The impact of a new emergency admission avoidance system for older people on length of stay and same-day discharges

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Abstract

Background: unplanned hospital admissions of older patients continue to attract the attention of UK policymakers, advisors and media. Reducing the number and length of stay (LOS) of these admissions has the potential to save NHS substantial costs while reducing iatrogenic risks. Some NHS trusts have introduced geriatric admission-avoidance systems, but evidence of their effectiveness is lacking. In September 2010, The Royal Free Hospital and Haverstock Healthcare Ltd, a GP provider organisation, introduced an admission-avoidance system for patients aged 70 or over: the Triage and Rapid Elderly Assessment Team (TREAT).

Objective: to measure the effect of TREAT on LOS and the rate of same-day discharges (an inverse measure of admission rate).

Setting: TREAT was based in the Accident and Emergency (A&E) department of the Royal Free Hospital, London.

Design: a pre- and post-retrospective cohort study comparing the 5,416 emergency geriatric admissions in the 12 months preceding the introduction of TREAT with the 5,370 emergency geriatric admissions in the 12 months following. Emergency geriatric admissions were divided into TREAT-matching and residual (non-matching) cohorts from hospital provider spell records, using the Healthcare Resource Group (HRG), treatment function and patient classification of the TREAT admissions. LOS and same-day discharge rates were measured over the pre- and post-TREAT periods: for the TREAT-matching cohort; for the residual cohort of emergency geriatric admissions; and for all emergency geriatric admissions.

Intervention: TREAT is a system of care combining early Accident and Emergency (A&E)-based senior doctor review, Comprehensive Geriatric Assessment (CGA), therapist assessment and supported discharge; post-discharge supported recovery; and a rapid access geriatric ‘hot-clinic’. TREAT was supported by a post-acute care enablement (PACE) team, providing short-term nursing support immediately following discharge.

Results: TREAT accepted 593 geriatric admissions over a 12-month period, of which 32.04% were discharged on the day of admission. The mean LOS was 4.41 days, and the median LOS was 1 day. After the introduction of TREAT, mean LOS reduced by 18.16% (1.78 days, \(P < 0.001\)) for TREAT-matching admissions; by 11.65% (1.13 days, \(P < 0.001\)) for all emergency geriatric admissions; and by 1.08% (0.11 days, \(P = 0.065\)) for the residual population. Over the same period, the percentage of admissions resulting in same-day discharges increased from 12.26 to 16.23% (OR: 1.386, 95% CI: 1.203–1.597, \(P < 0.001\)) for TREAT-matching admissions, but for the residual population fell from 15.01 to 9.77% (OR: 0.613, \(P < 0.001\), 95% CI: 0.737–0.509).

Conclusions: TREAT appears to have reduced avoidable emergency geriatric admissions, and to have shortened LOS for all emergency geriatric admissions. It aims to address the King’s Fund’s call for an ‘overall system of care rather than lots of discrete processes’ through ‘better design and co-ordination of services following the needs of older people’. The ease of set-up lends itself to replication and testing in clinical and cost-effectiveness studies. Further studies are needed to measure the impact of TREAT on re-admission rates, patient outcomes and satisfaction.

Keywords: elderly, admission, length of stay, patient discharge, older people
Impact of a new emergency admission avoidance system

Background

Unplanned hospital admissions of elderly patients continue to attract attention of policymakers, advisors and media [1–3]. The increase in unplanned admissions for all the patients remains at 3% per year [4]. Patients over 65 account for 80% of NHS emergency admissions who stay for >2 weeks. Reducing the length of stay (LOS) for these patients has the potential to save NHS substantial costs while benefitting patients [2, 4]. Admissions can be particularly disruptive and unsettling for the older patient [5]. Those fit for discharge but remaining in hospital are exposed to risks of functional decline and dependency [6, 7], and hospital acquired infections [8].

The King’s Fund identified proven hospital interventions to reduce admission rates and LOS for older people [5]. These include early senior doctor review in A&E, specialist input in areas such as geriatrics, and timely access to therapist assessment [9]. Comprehensive Geriatric Assessment (CGA) followed by appropriate intervention has been shown to reduce the length of the initial hospital stay and subsequent readmissions [10] and for screened patients in A&E, CGA has been shown to be efficient for decreasing functional decline, and readmission [11].

Some NHS trusts have introduced rapid access geriatric clinics and admission-avoidance systems to reverse the growth in geriatric emergency bed-days [12]. These systems combine some or all of the above interventions according to best practice, but evidence for the effectiveness of these combinations is lacking [9, 13, 14].

The Royal Free Hospital recorded 5,416 A&E admissions of patients aged 70 or more in 2009–10, with a mean LOS of 9.93 bed-days. In September 2010, the hospital in partnership with the Haverstock Healthcare Ltd (a GP provider organisation) introduced an A&E-based geriatric admission-avoidance system: the Triage and Rapid Elderly Assessment Team (TREAT). TREAT was established to reduce LOS and unplanned hospital admissions in patients over 70 presenting in medical crisis. It combines A&E-based early senior doctor review, CGA, therapist assessment and supported discharge, post-discharge supported recovery; and a rapid access ‘hot-clinic’. TREAT was supported by a post-acute care enablement (PACE) team, providing short-term nursing support immediately post-discharge.

Objective

This paper aims to measure the effect of TREAT on LOS and the rate of same-day discharges (an inverse measure of the admission rate).

Setting

TREAT was based in the Accident and Emergency (A&E) department of the Royal Free Hospital, London.

Methods

Design

TREAT was assessed through a pre- and post-retrospective cohort study comparing 5,416 emergency geriatric admissions in the 12 months preceding TREAT with the 5,370 emergency geriatric admissions in the 12 months following (Figure 1).

A cohort of TREAT-Matching admissions was defined by identifying those emergency geriatric admissions sharing the same combination of Healthcare Resource Group (HRG [15]), treatment function and patient classification as the TREAT admissions. Other terms referenced in the cohort definitions are defined in the NHS Data Dictionary [16].

Key measures

Key measures for the study were same-day discharge rate as a percentage of admissions (an inverse measure of admission rate) and LOS, compared over the pre-and post-TREAT periods for the TREAT-Matching Cohort.

LOS was measured as the difference in days between the start date and discharge date for a Hospital Provider Spell. A same-day discharge was defined as a Hospital Provider Spell where the start date and discharge date are the same.

The same measures were taken for the Residual Admissions Cohort, to compare against TREAT-matching admissions; and for all Emergency Geriatric Admissions, to assess the wider impact of TREAT.

Data collection

The medical record number (MRN) and date of each TREAT admission was combined with the standard Hospital Provider Spell record, providing: MRN; Age on Admission; Start Date; Discharge Date; Admission Method; Treatment Function; Patient Classification and Spell HRG.

Analysis and interpretation

The data were loaded into an Oracle 11g database, from which the cohorts were defined. Each hospital provider spell record was extended to indicate the cohort(s) to which it belonged. These extended records were loaded into the Statistical Package for Social Sciences (SPSS) Version 15 and Epi-Info Version 7, to calculate Mann–Whitney U tests P-values for LOS, and odds ratios and associated 95% confidence intervals for same-day discharges.

Intervention

The King’s fund recommended ‘any local strategy should look across the system and align ways of working between primary, community and acute care to reduce avoidable admissions and length of stay in hospital’[5]. TREAT is the product of such a strategy.
TREAT aimed to provide a CGA in A&E followed by prompt intervention and tailored supported discharge on the day of admission (see Appendix 1, available as supplementary data in *Age and Ageing* online). It provided a rapid response to all admissions of older people, selecting and managing patients suited for the TREAT pathway, redirecting the remainder to the admitting teams for inpatient management or to A&E for straightforward discharge. TREAT operated from 9 a.m. to 5 p.m. on weekdays, and from 9 a.m. to 1 p.m. on weekends and holidays.

**Team structure**

A dedicated multi-disciplinary team was established in the A&E setting to maximise impact on the department and its responsiveness, comprising: a Consultant geriatrician, a specialist registrar, a nurse practitioner, an occupational therapist and an administrator. Community-based care was delivered by a nurse practitioner.

TREAT drew on established community, social, and therapy services and the PACE team, which provided short-term nursing support immediately following discharge.

**Roles and responsibilities**

The consultant geriatrician selected patients for TREAT from the A&E admissions, performing a CGA in A&E for these patients. The selection criteria were: the patient was aged 70 or more, medically stable with complex medical and social needs otherwise necessitating admission.

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**Figure 1.** Illustration and definition of cohorts.

<table>
<thead>
<tr>
<th>Pre-TREAT Cohorts</th>
<th>Post-TREAT Cohorts</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/09/2009 to 31/08/2010</td>
<td>01/09/2010 to 31/08/2011</td>
</tr>
<tr>
<td>Emergency Geriatric Admissions</td>
<td>5416 admissions</td>
</tr>
<tr>
<td>TREAT-Matching Admissions</td>
<td>3084 admissions</td>
</tr>
<tr>
<td>TREAT Admissions</td>
<td></td>
</tr>
<tr>
<td>TREAT Admissions are those emergency geriatric admissions triaged and seen by TREAT. TREAT Admissions are a subset of TREAT-Matching Admissions (below)</td>
<td></td>
</tr>
<tr>
<td>TREAT Matching Admissions</td>
<td>An extrapolation of TREAT admissions: Emergency geriatric admissions where the combination of treatment function, patient classification and spell HRG match the treatment function, patient classification and spell HRG of any TREAT Admission. TREAT-matching admissions exist for both pre- and post-TREAT periods.</td>
</tr>
<tr>
<td>Residual Admissions</td>
<td>Those emergency geriatric admissions which are not TREAT-matching admissions.</td>
</tr>
</tbody>
</table>
The TREAT team was responsible for co-ordinating a rapid, individualised and structured discharge for these patients, on the same day where possible, communicating each patient episode to GPs and community services.

The Hot-Clinic aimed to see TREAT patients within five working days of discharge, following up investigations, and tracking recovery progress.

The community nurse attended and supported discharged patients identified as high-risk hospital attenders by the discharging doctor or GP.

The PACE team provided nursing support, monitoring and treatment for up to 5 days post-discharge.

### Results

See Table 1.

**Length of stay**

In the Post-TREAT period, the median LOS for TREAT-matching admissions reduced by 2 days, and mean LOS by 18.16% (1.78 days, \( P < 0.001 \)). For the residual admissions, the median was unchanged, and mean LOS reduced by 1.08% (0.11 days, \( P = 0.065 \)).

For all Emergency Geriatric Admissions population, median LOS reduced by 1 day, and the mean LOS by 11.65% (1.13 days, \( P < 0.001 \)).

**Same-day discharges**

After the introduction of TREAT, the percentage of admissions resulting in same-day discharges increased from 12.26 to 16.23% (OR: 1.386, 95% CI: 1.203–1.597, \( P < 0.001 \)) for TREAT-matching Admissions, but for the residual population fell from 15.01 to 9.77% (OR: 0.613, \( P < 0.001 \), 95% CI: 0.737–0.509).

### Discussion

This was a large study of over 10,000 admissions over 2 years.

The introduction of TREAT appears to have produced a substantial and significant reduction in LOS for all emergency geriatric admissions, particularly for TREAT-matching admissions. There was no significant change in the mean LOS for post-TREAT residual admissions. The reduction in LOS for all emergency geriatric admissions is therefore attributed to the change in LOS for the TREAT-matching admissions.

There was a substantial and significant increased likelihood of same-day discharge for the TREAT-matching admissions, but an almost equivalent reduced likelihood for the residual admissions. There was therefore no significant impact on same-day discharges across all geriatric admissions. The residual cohort provided an effective control group, verifying that the change in LOS was restricted to the TREAT-matching cohort.

Two hypotheses may explain this effect: TREAT’s targeted admission avoidance may have allowed the hospital to

### Table 1 Results

**Admissions Length of Stay Same Day Discharges**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Pre/Post</th>
<th>TREAT</th>
<th>Pre</th>
<th>Post</th>
<th>Pre</th>
<th>Post</th>
<th>Comparison</th>
<th>MW</th>
<th>P Value</th>
<th>Count</th>
<th>% of adm</th>
<th>Count</th>
<th>% of adm</th>
<th>OR</th>
<th>95% CI</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TREAT</td>
<td></td>
<td>593</td>
<td>3,084</td>
<td>8.70</td>
<td>9.44</td>
<td>11.96</td>
<td>−18.16%</td>
<td></td>
<td></td>
<td>953</td>
<td>3,084</td>
<td>8.68</td>
<td>9.36</td>
<td>1.39</td>
<td>1.203-1.597</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>2,332</td>
<td>2,048</td>
<td>14.86</td>
<td>12.22</td>
<td>14.09</td>
<td>−108%</td>
<td></td>
<td></td>
<td>953</td>
<td>2,048</td>
<td>8.77</td>
<td>9.44</td>
<td>0.61</td>
<td>0.737-0.509</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Emergency</td>
<td></td>
<td>5,416</td>
<td>5,370</td>
<td>9.30</td>
<td>10.10</td>
<td>13.10</td>
<td>−11.65%</td>
<td></td>
<td></td>
<td>953</td>
<td>5,370</td>
<td>9.30</td>
<td>10.10</td>
<td>1.03</td>
<td>0.921-1.147</td>
<td>0.63</td>
</tr>
</tbody>
</table>
Further studies are needed to measure the cost-effectiveness of TREAT reduced length of stay across all emergency geriatric admissions, addressing the King's Fund call for an ‘overall system of care rather than lots of discrete processes’ through ‘better design and co-ordination of services following the needs of older people’ [5].

Limitations
Pre-post comparisons are inherently limited by selection bias, confounding factors, the restricted nature of available data, and the attribution of positive results to an intervention rather than to ‘some other intervention or a general secular trend’ [17].

The standard records used did not allow reporting on missed or delayed discharges; on immediate, medium and long-term patient outcomes or endpoints; did not support or refute the hypotheses proposed regarding the reduced likelihood of same-day discharges for the residual admissions; and could not determine whether a patient could not be selected, admitted or discharged due to saturation of services or conversely whether the TREAT service could be effectively extended.

Cost-effectiveness, readmission rates and patient satisfaction were not recorded.

Conclusion
TREAT appears to have reduced avoidable emergency geriatric admissions, and to have shortened LOS for all emergency geriatric admissions, addressing the King’s Fund call for an ‘overall system of care rather than lots of discrete processes’ through ‘better design and co-ordination of services following the needs of older people’ [5].

Key points
- TREAT reduced the length of stay for a targeted geriatric population by 18.16%, increasing their likelihood of a same-day discharge by an OR of 1.386.
- TREAT reduced length of stay across all emergency geriatric admissions by 11.65%, but made no significant difference to their likelihood of a same-day discharge.
- Further studies are needed to measure the cost-effectiveness of TREAT, its impact on re-admission rates, patient outcomes and satisfaction.

Supplementary data
Supplementary data mentioned in the text are available in Age and Ageing online.

Acknowledgements
We thank Simon Grabinar for contributing the data analysis, and Sheldon Stone for discussions and editorial assistance.

Authors’ contributions
P. N. W. designed the study and wrote the report. G. T. and D. L. reviewed the report and approved it for final publication. S. I. contributed the statistical analysis, and reviewed the report.

Conflicts of interest
All authors have completed the Unified Competing Interest form at http://www.icmje.org/coiDisclosure.pdf (available on request from corresponding author) and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous 3 years; no other relationship or activities that could appear to have influenced the submitted work.

Funding
TREAT was funded Royal Free Hospital Trust with the funding for one nurse practitioner by Haverstock Healthcare Ltd.

References
8. Hussain M, Oppenheim BA, O’Neill P et al. Prospective survey of the incidence, risk factors and outcome of...


Received 28 November 2012; accepted in revised form 10 May 2013