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# Efficacy of a triage system to reduce length of hospital stay

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**Background**
Attempts have been made to improve the efficiency of in-patient acute care. A novel method has been the development of a 'triage system' in which patients are assessed on admission to develop plans for discharge or transfer to an in-patient ward.

**Aims**
To compare a triage admission system with a traditional system.

**Method**
Length of stay and readmission data for all admissions in a 1-year period between the two systems were compared using the participating trust's anonymised records.

**Results**
Despite reduced length of stay on the actual triage ward, the average length of stay was not reduced and the triage system did not lead to a greater number of readmissions. There was no significant difference in costs between the two systems.

**Conclusions**
Based on our findings we cannot conclude that the triage system reduced length of stay, but we can conclude that it does not increase the number of readmissions as some have feared.

**Declaration of interest**
None.

Admission to hospital for mental ill health is an expensive resource. As it became clear that community-based alternatives were both feasible and less costly, there has been a steady reduction in the number of acute admission beds in many countries around the world. In fact, most countries have fewer than 100 beds per 100 000 people.[1] This is accompanied by pressures to avoid hospital admission and shorten lengths of stay. In the UK, average length of stay is still higher than the Organisation for Economic Co-operation and Development (OECD) average (21 days for mood disorder to 38 days for psychosis),[1] which suggests further efficiency is possible. The average bed occupancy is about 85% but is frequently 100% or more[2–4] (H. Wickham, South London and Maudsley NHS Foundation Trust, personal communication, 2013) and this affects the amount of time that staff have to provide more than a temporary stabilisation of the most acute symptoms. This probably contributes to the 'revolving door', as patients experience repeated cycles of brief admissions with no resolution to their underlying problems.[5] Paradoxically, it also leads to delayed discharges of some patients who need, but cannot access, the type of sustained therapeutic intervention that might result in more lasting recovery as a result of ward staff spending time on bed management tasks rather than engaging with patients in potentially therapeutic communication or activities.[6] The OECD[1] highlights the challenges worldwide of the need for mental health services that allow smooth and efficient movement of patients from community to specialist and in-patient services according to their needs.

In this context there have been many varied attempts to improve the efficiency of acute in-patient care in most countries. Thirty years ago, Hirsch[7] showed that patients randomly allocated to a short admission programme rather than regular admission, improved as much as the comparison group despite a 33% reduction in the length of their hospital stay. Subsequently, crisis resolution and home treatment teams have been developed in an attempt to prevent admission to hospital and to facilitate earlier discharge where admission was unavoidable. The results have been mixed, with little reduction in in-patient bed use.[8,9] Another approach and the subject of this paper, is the use of 'triage' care. In this case, all acute admissions are directed to one in-patient facility that has a capped length of stay (typically 7–10 days) and is tasked with rapid stabilisation of the acute episode. Patients who are assessed as needing a longer period of in-patient treatment are subsequently transferred to other in-patient settings that offer more rehabilitative care. Early experience of this model has claimed considerable benefit both clinically and in terms of greater efficiency. In a local example, over a 6-month period 406 patients were admitted to the ward, with 170 (46%) being discharged home within a week. The mean occupancy rate on the triage ward during that period was 70% of capacity, allowing for the temporary admission of patients from other boroughs where no in-patient beds were available.[10]

Despite their appeal, triage services have not been subject to robust investigation. It is unclear, for example, whether compared with a system without triage the claimed advantage of the model is sustained in the face of wider pressures on efficiency, whether it achieves the hoped-for cost–benefit or whether the savings from those patients discharged within the 7- to 10-day target are offset by even longer stays in those patients who are transferred to less acute settings.

In this paper we report an evaluation of admissions over a 12-month period to a hospital system that includes a triage ward, and hypothesise that compared with a routine service the triage system will demonstrate shorter overall length of hospital stay. As short admissions might result in the adverse effect of increasing the likelihood of subsequent readmission, we also followed up each admitted patient for a period of 12 months after their discharge.

## Method

### Setting

The study was carried out in one large mental health organisation responsible for all mental health services in a deprived inner-city

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area and hence length of stay, as expected, is longer than elsewhere in England. The defined geography covered four catchment areas, each of which has its own in-patient hospital provision prioritised for catchment area residents, but patients from any area – including other areas in the UK – may be admitted. For this paper we compare rates of hospital admission in two of these areas, one of which operates a triage system of care and the other that provides a traditional service.

### Triage service

Triage services are located in an area of London with an adult population of approximately 275 000 and an average index of deprivation score of 30.97 (ranking 31 out of the 326 boroughs in England[12]). The in-patient resource comprises 79 beds (16 mixed gender). The triage ward is a single point of admission for the entire catchment area, with length of stay limited to a maximum of 10 days after which patients are either discharged or, if necessary, transferred to one of the three 'locality' wards. The intensive assessment process allows for immediate discharge planning on the day of admission. This admission model is based on a holistic approach aiming for more efficient and continuous care, with the patient's community mental health team (CMHT) and home treatment team (HTT) significantly involved in both the admission and discharge processes. In the whole period of acute care the HTT acts as an extension of the in-patient services, providing high levels of support immediately after discharge. There is also a psychiatric intensive care ward of 10 beds.

### Routine service

The comparison routine service is an area well matched for population (300 000 residents), with an average index of deprivation score of 31.24 (ranking 29 out of 326 boroughs[11]). Beds are provided in five wards (one of which closed during the year of study), of 18 beds each, which accept acute admissions. Patients are admitted to a ward with an available bed for their whole stay. As in the triage system there is involvement of the patient's CMHT and a separate HTT that liaises with each of the wards to facilitate discharge. There is also a psychiatric intensive care ward of 10 beds.

### Data extraction

Data on all admissions and discharges were extracted from the comprehensive electronic patient record using the Clinical Records Interactive Search (CRIS) system. This has regulated access to anonymised information extracted from the Trust's electronic clinical records system, which is updated daily.[12] Data were extracted for dates of admission and discharge from all the wards in the two study areas and pathways on discharge including any input from HTTs. Demographic and diagnostic characteristics of each admitted patient were also extracted. Two data-sets were created to contain:

(a) All admissions to the two systems between 1 January and 31 December 2009 for analyses of length of stay and costs. There were no admissions with lengths of stay that exceeded the date of data collection and so no censoring was necessary.

(b) All readmissions in the 1-year window following discharge from their first admission (i.e. index admission) in 2009 for the readmissions analysis. This allowed for a fair comparison by limiting the same period of time for readmission to occur, regardless of the admission date or the length of stay. There were no observation periods that exceeded the date of data collection.

### Analysis

This was carried out in four steps. To determine whether there were differences between the in-patient systems we first needed to identify whether the systems admitted different patient groups. This was investigated with *t*-tests and chi-squared tests. Then we investigated whether compared with routine care, the triage system discharges a greater proportion of patients back into the community within 10 days – that is, whether the triage did act as a fast throughput ward and therefore is different to the routine care system.

Second, we carried out an analysis of the length of stay for each admission as (a) length of in-patient care – the period from the night of admission to the day of discharge home – and (b) length of acute care, which includes any involvement of the HTT as a step-down from hospital. As these analyses are by admission and some patients had multiple admissions during the study period, all models accounted for non-independence of observations using random effects linear regression including a random intercept at the patient level. Due to the skewed distribution of length of stay, we used bootstrapping to estimate standard errors and confidence intervals. Additionally, to adjust for any confounders owing to differences in patient characteristics between the two areas, we constructed multivariable models using the same techniques and adjusted for patient characteristics which have been shown to be important in predicting length of stay in other studies.[13,14]

Third, we carried out an analysis of readmissions to hospital. To estimate difference in odds of a readmission (readmitted or not within 1 year) between the care systems, we used a logistic regression model and added potential confounding variables using a stepwise selection technique with a threshold of $P<0.20$. Categorical variables were tested using likelihood-ratio tests.

Fourth, in an analysis of the costs of the two systems, we used the same statistical models and adjusted for the same confounders as for the length of stay analyses. We extracted data on the number of HTT visits that each patient received, and multiplied the number of in-patient days and the number of HTT visits by unit cost figures from National Health Service reference costs[15] (adult acute mental health in-patient care day, £304; face-to-face contact with a crisis resolution home treatment team, £179).

It is fairly common practice that some patients are granted periods of trial leave prior to final discharge. Sensitivity analyses were conducted that repeated the multivariable analyses of length of stay and costs, but defined length of stay as the number of days spent physically present in hospital during an admission ('bed days'), i.e. excluding any leave periods before official discharge. The cost sensitivity analysis was performed under the assumption that in-patient costs while the patient was on leave were negligible and thus the analysis applied the same cost estimates for in-patient care (£304). Percentile-based confidence intervals are reported for all length of stay and cost analyses. All analyses were carried out using Stata v.12.1 for Windows.

## Results

### Difference in admitted patients between triage and routine care

There were a total of 935 admissions to the triage system and 899 to routine care over our census year. There were few differences – none reaching statistical significance between the characteristics of people admitted in the two systems (Table 1). Psychosis accounted for the largest diagnostic group in both systems and about 40% were involuntary admissions. For a fair comparison of the two systems, all admissions were analysed regardless of whether or



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**Table 1** Description of admissions to the two systems[a]

| | Routine care system[b] | | Triage system[c] | |
|---|---|---|---|---|
| *Demographic and clinical characteristics* | | | | |
| Age, years: mean (s.d.) | 39 | (12.0) | 39.2 | (12.7) |
| Male, *n* (%) | 506 | (56) | 502 | (54) |
| Ethnicity, White: *n* (%) | 385 | (43) | 476 | (51) |
| Missing | 13 | (1) | 22 | (2) |
| Primary diagnosis, *n* (%) | | | | |
| Drug-related disorder | 74 | (8) | 107 | (11) |
| Psychosis | 451 | (50) | 411 | (44) |
| Bipolar disorder | 128 | (14) | 110 | (12) |
| Depression | 90 | (10) | 88 | (9) |
| Anxiety | 46 | (5) | 85 | (9) |
| Personality disorder | 22 | (2) | 59 | (6) |
| Other/unspecified | 49 | (5) | 41 | (4) |
| Missing | 39 | (4) | 34 | (4) |
| Involuntary admission,[d] *n* (%) | 354 | (39) | 401 | (43) |
| *Admission characteristics* | | | | |
| Admission resulting in home treatment, *n* (%) | 236 | (26) | 301 | (32) |
| Admission from outside catchment area, *n* (%) | 188 | (21) | 225 | (24) |
| Rapid discharge (<10 days) , *n* (%) | 259 | (29) | 403 | (43) |
| Length of in-patient stay, days | | | | |
| Mean (s.d.) | 47.0 | (84.7) | 44.7 | (75.2) |
| Median (IQR) | 22 | (8–53) | 16 | (4–57) |
| Length of acute care (including HTT), days | | | | |
| Mean (s.d) | 51.8 | (90.8) | 54.5 | (79.3) |
| Median (IQR) | 26 | (11–58) | 27 | (6–76) |
| Number of bed days (in-patient stay excluding periods of leave from ward) | | | | |
| Mean (s.d.) | 45.3 | (85.7) | 36.1 | (57.2) |
| Median (IQR) | 20 | (7–49) | 15 | (4–46) |
| Readmission characteristics | | | | |
| Any readmission within 1 year of discharge from index admission,[e] *n* (%) | 249 | (35.6) | 259 | (35.4) |

IQR, interquartile range; HTT, home treatment team.
a. Figures presented are from the length of stay data-set unless otherwise stated.
b. Admissions, $n=899$; individuals, $n=737$; admissions per individual, $n=1.22$.
c. Admissions, $n=935$; individuals, $n=757$; admissions per individual, $n=1.24$.
d. Informal admissions included those individuals voluntary admitted. Those admitted under the Mental Health Act 1983 Section 2/3 were formally detained.
e. Calculated on readmissions data-set.

not patients were resident in the catchment area. Admissions from individuals recorded to be homeless were assumed to be inside the catchment area. In both systems, a similar proportion of all admissions were for 'out of area' residents (routine care 21%; triage 24%).

## Differences in length of stay between the two systems

Figure 1 shows probability density distributions of length of in-patient stay with and without involvement of the HTT in both systems. It is apparent that more admissions to the triage system resulted in rapid discharge, but both systems had a long 'tail' of admissions that were in excess of 60 days. The use of HTT differed. In the routine care system, HTT duration was largely focused around 1–2 weeks following discharge from hospital, whereas in the triage system patients generally had longer contact with the HTT. When the two components were considered together as a period of acute care, there were no differences between the systems. Looking in detail, we noticed that for the acute care episodes of short duration, both systems used a similar percentage of days on home treatment to days in in-patient care. However, for the longer-care episodes we noticed that the triage system discharges individuals to HTT care for longer.

Odds of discharge within 10 days for catchment area patients are over twice as high in the triage system compared with the routine care system (odds ratio (OR) 2.31, 95% CI 1.72–3.09, $P<0.001$). No significant difference was found in the odds of a rapid discharge from admissions originating outside the catchment areas for the routine care system or comparing the two systems (interaction effect). These results remained stable (OR = 2.54, 95% CI 1.88–3.42, $P<0.001$) in a multivariable model adjusted for patient characteristics (online Table DS1).

### Total length of in-patient stay

A univariable analysis showed that although the length of in-patient stay was on average lower in the triage system, the difference was not statistically significant (mean difference –3.87 days, 95% CI –12.20 to 4.47, $P=0.364$). A multivariable analysis (Table 2) taking account of patient characteristics also failed to provide evidence of a difference between the systems (mean difference 0.53 days, 95% CI −9.77 to 7.21). Patients treated in the routine care system who were resident outside its catchment area had a shorter length of stay than those from its catchment area, but this was not seen for the triage system (interaction effect).

Our sensitivity analysis suggested that the triage system uses more leave periods within admissions. By excluding the periods of leave from the measure of length of stay, the average number of days spent on the ward was lower in the triage system (mean difference −8.36 days (95% CI −16.54 to −1.51, $P=0.030$).

### Home treatment teams

In the triage system more people were followed up by the HTT (32%) at discharge compared with 26% in the routine care system (OR = 1.50, 95% CI 1.12 to 2.01, $P=0.006$). These results remained stable in a multivariable model adjusted for patient


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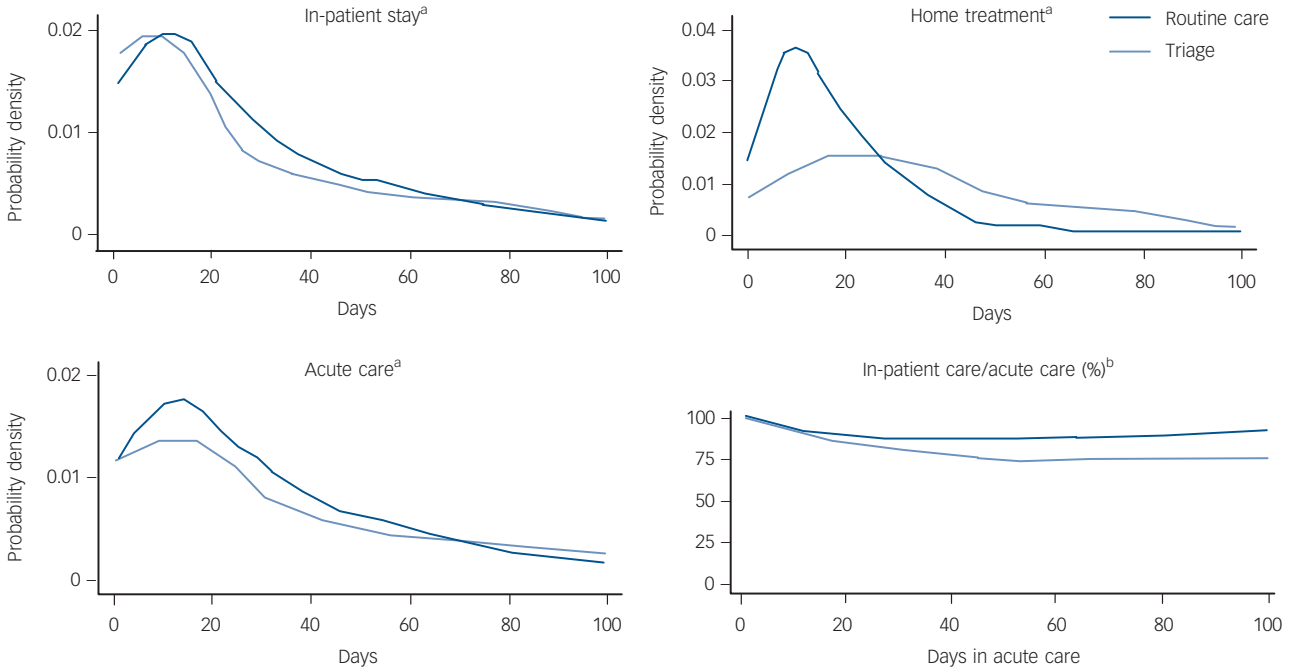


**Fig. 1** Length of care components.

a. Probability density functions estiamted using a kernel smoothing function calculated on full sample, distribution censored at 100 days.
b. Locally weighted scatterplot smoothing (LOWESS) curves, censored at 100 days.
Acute care = Length of stay including any use of Home Treatment. Acute care admissions lasting 100 days or less accounted for 85% of the full sample.

characteristics (OR = 1.71, 95% CI 1.21 to 2.41, $P = 0.002$) (online Table DS2). Repeating the multivariable analysis of length of stay but including the additional days spent with the HTT showed that the mean length of acute care is actually somewhat longer in the triage system, although this difference was not statistically significant (mean difference 7.83 days, 95% CI −1.62 to 15.63, $P = 0.076$) (online Table DS3). Our sensitivity analysis of acute care showed that even when excluding periods of leave from the duration of acute care, the mean difference remained higher in the triage system, although this difference was not significant (mean difference 5.8 days, 95% CI −3.45 to 13.49, $P = 0.171$).

### Differences in readmissions

About 1 in 3 of the admissions in each system resulted in a readmission within 1 year of discharge. A multivariable model showed no significant difference in the probability of readmission between the two systems (odds of readmission triage *v.* routine 1.05, 95% CI 0.77–1.44, $P = 0.758$) (online Table DS4). Results from the univariable analysis were: odds of readmission triage *v.* routine 0.90, 95% CI 0.80–1.22, $P = 0.925$).

### Cost differences between the two systems

Similar to the analysis of length of stay, our exploratory cost analysis suggested that there were no statistically significant differences between the two systems. The mean cost of an acute care episode (in-patient length of stay and number of home treatment visits) was £15 233 in the triage system compared with £15 476 in the routine system. A univariable linear regression of the cost of an episode accounting for the effect of clustering within patients suggested that the triage system had lower costs compared with the routine care system, but the difference was not statistically significant (cost difference −£553, 95% CI −£3522 to £1974, $P = 0.608$). Adjusting for potential confounders, the mean difference in the cost of acute care for patients treated within their catchment area was estimated to be higher in the triage system (cost difference £391, 95% CI –£2535 to £2748, $P = 0.766$) (online Table DS5). Our sensitivity analysis tested the difference between the two systems under the assumption that in-patient costs associated with patients on leave from the ward were negligible. In this model, the mean difference in cost for patients treated within their catchment area between the two systems was not significantly lower in the triage system (cost difference −£1915, 95% CI −£4235 to £405, $P = 0.106$).

## Discussion

In an attempt to overcome some of the pressures and challenges characterising current acute care, many inner-city services are experimenting with triage models. These services have been heralded as a panacea for the problems experienced in in-patient care but until this study there was no robust evidence of benefits. The triage ward provides rapid clinical assessment which should reduce length of hospital stay with no increase in readmission and at no extra cost.

Our results provide partial support for these aspirations. Although it is clear that the triage ward does achieve more rapid discharge for a greater proportion of its patients, this is not the whole story as it will be recalled that patients who cannot be discharged home within 10 days are transferred to locality wards within the hospital. Of all the admissions to the triage system, 43% lasted for less than 10 days, so it was working as it should. But the average length of in-patient stay within the whole triage system was not reduced significantly compared with routine care. It is possible that streaming admissions will have an effect of encouraging longer stays on in-patient areas that have a more rehabilitative focus. Furthermore, patients needing to assimilate into a new clinical team may delay discharge as well. This indeed seems to be the case as average lengths of stay between the two systems are broadly comparable.



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**Table 2** Length of in-patient stay[a]

| | Days | Bootstrap s.e. | *P* | 95% CI (percentile-based) |
|---|---|---|---|---|
| Service system | | | | |
| Routine (in catchment) | reference | | | |
| Triage (in catchment) | −0.53 | 4.37 | 0.903 | −9.77 to 7.21 |
| Interaction between system and catchment area | | | | |
| Admission from outside catchment area (for routine care, reference) | −13.39 | 5.86 | 0.022 | −24.20 to −1.25 |
| Service system x catchment area (interaction, additional effect of triage) | 10.02 | 7.83 | 0.200 | −5.98 to 23.93 |
| Diagnosis | | | | |
| Schizophrenia | reference | | | |
| Other psychotic disorder | −12.32 | 5.53 | 0.026 | −24.18 to −2.50 |
| Bipolar and related disorder | −4.76 | 8.96 | 0.595 | −20.78 to 14.74 |
| Depressive disorder | −9.34 | 5.82 | 0.109 | −21.04 to 2.19 |
| Neurotic and anxiety disorders | −19.58 | 10.61 | 0.065 | −36.37 to 3.68 |
| Personality disorder | −22.28 | 8.63 | 0.010 | −39.54 to −6.14 |
| Substance use disorder | −27.02 | 4.90 | <0.001 | −37.74 to −17.84 |
| Other/unspecified | −2.17 | 9.54 | 0.820 | −17.64 to 18.56 |
| Age | 0.06 | 0.16 | 0.697 | −0.25 to 0.38 |
| Previous number of admissions (log scale) | 9.36 | 3.33 | 0.005 | 3.94 to 16.59 |
| Admission status | | | | |
| Voluntary | reference | | | |
| Compulsory assessment | 1.67 | 2.66 | 0.529 | −3.60 to 7.31 |
| Involuntary treatment section | 69.83 | 5.65 | <0.001 | 57.92 to 79.55 |
| Fixed residence | | | | |
| Yes | reference | | | |
| No | 69.54 | 9.65 | <0.001 | 51.35 to 89.76 |

a. Multivariable linear regression model including a random intercept to account for clustering effects by patient. Bootstrapped standard errors and percentile-based confidence intervals were estimated using 1000 repetitions. Number of admissions, 1722; number of individuals, 1367; average number of admissions per person, 1.3. Intraclass correlation coefficient (ρ) 0.49.

When considering the episode of acute care – i.e. including the use of HTTs in addition to in-patient treatment – the duration of care was longer by 8 days in the triage system, although the difference was not statistically significant. We did not find any difference in readmission rates between the two types of care, so there was no evidence to support the fears that short admissions in triage systems will be associated with increased readmission. There was also no statistically significant benefit or disadvantage in terms of costs. In our sample there was a slightly higher cost of £391 in the triage system but this difference was not statistically significant.

## Strengths and weaknesses

To our knowledge, this is the first study to explore the impact of a triage ward on the wider in-patient care system. We analysed comprehensive data on admission numbers and length of stay across both in-patient wards and HTT with little missing data on diagnostic or demographic information that may also play a part in determining the duration of hospital stay. In our efforts to report an accurate description of the two systems we chose to define length of stay with and without periods of leave and to present both findings. The leave period does have an associated in-patient cost as the bed is not available for another patient, and many patient costs may have been transferred to the HTT before official discharge from in-patient care. In our sample, 50% of admissions using home treatment were initiated before official discharge. This approach allowed us to consider whether there were any potential significant effects on length of stay and costs when all the variables favoured the triage system. Our cost analysis should be regarded as exploratory only as we did not have access to detailed information on differences in actual spending between the triage and routine care system and so had to base this on assumptions that the daily cost of in-patient and HTT contacts were identical across the two geographical locations as well as independent of the characteristics of the patients. However, information from our staff census provided no evidence of differences likely to affect our analyses. The quality of data on HTT non-face-to-face contacts in our database was uncertain and so we limited our cost analyses to include only face-to-face contacts. However, according to the Department of Health,[16] non-face-to-face costs account for only 8% of total HTT costs.

There has been pressure on all services to increase efficiency and it may be that all services have changed their assessments to make faster discharge decisions and that this moving control in our comparisons has affected our results. However, this would indicate that there is still opportunity within routine care for increased efficiency, i.e. that any advantages of the triage system can be reduced with better attention to discharge planning in routine services. Second, there is an expectation in delivering services that patient experience is central and this has recently been emphasised by the publication of the Francis report[16] on UK in-patient care. There is evidence that the two systems do, as expected, use the components of care (in-patient and home treatment) differently. This mix of care may affect the patient experience. This patient experience may tip the balance of evidence on the worth of this new triage system and we have not tried to measure this effect. Of course there will also be questions of being able to replicate the results, as this study was carried out within one area. However, we were clear that both triage and routine services were similar and any patient differences would be controlled in analyses. In both areas there was a high demand for in-patient services and this is exactly where the triage system should provide benefits. The fact that it did not suggests that, at least in inner-city areas, the system does not provide tangible benefits. Finally, this study did not attempt to address the sustainability of the system in terms of staffing. The triage system we investigated has been in place for 9 years; however,



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the workload or other aspects of working in a triage ward may affect staff turnover or factors that impact on quality of care such as staff burnout.

Despite the popularity of the triage system in the plans for clinical care and all our efforts to provide an advantage to triage, we cannot conclude that the triage system is superior to routine care. We were not able to discover any benefits to the triage system in terms of length of stay and costs across the wider in-patient system despite the triage achieving shorter lengths of stay for some patients. There seemed to be no risks associated with the triage system including a 'revolving door' of increased readmissions over the course of a year. The routine care system comparison service was able to discharge patients as quickly, and those patients were not readmitted less frequently in the triage ward. There may be other advantages not apparent in these analyses. For instance, the current emphasis is on patient and staff experience as important components of sustainable, high-quality care. Our next investigation will include this information to make a considered decision on whether the triage system has any advantages or disadvantages over routine care.

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