cost saving when compared to conventional inpatient care. The robustness of these results was confirmed by a rigorous sensitivity analysis. The outcome data showed that, although RRS patients made progress in terms of the physical activities they were able to perform while being cared for by the scheme, subjective feelings about health states transmitted via the EuroQol and patient satisfaction questionnaires were not wholly in accordance with physical findings.

Success in achieving the stated objectives

The objectives of an evaluation, as the name suggests, are easily evaluated in terms of success in achievement, or otherwise.

HA evaluation

The descriptive objectives of the HA were comprehensively met, and detailed data on age, socio-demographic characteristics, medical diagnosis, as well as information on the source and frequency of referrals and admissions to the RRS over the 6 month period were provided.

Patient outcomes were described objectively, using the Barthel index to measure changes in the activities of daily living between admission to the scheme and discharge, and through proxy measures identifying adverse events requiring re-admissions to hospital and A&E attendances during and following their time in the RRS. The use of such objective measures is interesting. Patients eligible for HaH cannot generally be categorised as disease specific, thus suggesting that the use of a generic valuation of health benefit would be appropriate. Health-related quality of life is the important outcome - eligible patients for HaH, by definition, can not be suffering acutely from life threatening conditions.

The impact of the RRS on hospital activity was tentatively estimated by comparing the ratio of Care of the Elderly ward admissions to the number of A&E attendances during the first 6 months of the scheme with the same period a year earlier. This provides an indirect measure of the impact of the prevention of admission patients on

hospital activity. No indicator of the impact of early discharge patients was presented. As in the HERG evaluation, the measurement of the impact of the RRS on hospital activity was a peripheral part of the evaluation and this subject formed a key issue in the post evaluation discussion, as is discussed later.

The HA evaluation performed a cost analysis comparing the total cost of the RRS for 6 months with the estimated cost of inpatient care for the same patients, using the number of bed days saved predicted by the referring consultants. The cost to the HA of a medical bed day, and minimum and maximum estimates of the bed days saved were used. This is obviously a crude analysis, and was acknowledged as such. The shortcomings of the HA evaluation, from the perspective of the cost analysis, relate to the method for estimating comparator costs, the restriction of the period of interest to only the time spent in the RRS, and the lack of sensitivity analysis employed to account for the uncertainty inherent in the approach adopted.

Patient satisfaction with the scheme was elicited from a questionnaire, which achieved a response rate of 68% amongst the 108 patients discharged from the RRS after completion of their care package. The survey excluded patients who were readmitted to hospital from HaH, and this is likely to have introduced bias into the estimates of patient satisfaction.

HERG evaluation

The primary objective of conducting a cost-effectiveness analysis was not met due to the problems experienced in recruiting a prospective comparator set of patients. Patients eligible for the RRS, who were receiving inpatient care, could not be prospectively recruited in sufficient numbers during the available time period. A historical comparator group was then assembled, using patients who had been accepted onto the RRS (i.e. they were assessed as being suitable), but had refused to receive HaH care.

The use of historical comparators precluded the collection of outcome data, although their case notes were examined for details of their inpatient stay and cost generating events following discharge were identified. In the light of previous economic evaluations of HaH schemes, which have compared outcomes and found no

appreciable difference between HaH patients and inpatients^{3,5}, an assumption of equal effectiveness appears valid. Thus, the evaluation may be termed a cost minimisation analysis (CMA).

Although any systematic differences between patients who accepted and refused to receive HaH could introduce bias into the analysis, it was felt that the two groups were sufficiently similar (in terms of source and average age) to allow meaningful comparison. The use of a decision model to integrate the cost data facilitated extensive sensitivity analysis to test the robustness of the results. Moreover, inspection of the data for the post-discharge period showed that the patterns of resource consumption for the two groups were similar.

The costs saved (per patient) by the hospital were estimated as the average cost of the inpatient group minus the average cost to the hospital of the RRS. It was not possible, however, to explore the direct implications of diverting patients from inpatient beds, in terms of how the freed-up beds were used. Post-discharge readmissions to hospital, and entry to nursing homes or residential accommodation for both groups were monitored and costed as part of the CMA.

The final objective, to assess the usefulness of DES in evaluating such services, was accomplished. The modelling technique demonstrated flexibility with respect to the structure of, and the data requirements for, the model. The other particularly important aspect of the modelling approach was the ease and extension of the sensitivity analysis.

Interpretation of the stated aims, and applicability to the policy decision

The separate aims identified by the HA and HERG evaluative teams appear similar, but are subject to interpretational differences. This section discusses the possible interpretations of the respective aims, relating them, when possible, to the applicability of the evaluations to the policy decision faced by the management of Hillingdon HA

The raison d'être of the Hillingdon HaH scheme was to relieve winter bed pressures, whereby HaH acted as an overspill to inpatient care when the available resources

within the hospital were being fully utilised. In such a situation the true comparator, defined as “the most relevant to the policy question being addressed” (pg236), is uncertain¹². A do-nothing alternative is not feasible. An evaluation could compare the operation of HaH to the actions employed during the real winter bed shortage of 1996, whereby beds in the wards allocated to elderly patients were supplemented with beds from surgical wards, to the extent that routine surgery was suspended. It is unlikely, though, that such a situation could be considered a viable policy option. In terms of relevant policy alternatives to HaH, therefore, the only possibility would appear to be the creation of extra inpatient capacity, either by extending existing volume, or building new hospital accommodation.

From the HA’s viewpoint, the creation of new hospital capacity was not a credible alternative. The practicalities of extending capacity lie beyond the HA management. Whilst the HA could advise Hillingdon hospital on the need for extra volume, the judgement to apply for funding, and the process of obtaining the necessary funds and resources are controlled by the hospital Trust.

HA evaluation

The HA evaluation, in which the performance of the RRS was described in great detail but without recourse to the collection of any comparator data, should be considered in the context within which the RRS was set up. The discussion of the HA evaluation relates to two aspects of the RRS – a quality threshold and the scope of the scheme - as well as the policy issues regarding the use of the HA evaluation.

The quality of performance threshold

The HA evaluation was intended to provide short-term advice on the progress of the RRS, and to advise on the continuation of the scheme. However, it could also be interpreted as a ‘threshold’ evaluation. Such an evaluation could describe the operation of a service, wherein the objective is to determine whether the service meets an objective, or subjective, threshold of performance. The quality of performance may include such factors as clinical quality, patient acceptability, and resource consumption.

Indeed, the analysis may consist of several (implicit or explicit) thresholds. The extent to which the service surpasses consecutive thresholds can then influence the policy decisions taken. With respect to the comparison of the RRS to the provision of new beds, the lowest threshold of performance may be set to indicate whether the overall standard of service delivery warrants consideration of the extreme policy action of building extra capacity. If this threshold is not met, then a comparative evaluation may be necessary. The relevance of the thresholds is that they relate to the policy maker's perceptions of the required standards of service.

Scope of the RRS

Even if an evaluation assessed the RRS unfavourably, the length of the period before the availability of extra inpatient capacity would be likely to warrant some intermediate decisions relating to the scope and size of the scheme.

The scope of the service relates to the types of patients that are suitable to be treated on the RRS, for example, different categories of admission prevention patients or early discharge patients. The minimum size of the RRS would be set to cope with any winter bed pressures, but no more. A larger size would acknowledge the worth of HaH as an independent service, not purely as a back up programme to accommodate a shortfall in hospital beds.

The impact of the scope of the service on the performance of the RRS was investigated in the HA evaluation. Comparing the outcomes of the different categories of patients within the scheme, particularly the readmission rates, it was concluded "that the selection criteria for admission to the scheme need to be reviewed [especially with respect to] the admission prevention" group" (pg23)¹³. Although the cost consequences of reducing the scope of the RRS were not flagged for consideration, reducing unnecessary readmissions are uncontroversial clinical issues which relate to the configuration of a service, rather than highlighting distinct programmes.

Policy applicability

Other than comment on whether the RRS is an appropriate measure to cope with inpatient bed shortages, it would appear intuitive that the HA evaluation cannot

adequately analyse the size of the RRS. As soon as the scheme becomes a substitute for inpatient care, a credible policy alternative is determined and should itself be evaluated.

However, there are more parameters to be added to the policy equation. Firstly, as the RRS was set up to cover the winter bed pressures, what would happen to it during the spring, summer and autumn? It may not be politically feasible to disband and unite the scheme as and when necessary to cope with bed pressures. If so, outside of the winter period, when the RRS is functioning as a substitute for inpatient beds, the minimum size of the scheme will be determined by the desire to keep the service in operation.

The other factor influencing policy decisions regarding the RRS is the report of the Tomlinson Committee⁹. As mentioned above, this report recommended the establishment of community initiatives as alternatives to hospital admissions, and more importantly, led to the provision of extra monies to set up such initiatives. The core funding for the RRS was specifically targeted to primary and community care programmes. Thus, in terms of the funding made available for reducing the dominance of secondary care, the HA management's policy relevant alternatives to HaH are limited to other programmes which shift resources from acute care to primary and community services.

Again, the notion of a threshold evaluation may explain the HA's reliance on a cost-outcome description. In the absence of evaluations comparing other community initiatives, or indeed in a scarcity of other relevant community initiatives, the policy decision over the RRS may require only confirmation of a certain standard of delivery.

In light of the above discussion, and the difficulties faced by the HA evaluation in terms of choosing a policy relevant alternative to HaH, the evaluation would appear to have provided some useful information to the HA management and their co-funders, as well as to the RRS itself. The primary conclusion of the research is that the scheme should "become a flexible service which functions primarily as an early discharge

support service for medicine and surgery” (pg25)¹³. It was also recorded that it was likely that the scheme did reduce the use of hospital beds.

HERG evaluation

By the time of the HERG evaluation, the anticipated winter bed shortage had failed to materialise and it was clear that the Hillingdon HaH scheme was acting as a substitute for, rather than a complement to, inpatient care. Thus, the relevant alternative was taken to be conventional inpatient care. Likewise, if HERG had undertaken their evaluation in the midst of the expected bed shortage, then the relevant policy alternative could be taken to be a programme of building extra inpatient capacity.

In the immediate scenario, both of the above evaluative strategies are correct. However, a more long term scenario might have encompassed an evaluation considering three alternative programmes. Realising the seasonal nature of the need for HaH, the relevant alternatives could have included the creation of new inpatient beds, a year round RRS, and a seasonal RRS. Account would then be taken of such factors as the annual rescaling of the HaH learning curve, and additional recruitment and capital costs.

Consideration of the impact of the Tomlinson report, and the extra funding made available in order to switch care from the acute to the primary and community sector, provides an insight into the complexities of local policy making. The HERG evaluation, although conducted at a local level, views the policy decision at the macro level, where there are no constraints on the use of any resources (funding). From the macro viewpoint, the relevant alternatives to a HaH scheme are naturally other forms of caring for the same set of patients, the most obvious of which is conventional inpatient care.

From the efficiency maxim, all primary and community care programmes that switch resources away from secondary care should be compared with their inpatient counterparts. The selection of community initiatives, even at the local level, should be based on the incremental cost-effectiveness of the separate programmes when compared with hospital care for the same sets of patients.

The HERG evaluation may be used by the HA to supplement the information provided by its own evaluation, relating to any thresholds that may be deemed relevant to the policy decision regarding the RRS, including the extra information provided on the resources used in the post-discharge period. In addition, the HERG evaluation may be used to compare the RRS to the performance of other primary and community care initiatives which switch resources away from acute care, if any such evaluations are undertaken.

Conclusions

Although the overall aims of the two evaluations were similar – to assist in the decision over the continued funding of the RRS – it might be inferred from their respective starting positions, and the resulting evaluations, that the interpretations of the decision to be taken were dissimilar. The decision pending at the outset of the HA evaluation related to the twin issues of finding an acceptable method of solving the winter beds crisis, and the desire to comply with the report of the Tomlinson Committee. Thus, the aims of the evaluation related to the attainment of an acceptable threshold of performance by the RRS, and to suggestions over possible improvements in the configuration of the scheme.

The HA evaluation provided detailed comment on the activity of the RRS in the course of describing the first 6 months of operation. Indeed, part of the evaluation may be considered as an audit of the service. Although the HERG evaluation did not analyse such issues as patient characteristics, it provided adequate information to advise on both the threshold of service delivery, as well as on suggestions relating to the operation of the scheme. In addition, the HERG evaluation employed a more absolutist interpretation, in which the policy decision includes the question of continued funding for the RRS. This interpretation follows the principles of economic evaluation, whereby incremental cost-effectiveness is measured between programmes of care for similar sets of patients, and then compared across disparate interventions.

The HERG approach may prove to be more durable, in terms of informing future decisions which may arise in relation to the RRS, but it is also true that the HA evaluation provided adequate information for the present policy decision. The

pertinent question then concerns the cost of the respective evaluations, and whether the net additional information provided by either of the evaluations over the other is worthy of any extra cost.

In both studies, the main research resources were free in that both evaluations were presented as theses in part fulfilment of post-graduate degree qualifications (the respective opportunity costs are not quantified). However, the time costs may be compared. DK spent 6 months collecting the data working 2-3 days per week, and a further three weeks analysing and writing up the report, receiving supervision from JA. HC spent 4 months working continuously collecting and analysing the data, and writing up the report, JK built the model and RD provided supervision and some data collection. It would appear that there is little difference in the costs of the two evaluations.

The implication of roughly equal research costs is that the dominant evaluation is that which provides the most useful information to the policy maker. This, of course, is impossible to judge objectively, and only would have been possible if the two reports had come to divergent conclusions. The HA will release the earmarked funds for the RRS to keep it in operation until the end of April, at which point the decision over its longer term future will be taken.

The immediate impact of the two evaluations, which has developed as a result of discussions between the two groups as well as members of the RRS steering group, has been a desire to investigate the use of the freed-up hospital beds. Hopefully, this issue will be explored from an economic perspective, comparing the costs and benefits of alternative methods of utilising the beds at this local level. If HERG are to be involved in such an exercise, the main lesson learnt from the previous evaluation will be to enter into full and proper communication with the HA and the hospital Trust regarding the policy problem being addressed.

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