Impact of an integrated rapid response psychiatric liaison team on quality improvement and cost savings: the Birmingham RAID model

Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

CRD summary
The study objective was to assess the effect of the Rapid Assessment, Interface and Discharge (RAID) integrated model on readmission rates and length of stay for patients with mental health issues. The authors concluded that adoption of RAID could lead to a reduction in readmissions, length of stay and hospital costs. Limitations in the reporting and scope of the analysis, particularly with regard to costs, mean that it is not clear whether the authors’ conclusions are appropriate.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The study objective was to assess the effect of the Rapid Assessment, Interface and Discharge (RAID) integrated model on access to psychiatric assessments and services, and on readmission rates and length of stay for patients with mental health issues (category F, ICD-10).

Interventions
The intervention was the Rapid Assessment, Interface and Discharge (RAID) integrated model at City Hospital, Birmingham, UK. The model consisted of a multi-professional team that provided an all-hours integrated rapid response mental health service. The service was available to any patient aged at least 16 years. The RAID team provided formal and informal training to the acute hospital staff, including two days’ training on dementia, depression, delirium and dignity every three months and a one-hour weekly session on different mental health issues. The study included patients with a mental health diagnosis of category F, ICD-10 who were in hospital for more than one day. The comparator was standard care.

Location/setting
UK/hospital

Methods
Analytical approach:
This was a retrospective analysis of data from the introduction of the RAID model. Patient data were accessed directly from City Hospital. Three patient groups were identified: RAID group of patients managed by the RAID team (referred December 2009 to July 2010); RAID-Influence group of patients not referred to RAID but with an overlapping discharge date (used to assess the indirect effect of RAID); and pre-RAID (control) group of patients admitted between December 2008 and July 2009. Data were collected over an eight-month period. All data were reviewed independently by a team at the London School of Economics (LSE) who provided alternative result estimates. The authors did not state the perspective but appeared to adopt a limited hospital perspective.

Effectiveness data:
The key effectiveness measures were reduced risk of patient readmission and reduced length of hospital stay. The authors assumed that the effect of the RAID team intervention could not be measured directly but could be inferred from observed variables such as reduced readmission and length of stay. The time to readmission of RAID patients versus RAID-Influence and Pre-RAID patients was estimated using a Kaplan-Meier plot using data from City Hospital for the three patient cohorts. A categorical variable was introduced to identify patient group. A Cox proportional
hazards model was used to analyse the effect of various covariates on the model. The model was used to calculate hazard ratios for each of the patient cohorts to estimate the relative risk of readmission between groups.

Reduction in length of hospital stay was calculated using a case-by-case matched control design. In each analysis pairs were matched on items including sex, Health Resource Group, diagnosis, age and seasonal variability. Matching resulted in a smaller subset of RAID versus Pre-RAID and RAID-Influence versus Pre-RAID groups. Each pair of sets was used as a direct empirical measure of the savings in the length of stay.

Monetary benefit and utility valuations:
Not applicable.

Measure of benefit:
Reduction in patient readmission risk and length of stay.

Cost data:
Total annual cost savings resulting from RAID were estimated by calculating the number of bed days saved as a result of reduced length of hospital stay and reduced numbers of readmissions. The result for number of saved bed days over the eight-month observational period were scaled up to give a result over 12 months and a corresponding daily saved bed-day rate. The authors assumed that each avoided readmission saved an average 4.5 hospital days. The annual number of bed days saved were converted into a corresponding cost saving.

Analysis of uncertainty:
A Monte Carlo randomisation approach was used to calculate the confidence interval of the main population mean for the length of stay.

**Results**
The hazard ratio for Pre-RAID versus RAID was 2.45 (95% CI 2.33 to 2.57) which indicated that the RAID model decreased the hazard of readmission by 65% compared to the Pre-RAID group. The hazard ratio for RAID-Influence versus RAID was 2.80 (95% CI 2.68 to 2.92) which indicated that the RAID model decreased the hazard of readmission by 60% from the RAID-Influence group. The RAID model reduced the readmission of patients with all mental illness codes from 15 readmissions for every 100 patients in the pre-RAID group and 12 readmissions for every 100 patients in the RAID-Influence group to four readmissions for every 100 patients in the RAID group.

In the RAID versus Pre-RAID analysis, average length of stay after matching was 9.4 days in the RAID group and 10.3 days in the Pre-RAID group with 0.9 saved days per patient (p=0.31). In the RAID-Influence versus Pre-RAID analysis, the average length of stay after matching was 5.2 in the RAID-Influence group and 8.4 days in the pre-RAID matched group with 3.2 days saved per patient (p<0.001).

It was estimated that 1,200 admissions over eight months could be avoided with RAID. This corresponded to an annual saving of 8,100 bed-days and a daily saved bed-day rate of 22 beds (in a hospital with 600 beds). Reduced length of stay led to a total of 9,290 bed days estimated to have been saved in eight months due to RAID. This corresponded to an estimated 13,935 bed days saved over 12 months with a daily saved bed-day rate of 38 beds (95% CI 21 to 42), mostly from the geriatric wards. The total expected bed days saved was 43 to 64. The corresponding annual financial savings were estimated to be £4 million to £6 million (based on saved beds). LSE estimated the saving to be around £3.5 million using a conservative calculation of 44 beds per day saved.

**Authors’ conclusions**
The authors concluded that adoption of a rapid response integrated model such as RAID could lead to a reduction in readmissions, length of stay and hospital costs.

**CRD commentary**
Interventions:
The interventions were appropriate. The authors gave a description of the intervention and the services provided with it. Specific details of the care delivered before the implementation of RAID were not discussed so the exact nature of the comparator was unclear. The authors did not discuss any other relevant alternatives.
Effectiveness/benefits:
The effectiveness estimates and methods used to derive them were reported clearly. Justification was given for using reductions in readmission and length of stay as surrogates for quality of care and improved health outcomes. Risk of readmission and length of hospital stay were proxy measures of benefit. No direct health measures were evaluated so the real health benefit was unclear. The focus of the paper was evaluating cost savings.

Costs:
The method used to derive the number of bed-days saved was reported clearly. The value of cost applied to one saved bed-day and the method used to derive this were not reported. It was unclear what hospital costs were taken into account when considering the cost of one bed day so it was unclear whether the final reported value of costs saved was appropriate. Costs were assessed from a limited hospital perspective; key hospital costs (such as the cost of the intervention) did not appear to be considered. The effect that early discharge of patients might have had on other NHS resources and on societal costs was not explored.

Analysis and results:
A key limitation of the study concerned the limited scope and reporting of the analysis. It appeared that only certain hospital costs were considered in the analysis. In particular it appeared that the actual cost of the intervention was not included. A full economic analysis should include intervention costs. The results may be valid for the scope of the analysis but the reader should consider carefully whether the analysis captured all costs relevant to their situation.

Another limitation of the analysis was the lack of a full sensitivity analysis; this made it unclear how robust the results were. The alternative LSE results were stated to represent a more conservative analysis but not enough details of this analysis were reported to allow for commentary.

Concluding remarks:
Limitations in the reporting and scope of the analysis, in particular with regards to the costs included, mean that it is not clear whether the authors' conclusions are appropriate.

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