

The short term assessment rehabilitation and reablement service (starrs); the impact on admission delay, length of stay, mortality and post-admission

Abstract

Rapid Response Services have become common in the management of the frail older person in the community. There is some evidence that they may avoid inappropriate hospital admissions and may also be economically viable. However, there is little data on the mortality of patients whilst under the care of such teams and on the length of hospital stay when admitted.

Aim: We examined a cohort of nearly 5000 patients over 1 year (January 2019 to December 2019). We reviewed mortality and mean length of stay (MOS) in those who required hospital admission at Day 1 (Day 1). We then compared this with the mortality and mean length of stay (MOS) in those who required admission whilst being managed by the Rapid Response STARRS Team (after Day1).

Results: There were 4895 patients, of which 743 required hospital admission. Data were available on 516 patients. 237 patients were admitted on Day 1 (of which 18 died) and 279 after Day 1 (of which 14 died). There was no significant difference in the mortality between the two groups or difference in MOS. In patients who were discharged, the MOS in the after Day 1 group was significantly shorter than the Day 1 group.

Conclusion: There was no difference in mortality between those admitted on Day 1 when compared to those admitted after Day 1. For those admitted and discharged, there was no evidence that STARRS management had prolonged the MOS in hospital.

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Background

Community management is increasingly thought to be an effective way of providing high quality care for patients with the advantage of avoiding costly hospital admissions and improving patients and carers' satisfaction.^{1,2} Furthermore, facilitating home-based healthcare may help to avoid many hospital acquired infections that are common once a patient is admitted into hospital.³ These factors are all important, especially within geriatric services where patients are increasingly complex and frail with varying comorbidities⁴, and where there has been a call for increased efforts for advanced care plans to be prioritized.^{4,5} Naturally, with an ageing population within the United Kingdom⁶, community services will likely play an increasing role in offering patients effective medical management by acting as an intermediary between primary and secondary care.⁷ Currently there is scarce data and literature analysing the utility of these community services in sicker patients who will inevitably go on to require hospital care when initial community management proves to be insufficient. This study aimed to view these cases and assess whether there is a difference in mortality and length of stay for patients who are admitted on the first day of their community management versus patients who are admitted at a later point, with the length of stay serving as a marker for disease progression by the time of admission. The study also investigates common reasons for hospital admission from within the community.

The community service studied within this work was the Short Term Assessment, Rehabilitation and Reablement Service (STARRS), based in Northwick Park Hospital, situated in North-West London. The service caters to the borough of Brent, which is home to a population of 330,795, including 39,995 people over the age of 65, and was established in 2010.⁸

Methods

The composition of the Rapid Response Team STARRS, operational hours and medical support is as described by Chua et al.⁸ The service runs from 8am to 10pm daily, seven days a week. It is a multi-disciplinary team of nurses, therapists (physiotherapists and occupational therapists), paramedics, dietitians and geriatricians. Patients remain in their home but are visited daily by nurses and/or therapists. They are then discussed in daily virtual ward rounds where a geriatrician formulates a management plan. Some patients are reviewed in ad hoc 'Hot Clinics' overseen by geriatricians. The team is comprised of a manager (Band 8c Nurse, manager), a senior physiotherapist (Band 8b), 16 general nurses, 12 physiotherapists, 3 occupational therapist, 2 para-medics, all trained to be competent in general clinical assessments, a dietitian (part-time), access to a social worker a man for transport and 5 administrators.

Daily ward rounds are undertaken by 2 geriatricians (EC and LPT) with 2 trainees (FY1 and FY2) with the MDT. Week-end ward rounds are undertaken taken by the on-call geriatrician with the MDT. Out of hours medical support including week-ends is provided by 4 other consultant geriatricians.

Within a sampling time between 1st of January 2019 and 31st of December 2019, patients who had been under the care of STARRS based in Northwick Park Hospital, a district general hospital in Harrow, Middlesex were obtained and analysed. 743 patients were identified as requiring hospital admission at some stage. Of these, 516 patients had complete records accessible using computer software EMIS, GCIS, and EPRO, including dates of admission and discharge, reasons for admission, and referral source. This was the sample of patients used to conduct the audit. When assessing length of stay and reasons for admission, this sample was divided into two groups:

- I. Patients that who were admitted on Day 1 of their STARRS care (Day 1). Each day starts from 8.00am to 8.00am the following day.
- II. Patients who were admitted at any point in time within the service after Day 1 of their STARRS care (after Day 1).

Mortality, admission and discharge dates for each patient allowed the length of stay to be assessed. Mean length of stay (MOS) was calculated for each of the groups of patients and the independent t-test was used to ascertain if there was a significant difference between the groups. Reason for admission in each instance was also qualitatively investigated.

Results

Patient Profile

In total, 4895 patients were seen by STARRS. Of these, 3667 (74%) were from general practitioners (GPs), 767 (16%) were discharges from Emergency Departments, 230 (5%) were from London Ambulance Service (LAS) and 231 (5%) were from others. The latter group were referrals for intravenous antibiotics, community palliative care, rehabilitation teams and anticoagulation clinic for INR management.

Hospital admission on Day 1 and after Day 1

During this period, a total of 743 patients (15.2%) were admitted

or alternatively, nearly eight-five percent of admissions were avoided. However, data on hospital admissions, mortality and MOS were only available on 516 (70%) patients. The remaining 227 patients were admitted to neighbouring hospitals nearer their homes. Of the 516 patients, 210 were male and 306 were female. The average age was 83 years. The mean number of days under STARRS before hospital admission was 2.8 days.

Mortality at Day 1 and after Day 1 (N=32)

516 patients were admitted to Northwick Park Hospital. Of these, 237 patients were admitted at Day 1 (of which 18 died) and 279 patients after Day 1 (of which 14 died). Day 1 deaths were all GP referrals (15 were telephone triages and 3 were face to face (F2F) consultations). For the 14 patients who died following an admission after Day 1, 11 were GP referrals (9 were telephone triages, 2 were after F2F consultations), 2 were from LAS and one was from the anticoagulation clinic. This has been summarised in Figure 1. Overall, mortality was 6.2%. The profiles of these patients have been summarised in Tables 1 and 2. There was no difference in the mortality between patients admitted on Day 1 and after Day 1 (Figure 2).

Hospital deaths and MOS (N=32)

The MOS for the group admitted on Day 1 was 13 days and 14 days for the after Day 1 group. There was no statistical difference in the MOS between the two groups (Figure 2).

Table 1 Profile of Patient Admitted on Day One

Numbers	Source	Age	Sex	Reason for addition	Hospital stay before death
1	GP	83	M	Clinical presentation	1 days
2	GP	84	F	News	2 days
3	GP	78	F	Clinical presentation	4 days
4	GP	83	M	Abnormal bloods	5 days
5	GP	83	F	Clinical presentation	5 days
6	GP	96	M	Clinical presentation	5 days
7	GP	97	F	Clinical presentation	7 days
8	GP	92	F	Clinical presentation	7 days
9	GP	86	M	Abnormal bloods	9 days
10	GP	83	F	News	16 days
11	GP	88	F	Abnormal bloods	25 days
12	GP	96	M	News	31 days
13	GP	90	F	Abnormal bloods	20 days
14	GP	88	F	Clinical presentation	8 days
15	GP	70	F	News	36 days
16	GP	86	F	Clinical presentation	46 days
17	GP	84	F	News	1 day
18	GP	93	M	News	4 days

Table 2 Profile of Patients Admitted After Day One

Numbers	Source	Age	Sex	How long before admission	Reason for addition	Hospital stay before death
1	LAS	85	F	2 days	News	5 days
2	GP	93	M	2 days	Abnormal bloods	3 days
3	GP	91	F	2 days	Abnormal bloods	2 days
4	GP	97	F	2 days	Clinical presentation	4 days
5	GP	88	F	2 days	News	6 days
6	GP	76	M	2 days	News	9 days
7	GP	88	M	2 days	Abnormal bloods	34 days
8	GP	86	F	3 days	Abnormal imaging	3 days
9	GP	84	M	3 days	Family call LAS	11 days
10	GP	79	M	3 days	Clinical presentation	28 days
11	GP	80	F	3 days	Family call LAS	31 days
12	GP	86	M	4 days	News	4 days
13	LAS	100	M	8 days	Family call LAS	1 day
14	Clinic	86	M	15 days	Abnormal bloods	54 days

Community deaths and length of stay (N=3)

There were 3 community deaths (2 females, 1 male). The MOS was 2.6 days (range 2 to 4 days).

MOS in Day 1 and after Day 1 admission following hospital discharge (N=483)

484 patients were discharged alive, of which 219 were admitted on Day 1 and 265 admitted after Day 1. The MOS was 14 days and 11 days respectively. Day 1 admissions had a significantly longer MOS (Figure 2).

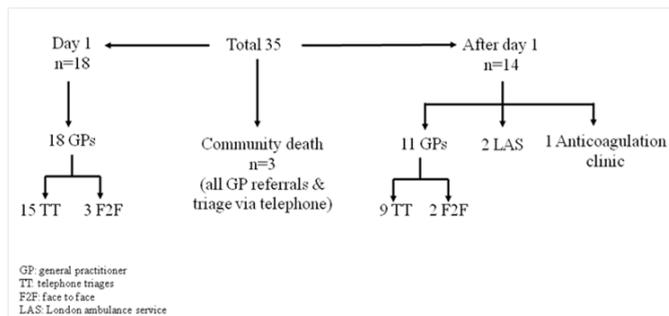


Figure 1 Mortality, Source of Referral and Triage.

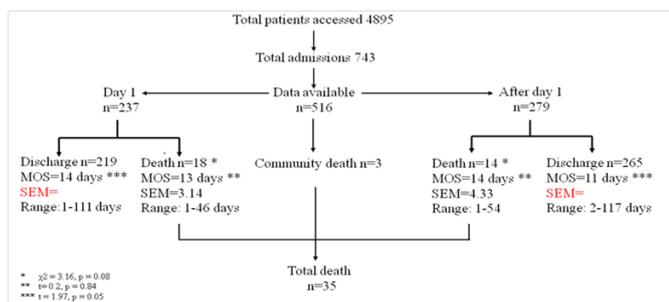


Figure 2 Patient Profile, Mortality and Mean length of stay (MOS).

Within both cohorts of patients, the most common reasons for hospital admission were clinical presentation and/or abnormal blood results. A breakdown of the reasons for admission within both groups are graphically represented in Charts 1 and 2.

Discussion

Community management for the older person has several perceived advantages. Home care may reduce hospital acquired infections, delirium for the older person, falls in hospital, costs, and may improve comfort; all possibly without worsening hospital outcome.^{1-3,9} However a large dataset assessing hospital outcomes is lacking. Although STARRS have mortality meetings 3 to 4 times a year, we felt it was important to undertake a more comprehensive review.

The Rapid Response Service STARRS primarily operates on virtual physician input. As such, clinical assessments of patients are largely conducted by extended scope multidisciplinary team members comprising nurses, physiotherapists, paramedics and occupational therapists who will then liaise with any one of two geriatricians daily during the “virtual ward round” and with one of any five geriatricians for out of hours issues.

In total there were 35 deaths of which 3 occurred in the community. The overall mortality was 0.7% but this translates to 7% if the patients

were admitted to hospital whilst under the care of STARRS (Figure 2). We examined mortality and MOS in 2 groups, admission group at Day 1 and after Day 1. This group of patients would be traditionally seen by GPs on their home visits, family calling the GP and LAS the Rapid response team was not present. A higher mortality in the Day 1 group may imply that this group was more unwell. However, a higher mortality in the after Day 1 group may imply that STARRS management delayed patient admission and even contributed to mortality especially if patients were admitted after spending many days in the community and passed away shortly after presenting to secondary care.

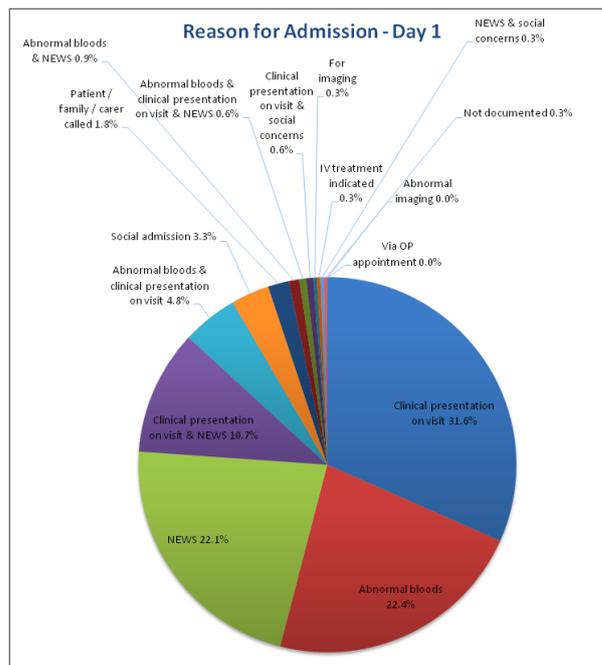


Chart 1 Reason for admission - Day 1.

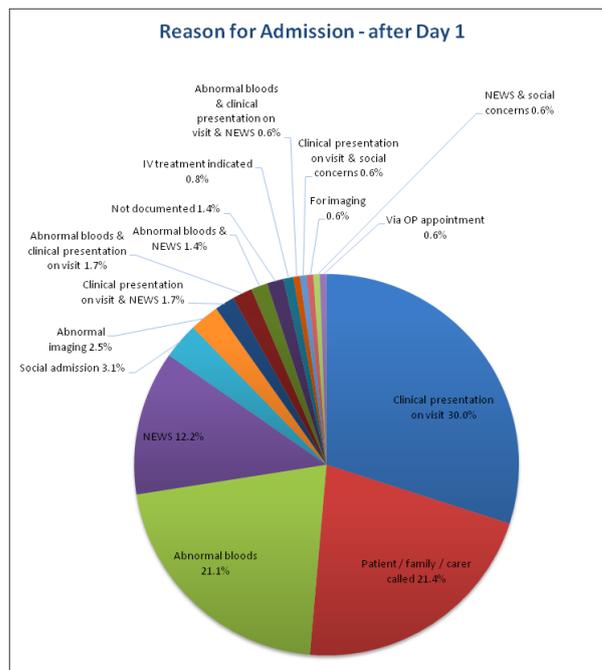


Chart 2 Reason for admission - after Day 1.

There was no significant difference in patient mortality between the Day 1 and after Day 1 admission groups (7.6% vs 5.0% respectively). Of the 14 patients that were admitted after Day 1 and died, the majority (11 patients) attended within 3 days. This suggests that STARRS had not kept them out in the community for an extended period before admission. However, one patient was admitted on day 4 (Patient 12), a further patient was admitted on Day 8 (Patient 13), and another patient was admitted on day 15 (Patient 14) as described in Table 2.

Patient 12 was an 86-year-old man referred after a F2F consultation. He was a bilateral amputee with a non-productive cough. His GP had commenced him on an antibiotic. Prior medical history (PMH) included ischaemic heart disease (IHD) with stents, peripheral vascular disease, hypertension and oesophageal carcinoma (stented). Observations were stable with a National Early Warning Score (NEWS) of 0; he had some chest crepitations on auscultation. There was minimal erythema over the stump site but bloods on Day 1 revealed an elevated C-reactive protein (CRP) at 141 mg/L, and the full blood count was unobtainable due to clotting. Observations remained stable on day 2, his haemoglobin (HB) was 7.5 g/dL. This was lower than his previous HB several weeks ago at 9.5 g/dL. It was decided not to admit the patient after discussion with the consultant but to monitor the HB, and a mid-stream sample of urine (MSSU) was collected. The patient's NEWS was 2 on Day 3, blood pressure was 100/64 mmHg with no postural drop. Repeat HB was 8.1 g/dL and CRP remained elevated at 114 mg/L. This was discussed with the on-call geriatrician and the plan was to continue to monitor. On Day 4, the patient had become unwell, NEWS had increased to 10 and the patient was conveyed to hospital. Repeat HB was 7.9 g/dL, a Chest X-ray revealed cardiomegaly and right lower lobe consolidation. He was noted to be in urinary retention on the second day on admission; insertion of a urinary catheter revealed pus. He was given antibiotics and a blood transfusion however, there was little improvement. Following family discussions he was commenced on the End of Life Care Agreement. He passed away on the fourth day of admission.

Patient 13 was a 100-year-old man referred by LAS. His wife had recent surgery. The patient suffered a fall 2 days previously with a further decline in his mobility. PMH included IHD, a trial fibrillation (AF), a permanent pacemaker (PPM), chronic obstructive pulmonary disease (COPD), a long term catheter and dementia resulting in minimal communication. Observations were stable on Day 1; previously he was able to walk with minimal supervision but at the time of review, needed assistance with one person. Biochemistry on Day 1 revealed a raised CRP of 122 mg/L. The urinary catheter was changed and he was given antibiotics. The patient was seen for the next 6 days and although frail, functional baseline was nearly attained. The patient was referred for further community rehabilitation and equipment. Repeat biochemistry on Day 4 and 6 revealed a slight improvement in CRP to 75 mg/L. However, the GP phoned back on Day 7 and asked for another review and both parties agreed that the patient could be seen the following day. On Day 8, the patient's wife became anxious as the patient had another fall the previous day. He also had diarrhoea and she felt she could no longer cope. Admission bloods were no different compared to Day 6. Chest X-ray showed extensive cardiomegaly and PPM in-situ with clear lung fields. He passed away on the same day. The death certificate read: Ia Cardiopulmonary degeneration, Ib Frailty of old age, IIa IHD/Dementia IIb COPD/AF.

Patient 14 was an 86-year-old male referred from the anticoagulation clinic for INR management. The patient had a prosthetic aortic valve and was on warfarin with limited mobility and a labile INR. PMH included hypertension, heart failure with preserved

ejection fraction, dementia, anaemia of chronic disease and chronic renal impairment. Although the patient remained stable, the prolonged stay with STARRS was due to a labile INR. He was admitted on Day 15 due to a drop in his HB. He spent a prolonged period in hospital (54 days) and passed away from complications due to his heart failure.

We also examined the MOS in the 2 groups. A shorter MOS in the Day 1 group may have indicated that STARRS were sending patients in "inappropriately" resulting in rapid discharges, or that patients may have died fairly soon on admission as they were very ill. A shorter MOS in the after Day 1 group may suggest that STARRS management had delayed admissions and consequently patients passed away soon after admission. There was no significant difference in the MOS at 15 and 17 days respectively between the 2 groups (Table 1 and 2 and Figure 2).

Three patients died in the community. Patient A was an 82-year-old female, telephone triaged to STARRS via the GP. She was managed in line with an exacerbation of her heart failure. There was a past medical history of a trial fibrillation, pulmonary hypertension and diastolic dysfunction on previous echocardiogram. A loop diuretic was initiated. Her biochemical indices and observations were stable other than a raised BNP and her pulse was elevated at 101 and 102 beats per minute at the time of visit on Day 1 and 2 respectively. She passed away later in the evening at home on day 2.

Patient B was a GP referral, telephone triaged to STARRS. He was 105 years old and was treated for a chest infection. Although still for hospital admission, his family wanted him to be treated at home if possible. His GP had already initiated an antibiotic on Day 1. His past medical history included AF, heart failure, hypertension and falls (resulting in a pubic ramus fracture). His general observations were stable but biochemistry on Day 1 revealed a raised CRP at 83 mg/L and a slightly elevated White Blood Cell (WBC) count of $10.3 \times 10^9/L$. On Day 3, CRP remained elevated at 118 mg/L. Observations remained largely stable on days 2 and 3, other than his axilla temperature on day 3 which was 35.9°C. A second antibiotic was introduced. Axilla temperature was re-checked later on Day 3 and was normal. He passed away on Day 4 at home.

Patient C was a GP referral (telephone triage) to STARRS. She was a 64-year-old female and was discharged from hospital 3 days previously. Past medical history included COPD, obstructive sleep apnoea, and she was on long term oxygen. The GP had initiated her on an antibiotic. Her observations were stable with a NEWS of 2. Biochemistry was unremarkable apart from a mildly elevated CRP of 27 mg/L. On the Day 2 visit, her family reported that she had become more unwell in the late evening and passed away at home. These cases illustrate that most of the patients are frail with several pathologies. Reliance on clinical assessment and biochemistry may not capture some patients who require hospital care although for some, earlier hospitalisation may not necessarily alter the final outcome.

Out of 516 patients admitted, 484 were discharged. We also looked at the MOS in the Day 1 and greater than Day 1 group. A longer MOS in the Day 1 group may indicate that they were more unwell and needed a longer recovery time. A longer MOS in the greater than Day 1 group may suggest that STARRS management delayed hospital admissions which could have prolonged patients' hospital stays on arrival. The MOS for the Day 1 group was significantly longer than the after Day 1 group at 14 and 11 days respectively. The absence of a shorter MOS in Day 1 group supports that hospital admissions were indicated such that patients were not immediately discharged back home (ii). The absence of a longer MOS in the greater than 1

day group suggests that STARRS have may not have delayed those that required hospital admission from obtaining adequate care, and that multi-disciplinary members with extended training and support from geriatricians are equipped to assess and identify patients that are clinically unwell and when hospital admission is warranted.

There is evidence that prompt face-to-face assessment is superior to telephone triages averting poor outcomes.¹⁰ GPs constituted 70% of the referrals during the timeframe of the audit, of which approximately 75% were telephone triages and the rest were F2F consultations. Of the 35 patients who died, 32 (91%) were GP referrals. Of these, 27 (84%) were telephone triages and 5 were after F2F consultations. However, F2F consultations from GPs may have been under-represented. There are patients who, after a GP consultation, may be found to be very unwell and sent straight to hospital thus by passing STARRS. The superiority of face-to-face assessment to telephone triaging will be a significant factor to audit with the increased rollout of virtual consultations in the current Covid-19 pandemic.¹¹

We acknowledge the limitation of the current analysis in that 30 percent of the data were unavailable as subjects were admitted to alternate hospitals nearer their home. This may have affected the interpretation of the data set. However, we think this is less likely. For Day 1 hospital admissions, this would have been discussed with the on-call geriatricians if there was uncertainty amongst STARRS clinicians (the same 5 geriatricians for the past 8 years). The most influential parameter was clinical presentation and/or abnormal biochemistry. For admissions after Day 1, daily virtual ward rounds were undertaken by the same 2 geriatricians (LPT and EC). Decisions to admit would have been discussed with them if there was clinical uncertainty during the daily ward rounds.

To avoid the virtual ward becoming too large, as from October 2019, a similarly modelled care team to STARRS, the Integrated Care Team (ICT), was set up. ICT is fundamentally similar, however it is less intensive with 2 community visits per week and ward rounds, and can provide support for patients for up to six weeks. Patients from ICT can also be escalated to STARRS. Future audits will also need to be undertaken on the efficacy of such teams on hospital avoidance. An audit similar to this study will be required for a number of reasons:

- I. This audit examined data sets before the onset of the Covid-19 pandemic. At the time, 70% of GP referrals were telephone triages. Since the pandemic, this has increased to 98%.¹²
- II. From October 2020, the LAS hub have started triaging some of their telephone referrals directly to STARRS. STARRS is a Rapid Response service which is not the same as an emergency response service.

Conclusion

This audit demonstrates that initial management in the community by a Rapid Response Team may not lead to increased adverse outcomes for patients who were eventually admitted. Prompt admission on Day 1 may not necessarily lead to improved outcomes

when using length of stay and mortality as barometers for assessing disease severity. Clinicians with extended training beyond the remit of their normal roles may be up-skilled to assess patients and identify those who require hospital admission with support from geriatricians. These patients are frail, often with multiple pathologies, as such, Rapid Response Services will need to audit their care to ensure that clinical governance is maintained.

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Conflicts of Interest

None.

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