UNIVERSITY OF MEDICINE AND HEALTH SCIENCES

Royal College of Surgeons in Ireland

repository@rcsi.com

The Boomerang study: increased hospital re-admission via the emergency department

AUTHOR(S)

Paul Liston, G Conyngham, PJ Byrne, M Brady, S Winder-Baggot, Peadar Gilligan

CITATION

Liston, Paul; Conyngham, G; Byrne, PJ; Brady, M; Winder-Baggot, S; Gilligan, Peadar (2022): The Boomerang study: increased hospital re-admission via the emergency department. Royal College of Surgeons in Ireland. Journal contribution. https://hdl.handle.net/10779/rcsi.21379116.v1

HANDLE

10779/rcsi.21379116.v1

LICENCE

CC BY-NC-SA 4.0

This work is made available under the above open licence by RCSI and has been printed from https://repository.rcsi.com. For more information please contact repository@rcsi.com

URL

https://repository.rcsi.com/articles/journal_contribution/The_Boomerang_study_increased_hospital_re-admission_via_the_emergency_department/21379116/1

Irish Medical Journal
Established 1867

Issue: Ir Med J; Vol 114; No. 1; P239

The Boomerang Study: Increased Hospital Re-admission via the Emergency Department

P. Liston[1], G. Conyngham[2], P.J. Byrne[2], M. Brady[2], S. Winder-Baggot[3], P. Gilligan[4]

1. Faculty of Business and Hospitality, Athlone Institute of Technology.
2. DCU Business School, Dublin City University.
3. Information and Communications Technology Department, Beaumont Hospital, Dublin 9.
4. Emergency Department, Beaumont Hospital, Dublin 9.

Abstract

Aims

This research was performed to assess if a reduced length of hospital stay was associated with increased re-attendances to, and re-admissions from, the Emergency Department (ED).

Methods

Inpatient discharge and ED attendance records over a ten-year period were sampled and collated. Independent sample t-tests and regression were used to assess changes.

Results

The analyses found a statistically significant decrease in inpatient hospital length of stay (7.34 to 6.69 days) and a significant increase in ED re-attendance for recently discharged inpatients from 8.88% (539/6065) to 10.98% (687/6255). However, the overall percentage of inpatients returning to a hospital bed within 30 days of discharge did not change significantly from 12.30% (746/6065) to 12.65% (791/6255).

Conclusion

Results confirm that an increasing percentage of recently discharged inpatients are attending the ED. This finding does not support the hypothesis that increased ED re-attendance of recently discharged inpatients is due to reduced hospital stay because the overall re-admission rate for recently discharged inpatients did not increase. Instead, further analysis revealed a significant change in the re-entry route as the increase in ED attendances is mirrored by a decrease in hospital re-admission via other routes (e.g. outpatient clinics). This change has increased the workload of an already overcrowded ED.

Introduction

Hospital, and specifically Emergency Department (ED), overcrowding has been an ongoing problem in Ireland since it was declared a national emergency in 2006[1]. There has been discussion as to whether or not increased acute hospital bed numbers are required or if it is just a question of using the hospital beds we have more efficiently. Decreasing the number of days that patients spend in a hospital bed increases the number of bed days available for other patients to use the same clinical space. Reduction in hospital length of stay is regarded as a marker of increased efficiency in the delivery of care[2]. This collaborative research was performed to examine a potential association between a reduction in length of hospital stay for inpatients in an academic teaching hospital and the number of re-attendances of recently discharged patients to the ED. The research was initiated on foot of the impression that the Emergency Medicine team had that the ED was getting busier as a result of increasing attendances by patients who had recently been discharged from the hospital. The working hypothesis was that reduced length of in hospital stay was associated with increased re-attendances to the ED.

A number of studies have examined reduction in average length of stay (ALOS) of patients in hospital wards[2–7]. McDermott and Stock concluded that lower levels of ALOS typically indicates better operational performance, but they also recognized that the link between quality of care and ALOS is less straightforward as it could lead to premature hospital discharges[2]. Capkun, Messner and Rissbacher[3] specifically examined the link between service specialisation and operational performance in hospitals, using reduced ALOS as a proxy for improved operational performance, highlighting the perceived industry position that reduced ALOS is a desirable efficiency target.

While ALOS reduction has been generally regarded as an operational improvement in hospitals, a number of recent studies have begun to examine its broader implications. As noted by Andritsos and Tang[5], early discharge may be interpreted as a sign of efficiency if seen in isolation, this can be misleading if a complication-induced re-admission follows, which in turn may lead to tension in the discharge process[8]. One approach is to consider total length of stay (LOS)[5], whereby additional unplanned re-admission LOS is added to the original LOS if re-admission occurs within thirty days after initial hospitalisation; this accounts for the effect of a hospital's discharge policies and the effectiveness of its provided care. It has been noted that re-admissions are expensive and often unnecessary; indeed, re-admissions are typically more expensive than the original visit[9]. McAlister et al. in Alberta, Canada, tested whether improving efficiency of hospital care (e.g. reduced LOS) would worsen post-discharge outcomes[10]. The findings of their study were consistent with the previous research of Kaboli et al.[6], which found that reduced LOS did not lead to an increase in 30-day mortality or re-admissions.

The study presented here was performed to see if the pressure to discharge patients is resulting in increased re-attendance to EDs and re-admission to hospital for those patients discharged following a hospital admission of longer than 24 hours in the preceding thirty days. This research also examined if the increasing average patient age impacted on re-attendance and re-admission. The research was carried out in the context of a sustained effort to reduce average length of stay in the hospital.

Methods

Ethics approval was obtained from the hospital Research Ethics Committee. The hospital in which the research took place has over 680 beds and provides service to approximately 50,000 patient attendances to the ED each year (see ten-year trend in Figure 1). This retrospective study was performed by a team with expertise in process management and data analytics from Dublin City University, Athlone Institute of Technology and the hospital management information services and information technology department and the clinical research team in the ED of Beaumont Hospital, Dublin, Ireland.

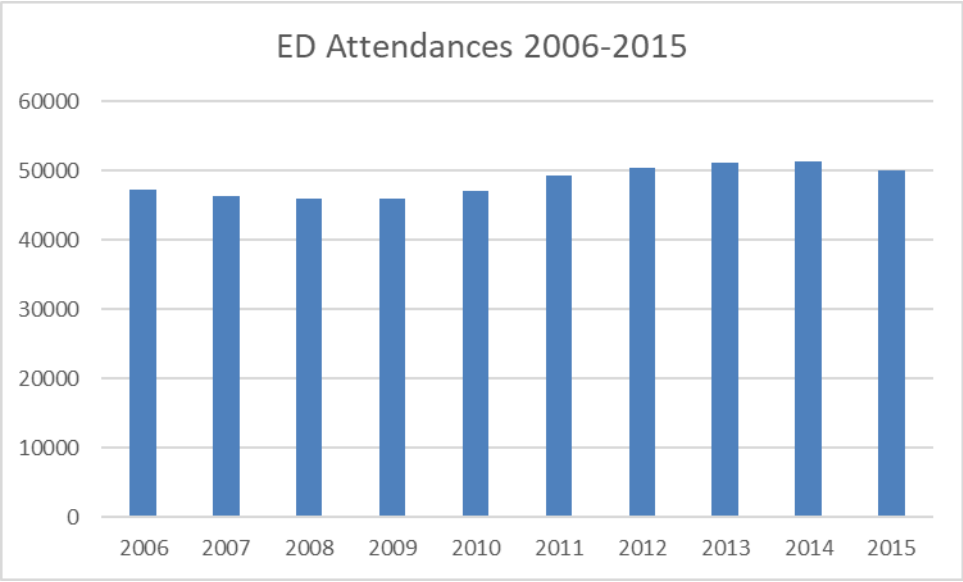

Figure 1: Total Annual ED attendances at the hospital from 2006 to 2015.

The following definitions, in line with those used in other studies[9], were used to inform the study design:

Re-attendance to the hospital is defined as an unscheduled return to the Hospital within 30 days of discharge following an inpatient admission of greater than 24 hours and less than 30 days.

Re-attendance to the ED is defined as unscheduled re-attendance to the ED within 30 days of discharge following an inpatient admission of greater than 24 hours and less than 30 days.

Re-admission is defined as unscheduled re-admission to hospital for inpatient care following a return within 30 days of having been discharged following inpatient admission for in excess of 24 hours.

To avoid missing a seasonal impact, data was gathered relating to ED attendances from one month each quarter (February, May, August and November) over ten years from the Accident & Emergency Oracle Database and the Hospital In-patient Enquiry database. The A&E Oracle database is the ED information system developed in house in the hospital where the research took place. It has been in use for over twenty years. Hospital In-Patient Enquiry (HIPE) data is gathered from the in patient data from the hospital information system. The data was entered into the Diver Solution which is a bespoke software programme which allows merging of data across different databases.

Data was gathered on the age of patients, length of stay in hospital and patients attending the ED within 30 days of hospital discharge following an inpatient admission. Statistical analysis was performed using SPSS. Regression analysis was carried out to measure trends over the 10 years from 2006 through 2015 with time period as the independent variable. Independent sample t-tests were carried out to compare the values of variables at the beginning and end of the timeframe.

Results

The initial anonymised dataset yielded 75,288 records. Patients with a length of stay of zero days (2708 patients) for whom admission overnight was not required and as such their care was likely day case or ED delivered were excluded from the analysis. Patients with a length of stay of over 30 days (4200 patients) were regarded as likely to be experiencing delayed discharge as a result of requiring nursing home or rehabilitative care or increased home support and were also excluded. Acute Medical Unit patients (1776 records) who were frequently discharged with a view to further follow up were also excluded. Patients under the age of 18 (3079 records) were excluded as Beaumont Hospital offers limited provision of specialist paediatric and adolescent care. After applying this exclusion criteria, 63,525 patient records were retained for the study.

Both the regression analysis and independent sample t-tests showed that the average age of patients increased significantly from 55.07 to 57.49 years. Over the same period, average length of stay in the hospital showed a statistically significant reduction from 7.34 days to 6.69 days. Re-attendance rate at the ED of patients within 30 days of discharge for the years 2006 and 2015 also saw a statistically significant increase from 8.89% to 10.98%. However, the re-admission rate back into the main hospital within 30 days of discharge showed no significant change increasing marginally from 12.30% to 12.65%. Regression analyses were rerun controlling for age, with all results holding. The results of the Independent T-test are presented in Table 1.

Table 1: Independent t-test results.

	2006	**2015**	**t**	**p**
Mean Age	55.07 years (95% CI: 54.59-55.55)	57.49 years (95% CI: 57.02-57.96)	7.07	<0.001
Mean Length of Stay	7.34 days (95% CI: 7.18-7.50)	6.69 days (95% CI: 6.53-6.85)	5.6	<0.001
Re-attendance Rate	8.88% (539/6065)	10.98% (687/6255)	3.89	<0.001
Re-admission rate	12.30% (746/6065)	12.65% (791/6255)	0.58	0.27

Initial exploration did show a moderate negative correlation between the changes in LOS and ED re-attendance; however, further analysis was carried out to understand the context of the increase in ED re-attendance. Patients who either re-attended the ED or were re-admitted to the main hospital within 30 days were recorded as a composite inpatient return rate and were found to represent approximately 16% of all inpatient discharges. Two cohorts of re-admitted patients were examined: those who returned via the ED (labelled 'A') and those who returned via other routes (e.g. outpatient and consultant clinics) (labelled 'B'). Patients who re-attended the ED and were then discharged home without admission were also noted (labelled 'C').

A structural change in the way discharged inpatients are re-admitted to hospital was evident (as illustrated in Figure 2): the percentage of patients entering via other routes (B) has fallen by almost 2 percentage points (from approximately 7% to 5%), while re-admissions through the ED (A) have increased by a similar amount. Note that the percentage of patients re-attending with an ED discharge (C) and the percentage of patients being re-admitted (A+B) have remained relatively static over the 10-year period.

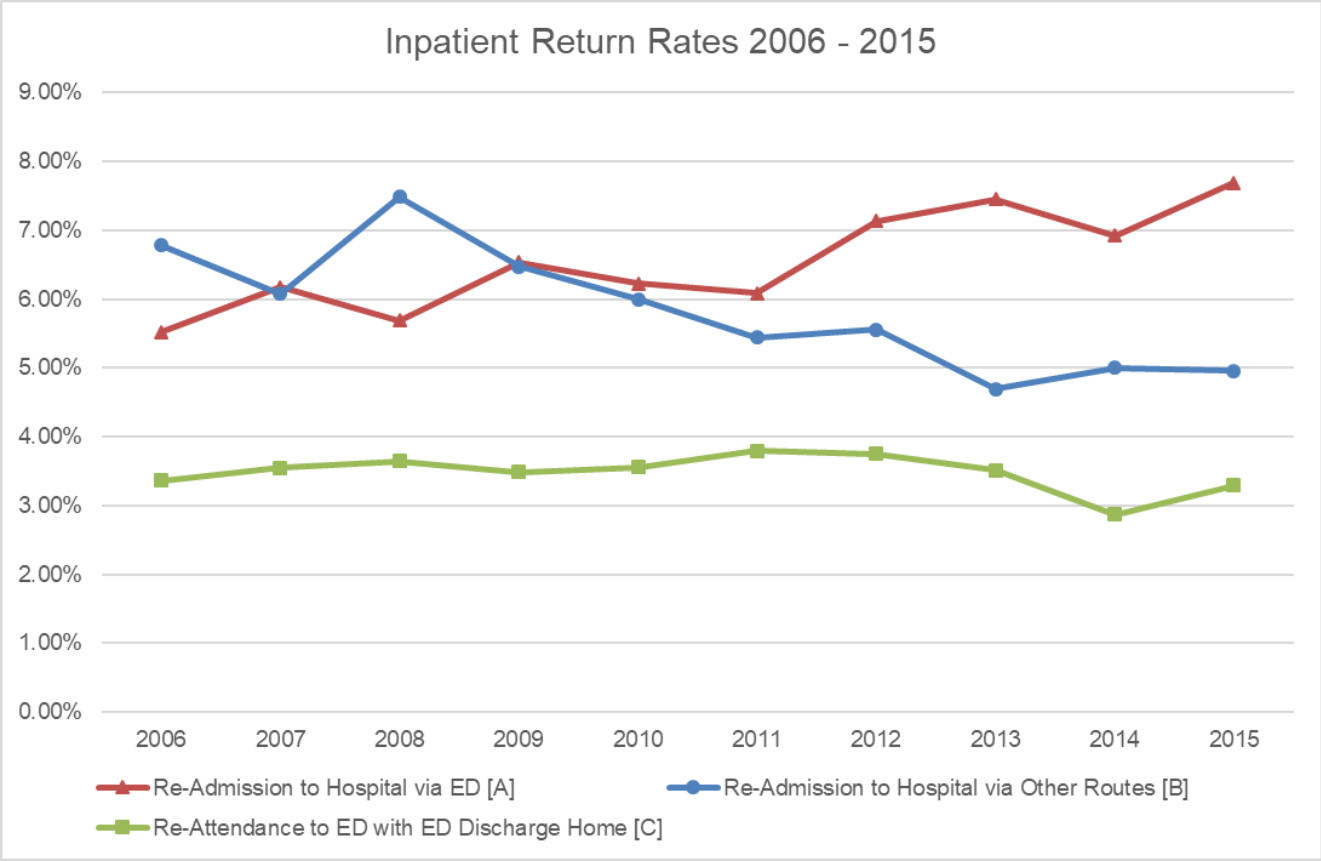

Figure 2: Graphical illustration of change in inpatient return to the hospital.

Trends in percentage of re-admissions via ED for four age related categories of patient (18-30, 31-50, 50-69, and 70+) were examined in the ten-year regression analysis. Interestingly, for patients in the two younger age categories the percentage of re-admissions via ED had increased but not significantly over the period (B=0.003, t=1.61, NS for the 18-30 year olds and B=0.002, t=1.25, NS for the 31-50 year olds), while for the older patients there was a statistically significant increase (B=0.371, t=5.73, p<0.001 for the 51-70 year olds and B=0.552, t=6.16, p<0.001 for the >70 year olds).

Figure 3 presents re-admission rates by age and by pathway for the base years 2006 and 2015. The results show that over the course of the ten-year period, ED has gone from the less likely, to the more likely, return route to hospital for patients of all ages but the change is more pronounced for those over fifty years of age (from 44.5% to 64.8% of re-admissions being via ED). This is substantial finding given that 69% (unchanged from 2006 to 2015) of re-admitted patients are over 50 years old.

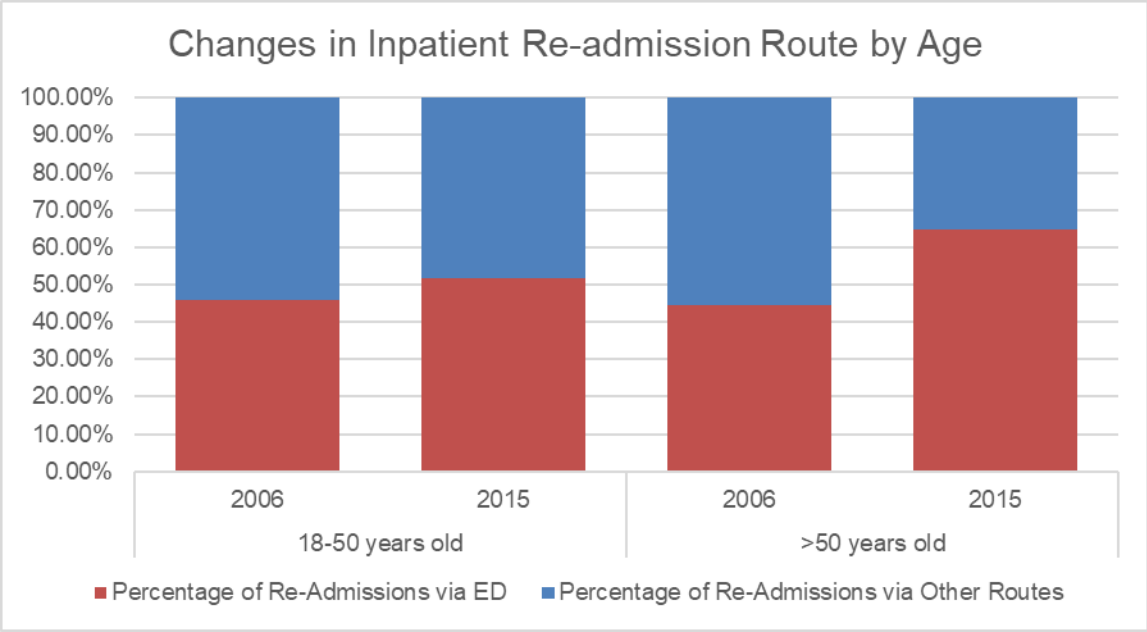

Figure 3: Percentage of re-admissions via ED and via other routes for patients under and over 50 years old.

Discussion

Our research has shown that total re-admissions to the same hospital have essentially remained unchanged despite decreasing inpatient length of stay. The total patient population who re-engaged with the hospital through re-attendance and/or re-admission has remained remarkably constant with a consistent annualised return rate of approximately 16%, with 12.5% being re-admitted to a hospital bed and the remaining 3.5% being cared for and returned home directly from the ED. These metrics are in line with international findings. The re-admission rate of 12.65% for 2015 compares well with 17% of Medicare patients in the US re-admitted to a hospital bed within 30 days of initial discharge[9].

However, the results do demonstrate a modal shift in the way inpatients return to hospital: the rate of patients returning via the ED has increased while the rate of patients returning via other routes has decreased. It was also found that age has an impact on the return route: the older the patient the more likely that the patient will return to the hospital via the ED rather than via alternate routes. Given that older patients form the majority of re-admissions via the ED, and that the general population is known to be aging[11], the implications of this change are substantial. Limitations of our study include that our findings are based on a sampling policy of selecting patient records for one month per quarter but, as the sampling catered for seasonality and is over a ten-year period, it is believed that it is not detrimental to the outcomes. It is recognised that the single site nature of the study may be a limitation as the identified changes in patient flow may well be nation, or even hospital, specific.

It is inevitable that some patients will return following hospital admission and discharge. The data analysis presented here has shown that an increasing percentage of those inpatients re-admit via the ED within thirty days of hospital discharge thus making a busy ED even busier. The reasons behind this change in re-admission route are not yet clear and will require further and broader investigation into the healthcare supports available to discharged patients. However, the fact that overall re-admission rates have remained remarkably consistent, even despite a reduction in hospital length of stay, suggests that they can be planned for and should be monitored. Given the national crisis in ED overcrowding, the apparent expectation that the ED can increasingly act as an admissions lounge for returning inpatients needs to be considered in detail. This re-admission pathway change has the potential to make EDs even busier and more crowded, thus detrimentally impacting the healthcare experience of all ED attendees, and should be explicitly addressed.

Declaration of Conflicts of Interest:
No conflicts of interest to disclose.

Corresponding Author:
Dr Paul Liston
Faculty of Business and Hospitality,
Athlone Institute of Technology.
Email: pliston@ait.ie

References:

1. Donnellan E. A&E crisis a national emergency, says Harney. The Irish Times. 2006 29 Mar; Available at: https://www.irishtimes.com/news/a-e-crisis-a-national-emergency-says-harney-1.1289657 [Accesssed 10 August 2020]
2. McDermott C, Stock GN. Hospital operations and length of stay performance. Int J Oper Prod Manag. 2007;27(9):1020–42.
3. Capkun V, Messner M, Rissbacher C. Service specialization and operational performance in hospitals. Int J Oper Prod Manag. 2012;32(4):468–95.
4. Galenkamp H, Deeg DJH, de Jongh RT, Kardaun JWPF, Huisman M. Trend study on the association between hospital admissions and the health of Dutch older adults (1995–2009). BMJ Open. 2016;6(8):e011967.
5. Andritsos DA, Tang CS. Linking process quality and resource usage: An empirical analysis. Prod Oper Manag. 2014;23(12):2163–77.
6. Kaboli PJ, Go OT, Hockenberry J, Glasgow JM, Johnson SR, Rosenthal GE, et al. Associations between reduced hospital length of stay and 30-day readmission rate and mortality: 14-year experience in 129 veterans affairs hospitals. Ann Intern Med. 2012;157(12):837–45.
7. Martin S, Street A, Han L, Hutton J. Have hospital readmissions increased in the face of reductions in length of stay? Evidence from England. Health Policy (New York). 2016;120(1):89–99.
8. Emes M, Smith S, Ward S, Smith A, Ming T. Care and Flow: Using Soft Systems Methodology to understand tensions in the patient discharge process. Heal Syst. 2017;6(3):260–78.

9. Helm JE, Alaeddini A, Stauffer JM, Bretthauer KM, Skolarus TA. Reducing hospital readmissions by integrating empirical prediction with resource optimization. Prod Oper Manag. 2016;25(2):233–57.
10. McAlister FA, Bakal JA, Majumdar SR, Dean S, Padwal RS, Kassam N, et al. Safely and effectively reducing inpatient length of stay: a controlled study of the General Internal Medicine Care Transformation Initiative. BMJ Qual Saf. 2014;23(6):446–56.
11. O'Sullivan, Colman, Ageing population will put strain on system - report. Available at: https://www.rte.ie/news/business/2019/0805/1067047-risk-report-2019/ [Accesssed 10 August 2020]