

REPORT

Centre for
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Economic evaluation of a liaison psychiatry service

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Executive summary

This report provides an independent economic evaluation of the Rapid Assessment Interface and Discharge (RAID) psychiatric liaison service operating in City Hospital, Birmingham. It is based mainly on a critical scrutiny and re-analysis of data collected as part of a wider internal review.

We conclude that the service generates significant cost savings and is excellent value for money.

Psychiatric liaison services provide mental health care to people being treated for physical health conditions in general hospitals. The co-occurrence of mental and physical health problems is very common among these patients, often leading to poorer health outcomes and increased health care costs. An effective liaison psychiatry service offers the prospect of saving money as well as improving health.

RAID is an award-winning service which offers comprehensive mental health support, available 24/7, to all people aged over 16 within the hospital.

The analysis of cost savings in the internal review of RAID focused on the ability of the service to promote quicker discharge from hospital and fewer re-admissions, resulting in reduced numbers of in-patient bed-days.

Based on a comparison of lengths of stay and rates of re-admission in similar groups of patients before and after RAID was introduced in December 2009, in place of a previous, smaller liaison service, the internal review estimated that cost savings are in the range of £3.4 - £9.5 million a year. Most of these savings come from reduced bed use among elderly patients.

To allow for uncertainty in these estimates, we undertook a cost-benefit analysis of RAID based on very conservative assumptions, seeking to address the question of whether the service is demonstrably good value for money even if its claimed benefits are put at the bottom end of a plausible range.

This should provide decision makers with a sound starting point for future planning, including the review of possible options for service re-design.

Our analysis indicates that the incremental cost of RAID (i.e. the additional cost of the service compared with its predecessor) is around £0.8 million a year. In comparison, we estimate on conservative assumptions that RAID generates incremental benefits in terms of reduced bed use valued at £3.55 million a year, implying a benefit:cost ratio of more than 4:1.

The service also offers some potential savings in addition to reductions in bed use, such as fewer discharges of elderly patients to institutional care rather than their own homes.

We conclude that the RAID service is good value for money, particularly as the benefits included in the assessment are over and above any improvements in health and quality of life which are the fundamental justification for health spending. Unlike most health care interventions, RAID actually saves money as well as improving the health and well-being of its patients.

We identify possible areas for further work at the end of the report.

Foreword

Improving the quality of treatment and care in health services is a difficult and continuous challenge in itself but with co-morbidities and complexity increasing at a time of economic austerity, it can appear daunting to say the least. There have been some significant successes in a range of QIPP (Quality, Innovation, Productivity and Prevention) initiatives but more needs to be (and can be) done.

The Government's mental health strategy (No Health Without Mental Health, 2011) recognises this and emphasises the importance of improved services at the interface between mental and physical health where co-morbidities present a broad spread of specific problems. There are a number of facets to this, one of which is encapsulated by liaison mental health services in acute hospitals. There are many of these services up and down the country and an established literature about their clinical effectiveness; hitherto, however, there has been little known about their potential economic impact.

The RAID service in Birmingham represents an evolution of the liaison model and an approach which undoubtedly improves the quality of care for people with mental ill-health in an acute hospital. This economic analysis, however, shows that at the same time such an approach has the potential to save very significant amounts of money for the local health economy. As such, these findings should be of particular interest to all those who provide acute hospital and mental health services - and this should be especially true also for commissioners.

Hugh Griffiths, National Director for Mental Health

Lawrence Moulin, Chair of the National Mental Health SHA Mental Health Leads

Introduction

This report presents the findings of an independent economic evaluation of the psychiatric liaison service provided by the Rapid Assessment Interface and Discharge (RAID) team at City Hospital, a large acute hospital in Birmingham which forms part of the Sandwell and West Birmingham Hospitals NHS Trust. The RAID service is provided by Birmingham and Solihull Mental Health NHS Foundation Trust and commissioned jointly by Heart of Birmingham and Sandwell PCTs.

Our assessment draws heavily on data and analysis from an internal evaluation of the RAID service carried out by a research team headed by Professor George Tadros. We are very grateful to Professor Tadros and his colleagues for providing us with the latest drafts of their evaluation report and related papers, for detailed discussion of their findings and for the provision of supplementary material requested during the course of our investigation. We have also benefited from site visits to the RAID service and from meetings and correspondence with local commissioners, managers and practitioners.

The evaluation of the RAID model being led by Professor Tadros assesses the service from three different perspectives: quality of service, response times and cost savings in the local health economy. Our assessment focuses solely on the last of these dimensions, but it is important to emphasise from the outset that this is only part of the story. The fundamental objective of any health service intervention is to improve the health and quality of life of service users, and it is generally to be expected that the achievement of such outcomes will require the use of more resources. In these circumstances the role of decision makers in the NHS is to strike the appropriate balance between health gain and additional resource use. How much is it worth paying to generate an extra unit of health benefit, or – in the language made familiar by the National Institute for Health and Clinical Excellence (NICE) – what is the cost per QALY ('quality-adjusted life-year') gained?

A noteworthy feature of the RAID service is its claim that it can promote improved health outcomes among service users while at the same time reducing the overall use of resources in the local health economy. In other words, cost per QALY is negative: better health at lower cost. If this combination of outcomes can indeed be achieved, such an intervention is obviously highly attractive from a resource allocation point of view, particularly at a time when NHS budgets are severely constrained.

The remainder of this report sets out some relevant background material, including a brief description of the RAID service, and then presents our economic analysis of the service.

Alongside this report, the NHS Confederation has produced a briefing for its members summarising the findings of the economic evaluation and discussing its implications for NHS organisations.

Liaison psychiatry

Liaison psychiatry services address the mental health needs of people with physical health problems who are being treated in general hospitals. The development of these services is a relatively recent phenomenon in this country and may be seen as part of a wider response to an accumulating body of evidence which shows that:

- very high proportions of people with physical health conditions also have co-morbid mental health problems; this includes 30-65% of medical in-patients (Gomez, 1987); and
- this co-morbidity is associated with a number of adverse consequences, including poorer quality of care for the physical condition, reduced adherence to treatment, increased health service and other costs and poorer health outcomes (Evans *et al.*, 2005; McVeigh *et al.*, 2006; Nuyen *et al.*, 2008; Unützer *et al.*, 2009).

The size of the economic and financial impact of co-morbidity can be very significant. For example, a US study has shown that health care costs for people with diabetes and co-morbid depression are almost twice as high as among those with diabetes alone (Simon *et al.*, 2007), while a UK study in the same field has found that individuals with diabetes and co-morbid depression are seven times more likely to take time off work than those with diabetes on its own (Das-Munshi *et al.*, 2007).

These findings suggest that an effective liaison psychiatry service can promote a range of positive outcomes including cost savings. Rates of co-morbidity are particularly high among elderly people in general hospitals, where they account for about two-thirds of all occupied beds. Up to 60% of these patients have or will develop a mental disorder during their admission, the most common conditions being dementia, depression and delirium. In the case of dementia, a survey carried out in Lincolnshire by the National Audit Office found that patients with this condition were particularly likely to experience delays in discharge and overall more than two-thirds of those with dementia were assessed as no longer needing to be in hospital. Potential savings from quicker discharge were estimated at £6.5 million in the local area, equating to more than £300 million if extrapolated over the whole of England (NAO, 2007).

Although the origins of liaison psychiatry have been traced back as far as the mid-18th century in the USA (Schwab, 1989), the development of this area of specialism did not really begin to take shape in this country until after the Second World War, when specialists in psychological medicine started having an impact on the treatment of general hospital patients.

There was, however, limited development in the introduction of dedicated liaison psychiatry services; indeed, Lloyd (2001) notes that until the 1970s such services were virtually unknown. Informal discussions between interested parties at the Royal College of Psychiatrists at the beginning of the 1980s led to the eventual formation of a Liaison Special Interest Group, followed in the 1990s by the steady introduction of psychiatric liaison services into general hospitals.

Despite continuing further expansion, the availability of these services remains patchy around the country and there is also considerable variation in service models, for example in terms of size and mix of staffing, coverage (e.g. by age of patient and type of mental health problem treated) and location (e.g. hospital-based or in-reach from a community base).

There is now a sizeable international research literature on liaison psychiatry, but the number of clear-cut conclusions which can be drawn from this evidence, particularly on effectiveness and cost-effectiveness, is disappointingly small. There are various reasons for this:

- most studies are descriptive rather than evaluative;
- many of the evaluative studies are subject to methodological shortcomings;
- much of the evidence comes from studies carried out in the USA and may not be readily transferable to this country because of institutional and other contextual differences;
- even for the UK-based evidence, variations in service models, care settings and outcomes measured mean that findings cannot easily be compared or generalised.

A recent systematic review has concluded as follows: “Our findings suggest that liaison mental health services in general hospitals have the potential to be effective in improving outcomes such as length of hospital stay, discharge disposition and hospital costs. Nevertheless, several important concerns about the reliability and validity of these studies persist” (Holmes *et al.*, 2010).

On a more positive note, a meta-analysis combining the results of 14 separate studies has found that liaison psychiatry services had pooled effect sizes averaged over a range of treatment outcomes including length of stay of 0.6, which would generally be considered as indicating a moderate-to-large effect (Draper, 2006).

The RAID service

The RAID service was launched in December 2009 as a pilot project, in succession to an already established but much smaller liaison psychiatry service in City Hospital. The service has received accreditation from the Psychiatric Liaison Accreditation Network (PLAN) of the Royal College of Psychiatrists and also won a Health Service Journal Award for innovation in mental health in 2010.

Key features of the RAID model are as follows:

- The service offers a comprehensive range of mental health specialities within one multi-disciplinary team, so that all patients over the age of 16 can be assessed, treated, signposted or referred appropriately regardless of age, address, presenting complaint, time of presentation or severity.
- The service operates 24 hours a day, 7 days week. It emphasises rapid response, with a target time of one hour within which to assess referred patients who present to A&E and 24 hours for seeing referred patients on the wards. (Data collected in the internal evaluation show that over the period December 2009 – July 2010 the A&E target was met in all but 6.8% of cases and the ward target in all but 10.2% of cases.)
- The service aims to meet the mental health needs of all adult patients in the hospital, including those who self-harm, have substance misuse issues or have mental health difficulties commonly associated with old age, including dementia.
- The service provides formal teaching and informal training on mental health difficulties to acute staff throughout the hospital.
- The service puts an emphasis on diversion and discharge from A&E and on the facilitation of early but effective discharge from general admission wards.

- At the time of the internal evaluation the service ran a number of follow-up clinics for patients discharged from the hospital. These included clinics for self-harm, substance misuse, psychological input and a general old age psychiatry clinic and an adjoined memory clinic.

Information given in the draft evaluation report shows that the service had an average of 250 referrals a month during the period December 2009 – September 2010 (Tadros *et al.*, 2011). Details of origin of referral and patient ages are shown in Table 1:

Table 1: Referrals to RAID, Dec 2009 to Sep 2010

Origin of referral	Number of referrals	16-64 years	65+ years
A&E	1022	95.6%	4.4%
West Midlands Poison Unit	638	95.9%	4.1%
Wards	837	40.4%	59.6%
Total	2497	77.2%	22.8%

As Table 1 shows, A&E was the leading source of referrals, accounting for 41% of the total, with a further 34% coming from the wards and 26% from the West Midlands Poison Unit, which is based in City Hospital. Older people accounted for less than a quarter of all referrals but for nearly three-fifths of those coming from the wards. In terms of gender, 51% of referrals were male and 49% were female.

The top six reasons for referral to RAID were: deliberate self-harm 27.6%; depression 16.2%; cognitive impairment, confusion and dementia 13.6%; alcohol misuse 12.5%; suicidal ideation 10.1%; and psychosis 8.4%.

In terms of follow-up support after discharge from the hospital, 916 of the patients seen by RAID between December 2009 and September 2010 were signposted to services in the community, with the majority of these (71.2%) being to the patient's General Practitioner. A similar number were formally referred to community services after discharge, including 252 to community mental health teams, 207 to home treatment teams and 139 to a RAID follow-up clinic.

Economic evaluation

As noted in the introduction, the internal evaluation of RAID includes an analysis of cost savings in the local health economy which are attributable to the service. Savings are identified and valued in three areas: reduced length of in-patient stay among acute patients in City Hospital; avoidance of admissions to general wards after patients have been seen in the short-stay medical assessment unit (MAU); and reduced frequency of re-admission after discharge.

The evaluation's estimates of minimum and maximum annual savings (2009/10 prices) in each of these areas are shown in Table 2:

Table 2: Cost savings estimated in the internal evaluation of RAID

	Minimum savings	Maximum savings
	£ million per year	£ million per year
Reduced length of stay	1.5	3.0
MAU admission avoidance	0.3	0.3
Reduced re-admissions	1.5	6.2
Total savings	3.4	9.5

Taking a mid-point of these estimates, aggregate savings are thus put at around £6.4 million a year. This compares with an estimated cost of the RAID service of around £1.4 million a year.

The estimated cost savings are based on an analysis of administrative data on patient admissions and discharges. Data on two groups of patients are used in this analysis: first, a retrospective (pre-RAID) control group, consisting of all emergency admissions over age 16 including a mental health diagnosis code admitted between 1 December 2008 and 31 July 2009; and second, an intervention group, consisting of all such admissions between 1 December 2009 and 31 July 2010.

The intervention group comprises two sub-groups: (i) the RAID sub-group, consisting of all those patients in the intervention group who were referred to and directly managed by the RAID service; and (ii) the so-called RAID-influence sub-group, covering all other patients in the intervention group, with a RAID influence being claimed because the RAID team provided training and support to the acute hospital staff who managed these patients during the study period. Training was provided in formal teaching sessions and informal hands-on training alongside the usual clinical case management.

Numbers of patients in the various groups are as follows: pre-RAID control group 2,873; intervention group 3,540, including RAID sub-group 886 and RAID-influence sub-group 2,654.

It may be noted that the intervention group is some 23% larger than the pre-RAID control group, supporting an argument that the presence of RAID has substantially increased knowledge and awareness of mental health difficulties in acute in-patients and hence the diagnosis of such conditions.

The data on patient admissions and discharges were used in various ways for the estimation of cost savings in the three areas identified above.

Length of stay

Patient length of stay is affected by a wide range of factors and to isolate the RAID effect in the evaluation it was necessary to control for as many of these other influences as possible. Use was therefore made of a pair-matched control research design in which patients in the intervention group were matched individually with corresponding patients in the control group, with the matching being based on a number of criteria including gender, age, Health Resource Group, main diagnosis and secondary diagnoses. Because of heterogeneity in the samples, only a proportion of patients in the intervention group could be matched in this way, meaning that the sub-samples used for statistical analysis were relatively small (79 for the RAID sub-group and 359 for the RAID-influence sub-group).

Comparisons of the matched sub-samples showed that average length of stay in the RAID sub-group was 0.9 days shorter than among matched patients in the pre-RAID control group, while for the RAID-influence sub-group the corresponding difference was 3.2 days. Applying these differences to the full (unmatched) samples, the total number of bed-days saved was estimated at 9,290 over the 8-month study period, equivalent to 13,935 bed-days in a full year.

Two points of interest may be noted: first, of total bed-days saved, 91% come from the RAID-influence sub-group and only 9% from the RAID sub-group, implying that the training of acute hospital staff in mental health issues has a bigger impact on length of stay than the direct management of patients by the RAID service; and second, nearly all of the aggregate saving in bed-days (93%) is associated with shorter lengths of stay among older patients, i.e. those aged 65+, rather than among patients of working age.

The cost of a bed-day is put at £200, implying total annual savings of £2.8 million. (The slightly higher figure of £3.0 million given in the draft evaluation report reflects the use of rounding.) Despite individual patient matching, not all relevant influences on length of stay other than the presence or absence of RAID may have been fully taken into account and the figure of £2.8 million is therefore regarded by the RAID evaluation team as a maximum estimate. The £1.5 million minimum estimate given in Table 2 is a statistically generated figure based on confidence intervals.

Medical assessment unit admission (MAU) avoidance

Comparison of the control and intervention groups (full unmatched samples) shows that while 30% of the former avoided admission after being seen in the short-stay medical assessment unit, the corresponding proportion among the latter was higher at 33%. The difference amounts to 160 avoided admissions in a full year. It is further estimated that each of these early discharges results in a saving of £2,250, reflecting the reduced rate of charging which applies under the short-stay tariff as part of the payment by results regime. Total savings from this source were therefore estimated at £360,000 a year.

Reduced re-admissions

A statistical analysis of data on hospital re-admissions, including multiple or repeat re-admissions, among all patients in the control and intervention groups found that, even after taking into account other influences, the likelihood of re-admission was some 70% lower in the RAID sub-group than in the pre-RAID control group. No such effect was found for the RAID-influence sub-group. The lower rate in the RAID sub-group corresponds to an estimated 1800 saved re-admissions in a full year. Average length of stay for re-admitted patients is put at 4.5 days, implying a total annual saving of 8,100 bed-days. (Again it is worth noting that the great bulk of this saving – 86% – results from reduced re-admissions among older people.) The estimates of minimum and maximum monetary savings given in the draft evaluation report are both based on the figure of 8,100 for bed-days saved but incorporate different assumptions about whether the avoided admissions would otherwise have incurred short-stay or full tariff charges under payments by results.

Commentary

This section offers a detailed scrutiny of the above estimates, supplemented by very helpful discussions with members of the evaluation team, the RAID service and other stakeholders.

Distribution of benefits

Cost savings as quantified in the RAID evaluation relate exclusively to savings generated within City Hospital from the reduced use of in-patient beds, whether because of shorter lengths of stay or reduced numbers of admissions and re-admissions. All of these savings accrue within the local health economy, meaning that the analysis has been undertaken wholly from an NHS perspective. This is a perfectly legitimate focus, but does mean that possible wider economic consequences of the RAID service are left out of account. These wider consequences might arise elsewhere in the public sector, especially local authority social services, or in the economy as a whole, if for example better health outcomes among patients of working age lead to reduced rates of sickness absence at work. Possible implications for social services expenditure are discussed further below.

A full economic evaluation of a liaison psychiatry service would ideally need to take into account all such non-NHS effects, but this is far from straightforward from a research point of view, particularly as it would require a good deal of post-discharge follow-up data, and in any event it seems unlikely that a broader perspective would fundamentally change the broad conclusions of the analysis.

Another point on perspective is that the estimation of cost savings within the local health economy leaves open the question of whether these savings are mainly of financial benefit to City Hospital or to local PCTs in their role as commissioners of acute inpatient services.

Essentially this depends on the detailed workings of payment by results. Because this system is based on fixed payments per episode of in-patient care, the general expectation is that savings from shorter length of stay will accrue to the service provider whereas the savings from reduced numbers of in-patient episodes will fall to commissioners. This is, however, a considerable oversimplification. For example, payments per episode are based on nationally set lengths of stay appropriate to each type of episode, with arrangements being made for additional daily payments if actual length of stay exceeds a specified 'trim point'.

The distribution of the financial benefits from reductions in length of stay associated with RAID will therefore depend on the extent to which the days saved were above or below the relevant trim points. Similarly, not all hospital admissions count as additional episodes entailing further payments, the main example being re-admissions which occur within 30 days of previous discharge, for which the hospital receives no extra money.

Although the RAID evaluation report includes some general comments on the distribution of financial benefits, it has not been investigated in detail and we accordingly identify this below as a possible area for further analysis. Nonetheless, the distribution of financial benefits has a number of possible implications, for example in determining who should most appropriately pay for the RAID service.

It does not, however, fundamentally bear on the question of whether RAID is or is not good value for money. In terms of the underlying economics, all that matters for this question is the overall scale of savings generated by the service, not where the savings fall in terms of budgetary impact. Distributional effects are important in their own right but are not directly relevant to any assessment of RAID's impact on the efficient use of health resources.

Additional costs and benefits

All of the cost savings which have been estimated in the RAID evaluation stem from reductions in acute in-patient bed-days, but – as recognised in the draft report – this by no means exhausts all the possible impacts of the service. These include:

Diversion at A&E

Over 40% of all referrals to the RAID service during the study period came from A&E and it is possible that interventions by the service at this point may have prevented some in-patient admissions. There may also have been a ‘RAID-influence’ effect, associated with the training of A&E staff by the RAID team. However, no information has been collected on such diversion at this point of entry into the hospital.

Elective admissions

The samples of patients used in the estimation of cost savings in the RAID evaluation consist entirely of emergency admissions and we were advised that this is because most elective admissions in the locality go to Sandwell rather than City Hospital. It is nevertheless possible that some elective patients were seen in City Hospital by the RAID team (or by RAID-influenced acute hospital staff), with potential implications for length of stay and rates of re-admission, but again no information is available to quantify this.

Increased use of other health services

An important role of the RAID service is to signpost and refer patients with mental health problems to appropriate services in primary or secondary care for follow-up treatment after discharge and it has been suggested that in some areas of service provision this has led to additional demand, with consequent resource implications.

As the introduction of the RAID service led to a significant increase in the overall number of acute in-patients identified with mental health problems, some knock-on increase in the demand for other services is to be expected. Data provided to us by one PCT showed a significant rise in the number of contacts with some secondary mental health services following the introduction of RAID, particularly home treatment and assertive outreach teams. Further analysis would, however, be needed to establish how much of these increases can be attributed to RAID referrals.

Data in the RAID evaluation report shows that the total number of onward referrals to assertive outreach teams was very small in the study period, suggesting that in this case at least other influences were more important.

Taking a longer time perspective, it can also be argued that in so far as the RAID service is effective in putting patients with mental health problems on to more appropriate care pathways, this should result in better health outcomes, leading in time to lower rather than higher health care costs. There is good evidence in the published research literature to demonstrate the cost-effectiveness of early identification and treatment for many mental health conditions.

Discharge destination

Data collected as part of the RAID evaluation indicate that among all elderly in-patients seen by the RAID service during the study period 67% were discharged to their own homes, compared with only 34% in the retrospective control group. (The corresponding proportion among the RAID-influence group was 44%.) On the assumption that those discharged to other destinations went mainly to residential or nursing homes, this is likely to imply significant cost savings in the social care sector.

For example, national data reported by the Personal Social Services Research Unit shows that the average cost of local authority-funded residential care for elderly people was £446 a week at 2006/07 prices, compared with an average cost of £129 a week for home care (PSSRU, 2010). Converted to 2009/10 prices, this implies a cost saving of around £340 a week for each patient discharged to their own home rather than residential care (and an even larger saving in the case of an avoided discharge to nursing home care).

Data provided to us by the evaluation team suggest that the RAID service prevented about 175 discharges to institutional care among elderly people in 2009/10, implying aggregate cost savings of around £60,000 for each week of such avoided care. This is, however, a purely illustrative calculation and because no information is available on lengths of stay it is not possible to make any assessment of aggregate cost savings on an annual basis.

Although not all going in one direction, it seems reasonable to conclude that allowance for the omitted effects described above would on balance increase rather than decrease the estimated total savings associated with RAID.

Methodology

It is generally accepted that, in terms of research design, randomised controlled trials (RCTs) are the best way of evaluating the impact and effectiveness of a health service intervention. This is essentially because the assignment of patients from a sufficiently large sample on a random basis between an intervention group and a control group means that differences between patients in potentially relevant characteristics such as age or severity of condition are evenly distributed across the two groups. This in turn implies that any variation in outcomes between the groups can be directly attributed to the intervention, with all other influences taken into account.

The RAID evaluation is not of this type and is rather an example of a non-randomised design involving the use of a retrospective or historic control, where the outcomes for patients receiving an intervention are compared with the outcomes for comparable patients in the past who did not receive the intervention. The main drawback of this approach is its reduced ability to allow fully for all relevant differences or biases in the comparison, particularly those associated with the passage of time. In consequence, less confidence can be placed in the findings of any such study than in those derived from an RCT.

Notwithstanding this important limitation, the use of a retrospective control group in the RAID evaluation can be justified as a practical way of comparing outcomes for the intervention in question. The RAID service is not like a new drug or surgical procedure, given to a limited number of readily identifiable patients. Particularly because of its role in training clinical staff as well as directly managing patients, the RAID service is likely to have some impact on clinical practice in relation to most if not all patients in City Hospital who are diagnosed with mental health problems.

In these circumstances a research design based on randomisation would not be practicable, because of the impossibility of identifying a control group that would be immune from contamination effects arising from the influence of RAID on patient management throughout the hospital. An entirely different and much more costly study based on multi-site comparisons would be needed for an evaluation of RAID using an RCT design that is free from such effects.

Two main sources of bias or difference can affect the comparison of outcomes between an intervention group and a retrospective control group: differences in the characteristics of individual patients and differences in wider contextual or environmental variables which may potentially influence the outcomes in question (e.g. changes in other aspects of hospital practice affecting admissions or lengths of stay).

As already noted, the RAID evaluation seeks to deal with the first of these problems by the matching of individual patients. This is an accepted way of reducing bias in non-randomised studies, but can introduce difficulties of its own.

In the RAID study the main such difficulty is that the process of matching leads to small and possibly unrepresentative sub-samples, particularly in the case of the RAID (as opposed to RAID-influence) sub-group. After matching, this amounts to only 79 cases. This is a very small sample and perhaps not surprisingly the finding of a reduction in length of stay of 0.9 days for this sub-group is not statistically significant. In contrast, the reduction of 3.2 days for the much larger RAID-influence sub-group is highly significant.

The matched sample for the RAID sub-group may also be unrepresentative, as average length of stay is 17.6 days, compared with only 9.3 days in the RAID sub-group as a whole. The evaluation team have tested for selection bias, but the variation in length of stay within the confidence interval described in this analysis is extremely wide (itself a reflection of the small sample size), leaving the question of representativeness unresolved. In the event, these concerns about the RAID sub-group are not of major quantitative importance, because – as already noted – less than 10% of total bed-days saved because of shorter in-patient stays relate to this group.

Of potentially great significance is the fact that patient matching deals only with the first of the two possible sources of bias mentioned above and does not address the question of whether differences in outcomes between the control and intervention groups were caused, in part at least, by wider changes in the hospital or health service environment that occurred during the course of the study. The RAID evaluation team are aware of this concern and note in their draft report that “there were no major changes in the clinical services, managerial structure or discharge support in the acute hospital during the study period. But, we acknowledge that it was not possible to control for all external changes in the community, during the time period in which RAID cost savings were examined.”

Discussions with commissioners suggested that there were indeed a number of such changes influencing both admission avoidance (e.g. expansion of the number of community beds) and discharge facilitation (e.g. additional social worker capacity and expansion of social care to provide home care packages). In the absence of further detailed information and analysis, it is not possible to assess the quantitative impact of these measures, but it must be assumed that they exerted some downward pressure on the use of in-patient beds, so not all of the reduced costs can be attributed to RAID alone.

A final point on methodology concerns the inclusion of cost savings from the avoidance of admissions at the point of the medical assessment unit (MAU). Our view is that this involves a form of double-counting and the savings should therefore be excluded. The term ‘avoidance of admissions’ is slightly misleading in this context, as all types of saving in the RAID evaluation are based on analyses of the same sample of patients, all of whom were admitted to City Hospital during the study period and had lengths of stay of more than one day. Those seen in the MAU and discharged at this point did not therefore entirely avoid admission but they did have shorter stays than other patients in the study. The fact that there were more of these patients in the intervention group than in the control group is a legitimate source of cost savings, but the savings arise because of shorter stays and all of the savings from this source have already been taken into account in the more general ‘length of stay’ analysis. This covers all patients in the study, including those admitted to the MAU, so a further, separate analysis of the MAU group necessarily implies a double attribution of savings. The confusion seems to have arisen because shorter length of stay is seen as one source of benefit and charging at short-stay rather than full tariff under payment by results as another. The underlying reality is that there is only one source of cost saving, namely reduced use of hospital beds, and the workings of payment by results are only relevant in so far as they determine how this saving is divided between providers and commissioners.

Our assessment

The cost savings estimated in the RAID evaluation are subject to a good deal of uncertainty. A considerable amount of further work would be needed to fill the major gaps in our knowledge, but this would be not only costly and time-consuming but also likely to be subject to diminishing returns because of inherent constraints in the research design.

In the absence of a definitive set of estimates for cost savings, an alternative approach which may be helpful for decision makers is to set out the key features of an economic evaluation of the RAID model using very conservative assumptions. The underlying aim of such an approach is to assess whether or not RAID is demonstrably good value for money even if its benefits are put at the bottom end of a plausible range. If the service is indeed good value for money even on this basis, this should provide decision makers with a sound starting point for future planning, including the review of possible options for service re-design.

Key features of this assessment are:

First, in any economic evaluation of a new or improved health service intervention, costs and benefits need to be assessed against a relevant baseline, usually defined as 'service as usual'. In other words, do the incremental benefits of the new intervention, over and above those provided by service as usual, outweigh any additional costs? In the case of RAID, the appropriate baseline is the previous liaison psychiatry service operating in City Hospital. Being based on a comparison of outcomes before and after the replacement of the previous service by RAID, benefits in the form of reduced bed use are already measured on an incremental basis in the RAID evaluation. Applying the same logic to costs, it has been noted above that the cost of running the RAID service amounts to around £1.4 million a year. Based on data on staff numbers given in the draft evaluation report, we estimate that the equivalent cost of the previous service was around £0.6 million a year. The incremental cost of RAID is thus about £0.8 million a year. The question to be addressed is therefore whether and by how much the incremental benefits of RAID, measured on a conservative basis, exceed this incremental cost.

Second, for the purpose of making a conservative estimate we have restricted the coverage of benefits to reductions in in-patient bed-days in City Hospital, and specifically to shorter lengths of stay and reduced rates of re-admission. Possible wider savings such as reduced use of institutional care by discharged elderly patients are not included.

Third, we have used conservative figures for reductions in inpatient bed-days resulting from shorter stays and fewer re-admissions, based on estimates of bed use at the lower end of the confidence intervals for each of these effects as calculated in the internal RAID evaluation. Figures on this basis made available by the evaluation team indicate full-year reductions of 7,700 bed-days because of shorter lengths of stay and 6,800 bed-days because of reduced rates of re-admission. Estimated on a conservative basis, total bed-days saved thus come to 14,500 a year. If all of this saving were taken in the form of a reduction in bed numbers, the overall number of occupied beds in City Hospital could be reduced by 40. Given a bed occupancy rate of around 90%, this in turn implies that the total number of available beds could be reduced by 44, with occupancy rates unchanged.

Finally, published research studies show that, for any given episode of care, hospital costs typically decline with length of stay, the highest daily costs being incurred in the early period after admission and then declining as the patient moves towards recovery and discharge. A straightforward implication of this is that the cost of a hospital bed-day is higher on average than at the margin. A conservative approach to valuing the reductions in bed-days attributable to RAID would therefore be to base the valuation in all cases on marginal rather than average costs.

The figure we use for this purpose is £245 per bed-day, based on a national average estimate of £255 for the cost of a marginal or “excess” bed day in 2009/10 as used in payment by results (Department of Health, 2011a), adjusted by the so-called market forces factor appropriate to Sandwell and Birmingham Hospitals NHS Trust (0.9591), which takes into account local variations in the costs of NHS inputs relative to the national average (Department of Health, 2011b).

It is important to note that a reduction in bed use does not lead to an immediate cash saving of £245 per bed-day saved. This is because the figure of £245 is calculated on a full cost basis, including fixed as well as variable costs, and by definition fixed costs cannot be reduced in the very short run. The full saving will therefore be realised only after appropriate adjustments have been made to hospital capacity and staffing levels, and the release of cash savings will depend on the speed at which adjustments such as ward closures can be made.

The measurement of savings in terms of full cost is, nonetheless, undoubtedly appropriate as a basis for evaluating the economic benefits of RAID and, more generally, for determining all major health service planning decisions.

Measured in this way, **total incremental savings from RAID estimated on the conservative assumptions described above come to £3.55 million a year (i.e. 14,500 bed-days saved at £245 per bed-day). In comparison, the incremental cost of RAID is £0.8 million a year, implying a benefit: cost ratio of more than 4:1. In the wider context of public expenditure appraisals, such a return would generally be considered as highly satisfactory.** And the benefits covered in this assessment are over and above any improvements in the health and quality of life of service users which would normally form the main justification for investment in a new or improved service.

Possible areas for further work

Our assessment of the RAID service was undertaken within limited resources and on a short timescale. It may therefore be appropriate to conclude by identifying some possible areas for further work.

The distribution of benefits

The cost savings generated by RAID are shared between City Hospital and local commissioners in ways that depend on the detailed workings of payment of results. Re-analysis of the patient admission and discharge data used in the RAID evaluation may be helpful in clarifying the nature and scale of these budgetary impacts, which are of considerable importance to local stakeholders.

Post-discharge pathways

The RAID evaluation focuses on cost savings within City Hospital, leaving to one side the resource implications of possible changes in post-discharge pathways. This is of some importance, not least because it is unclear even whether the net effect on costs is positive (e.g. because of fewer discharges of elderly people to institutional care) or negative (e.g. because of increased use of secondary mental health services). A major constraint on such an analysis is likely to be the limited availability of relevant data, although some progress may be possible using routine sources.

Service design for elderly people

A notable feature of the RAID evaluation is that elderly people represent only about a third of the studied patient samples but account for around 90% of total benefits in terms of reduced bed use. A possible implication requiring further analysis is whether the economic case for RAID could be strengthened by targeting resources more closely on this group.

Training

Another interesting finding of the RAID evaluation is that the training of acute hospital staff in mental health issues appears to have a bigger impact on length of in-patient stay (though not on re-admissions) than the direct management of patients by the RAID service. This too has possible implications for service design that may merit further investigation.

Impact in A&E

Over 40% of referrals to the RAID service come from A&E, but no information was collected in the internal evaluation on the impact of interventions at this point, which may include the prevention of some in-patient admissions. Further information on the role of RAID in A&E would be valuable.

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