Reducing the Length of Stay by Enhancing the Patient Discharge Process: Using Quality Improvement Tools to Optimize Hospital Efficiency

Yacoub Abuzied,[1] Hassan Maymani,[2] Basim AlMatouq,[2] Oweida AlDosary[2]

[1]Department of Nursing, Rehabilitation Hospital, King Fahad Medical City, Riyadh, Saudi Arabia
[2]Department of Medical Specialties, Main Hospital, King Fahad Medical City, Riyadh, Saudi Arabia

Address correspondence to Yacoub Abuzied (yabuzied2@gmail.com)

ABSTRACT

Introduction: Delays in the discharging process can affect hospital efficiency. Improving patient flow in acute care hospitals is an essential issue that hospital management and research aim to achieve. Admission volume and LOS for hospitalized patients in the medical specialties department was examined at a tertiary care center in Riyadh, Saudi Arabia, to explore practical approaches to reduce the LOS. We aimed to identify and manage reasons for the delay in discharging patients from the medical specialties department at a tertiary care center in Saudi Arabia. **Methods:** Admission and discharge data for hospitalized patients were collected from 2016–2018. In 2017, a FOCUS (find, organize, clarify, understand, select)–PDSA (plan, do, study, act) quality improvement method was used to improve the discharge processes, with specific measurable targets per year. The number of readmissions and mortality rates decreased significantly after the intervention was implemented, suggesting an improvement in the quality of treatment and the process of admission and discharge. **Results:** Despite gradual increases in admissions from 2016 to 2018, the mean LOS decreased significantly between 2016 and 2018, from 9.16 to 7.47 days ($p < 0.001$). The number of readmissions and mortality rates decreased after the intervention was implemented in 2017, suggesting an improvement in the process of admission and discharge. **Conclusion:** The LOS can be reduced by implementing a quality improvement intervention, driven by a multidisciplinary committee involving healthcare personnel, to facilitate the optimal discharge mechanism through available hospital resources and services.

Keywords: length of stay, hospital efficiency, patient discharge, bed utilization

INTRODUCTION

Reducing the length of stay (LOS) improves financial, operational, and clinical outcomes.[1] It can also minimize the risk of hospital-acquired conditions.[2] Pressures to cut costs have led many healthcare organizations to adopt strategies for reducing patient LOS and improving hospital throughput over the past 3 decades.[3] Studies show that the reduction in LOS reduces health costs and minimizes rates of mortality and morbidity as well as hospital readmissions due to complications.[4] Leaders in the health sector also focus on minimizing the LOS because of the growing need for hospital beds required for sick patients—a reality that has been brought to fruition during the coronavirus pandemic.

Discharging a patient is a clinical decision that is often affected by nonclinical elements. Several stakeholders contribute to nonclinical decisions, such as patient choices, irregular hospital procedures, healthcare resources, and social service arrangements. The delay in discharge because of nonclinical decisions affects cost, quality, and appropriateness of care.[5–7]

Decreasing the LOS of hospitalized patients is the primary challenge presently facing the National Health Service (NHS) in England and other international healthcare institutions where patient safety and improved quality of care provided is the primary focus. In the United Kingdom, complicated procedures to transfer inpatients from hospitals to nursing homes unfairly burdens social service departments with unjustifiable

charges resulting from extended LOS.[8] In Canada, the health system provides full coverage for all types of patient care, contributing to a continuous budget deficit because of inefficient LOS management.[9,10] Wasteful relocation by health institutions of inpatients to nursing homes impedes the discharge flow and is a huge challenge for the realization of poor health management.[11,12]

At our institution, lack of proper management and a clear strategy based on proven quality improvement methods, led to an increase in the LOS in the medical specialties department. LOS is an important indicator of bed utilization in any hospital department, so we aimed to reduce the average LOS by managing the demand for hospitalization with a multidisciplinary quality improvement intervention. This initiative was useful in forming a multidisciplinary committee that provided a set of controllable measures by focusing on the underlying causes of discharge variation, which identified potential opportunities for improvement.

METHODS

The institutional review board at King Fahad Medical City, Riyadh, Saudi Arabia approved this study. We aimed to identify and manage reasons for the delay in discharging hospital patients. We examined the admission volume and average LOS data for the medical specialties department from January 1, 2016 to December 31, 2018. On January 1, 2017, a quality improvement intervention was implemented using the FOCUS (find, organize, clarify, understand, select)–PDSA (plan, do, study, act) methodology. This approach is used to systematically improve processes; a comprehensive analysis, response, action plan, and a feedback loop was established to ensure success.

Admission and discharge data were collected for all patients discharged from medical specialties or internal medicine subspecialty service during the study period. The first admission for each patient was defined as the "index admission." Information was collected from a computerized inpatient system. A database tool was developed to collect data on admissions, discharges, reasons for delays, and predischarge requirements, including operative, imaging procedures, and lab investigations of six different medical units (internal medicine, nephrology, gastroenterology, dermatology, rheumatology, and infectious diseases). Staff were trained to use the database. We chose two time points (start and end points) rather than studying all 12 months to enhance the clarity of the comparisons.

Quality Improvement Intervention

To reduce hospital LOS, several multidisciplinary approaches were implemented based on the following critical points from Lewis and Edwards:[13]

- Patient flow through the current hospital processes was evaluated by collecting and analyzing the data at the ward level, to identify the barriers of the operational processes and staffing overlap that may contribute to the delay in the patient discharge.
- The process should start with planning discharge from admission, identifying potential barriers.
- Generating a typical method for various patient types based on approaches that concentrate on internal hospital flow, alternate out-of-hospital provision, and ultimately, patient safety.
- Organized ward rounds, end-of-life planning, and excellent communication among the multidisciplinary teams were activated.

The following actions were implemented in our institution on January 1, 2017:

- The discharge planning policy was revised.
- A shared electronic folder was used for monthly collection of the LOS data.
- The home care list of antibiotics was generated and updated for home care cases.
- An awareness campaign for discharge planning was conducted in April and December 2017 for all physicians and nurses.
- A process was developed for existing patient discharges.

A multidisciplinary LOS committee was formed to implement changes designed to optimize the patient flow and decrease the LOS. The committee included representatives from medical specialties as well as a social worker, home care nurse, case manager, head nurses, and quality nurse and physicians. Starting January 1, 2017, the committee focused on improving the average LOS for specific measurable targets each year (for example, < 8 days in 2017), monitoring mechanisms for the admission and discharge processes to sustain improvement, and ensuring that all staff were educated on the importance of initiating the discharge plan from the time of admission. Readmission rates were also monitored to detect any possible premature discharges.

Data Analysis

An Excel spreadsheet (Microsoft Corporation) was used for data manipulation and correction. Numbers of admissions for each 30-day study period were compared using a Poisson rare events probability calculation (Epi 6, Centers for Disease Control and Prevention), dichotomous variables and tests for linear trends in proportions were performed, using the χ^2 test. However, for continuous variables and tests in means the *t*-test was used. A root cause analysis was also conducted.

RESULTS

We analyzed data for 5836 admissions and 5880 discharges during a 3-year period from 2016 to 2018. Root cause analysis showed that delays in discharges were relevant to all patients (Fig. 1), and the main
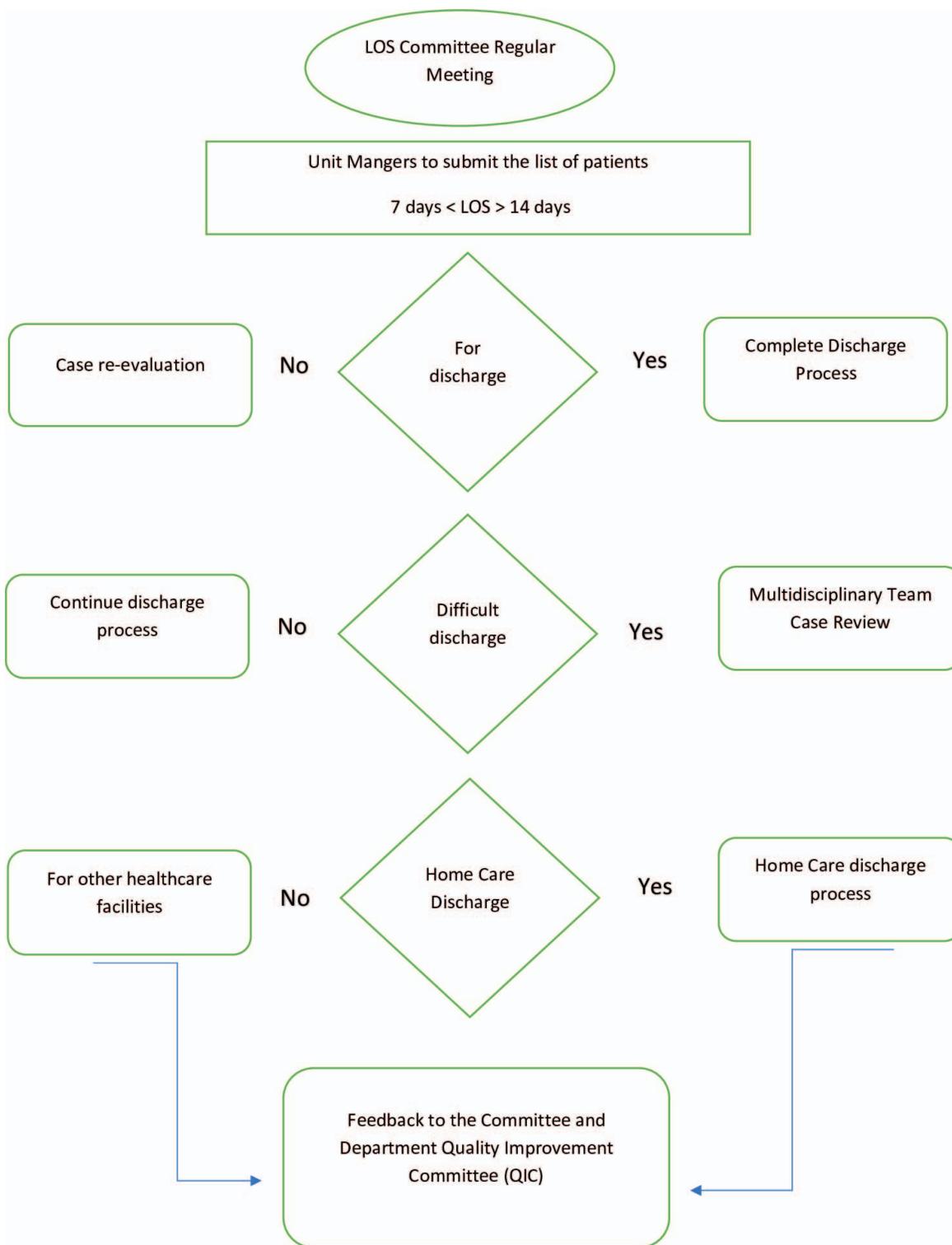
Figure 1.—Discharge process flow. LOS: length of stay.

problem was identified in the predischarge procedures, either due to social issues or the patient's beliefs.

The average number of monthly admissions increased gradually from 2016 to 2018, but the mean LOS decreased significantly from 9.16 days in 2016 to 7.47 days in 2018, a decrease of 1.69 days on average

($p < 0.001$) (Fig. 2). Lower rates of readmission were noted after January 2017 (Fig. 3). This decrease persisted after adjusting for possible confounding variables, including bed occupancy rate, bed turnover rate, daily admissions and discharges, unit specialty, and weekday/ weekend volume. Mortality rates were also notably lower
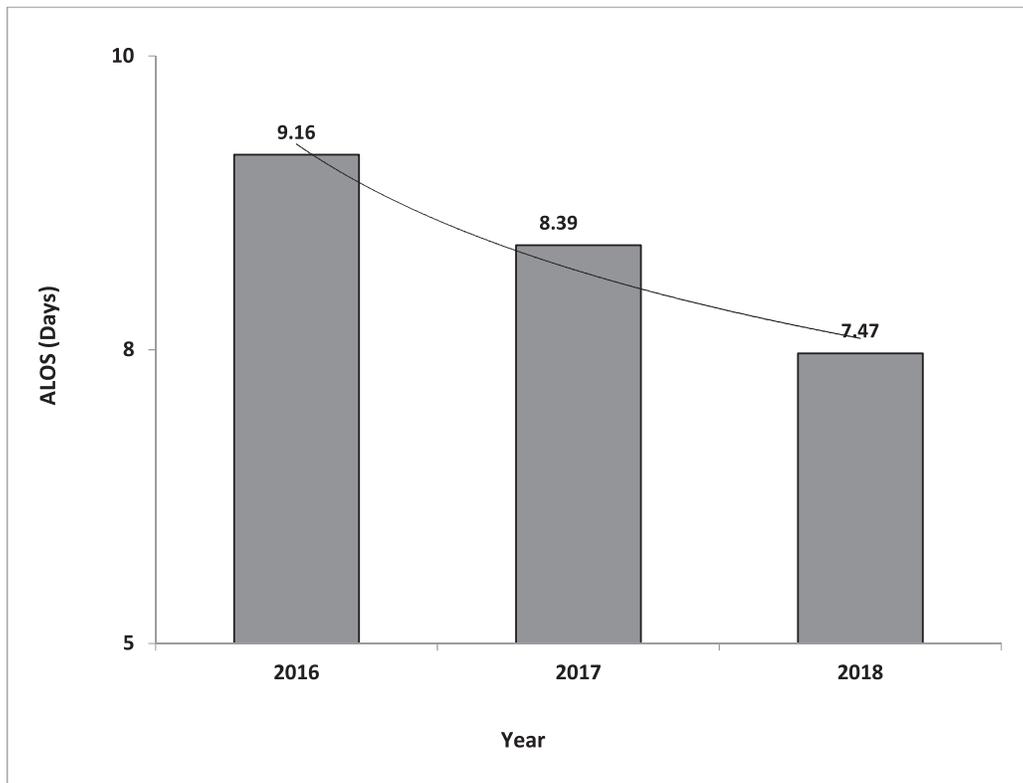
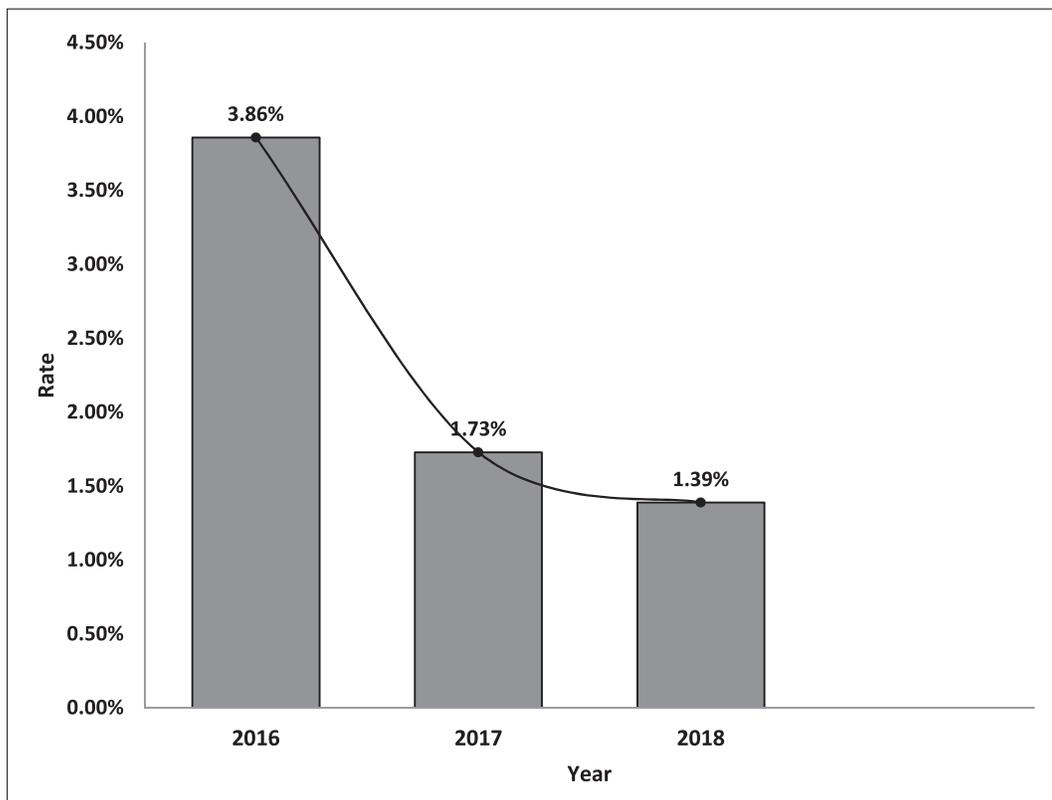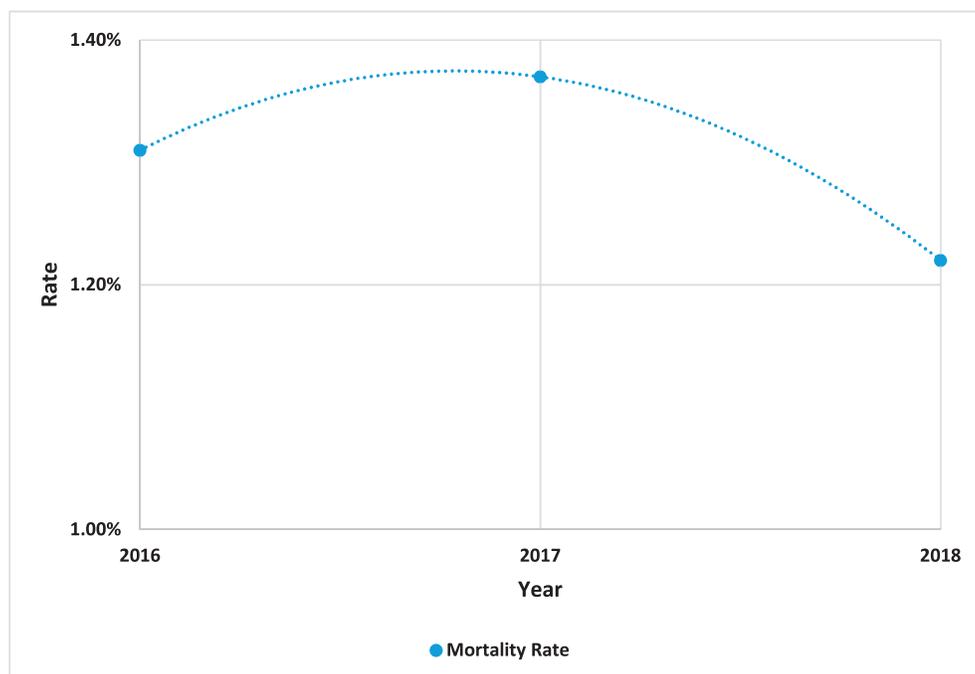**Figure 2.**—Average length of stay (ALOS).

Figure 3.—Readmission rate to the hospital within 30 days of discharge to the same specialty.

Figure 4.—Mortality rate.

during this time. (Fig. 4). The number of readmissions and mortality rates decreased significantly after the intervention was implemented, suggesting an improvement in the process of admission and discharge (Table 1).

DISCUSSION

Delays in discharging patients can lead to an increase in the LOS, and increase the bed occupancy rate, thereby increasing the cost. The process of discharging patients is complex, requiring the coordination of multiple groups, including physicians, nurses, ancillary service staff, patients, patients' families, and in some settings the finance/billing department. This study provides a set of measures that are within the hospital's control to improve LOS. This project was initiated to decrease the LOS for patients who exceeded their expected discharge date and to improve the discharge process. Based on the results of multiple complementary changes, a successful approach to reducing the LOS was established, for example, by creating an algorithm of patient flow according to policies and procedures for proficient care and patient safety.

LOS can be reduced by implementing practical approaches within the hospital's control to change; a good example is establishing a multidisciplinary committee consisting of expert stakeholders who facilitate the implementation of these approaches and improve communication with the interdisciplinary teams involved. Effective communication among members of the multidisciplinary team involved in patient care is essential to facilitate the patient discharge process. Effective discharge planning is achieved through staff education and awareness; a plan of discharge must begin during the admission process. In the past, patients were hospitalized until their medical conditions were resolved; however, currently, priority is given to stabilize the patient, minimize the LOS, and finalize the diagnosis and treatment in the outpatient setting.

Many studies have looked at factors that affect the LOS of inpatients, linking extended delays to increased hospital occupancy and high volume of admissions. The LOS for admitted patients in our study dropped significantly from 9.16 days to 7.47 days ($p < 0.0001$). This drop persisted even after controlling the potential confounders including daily admissions and hospital

Table 1.—Admissions, discharge, LOS, bed turnover, and mortality rates: 2016–2018

Year	Average No. of Admissions per Month	Average No. of Discharges and Deaths per Month	Readmission Rates Within 30 Days of Discharge to Same Specialty, %	Average LOS per Month (Days)	Average Bed Turnover Time Per Month	Mortality Rate, %
2016	155	162	3.86	9.16	2.25	1.31
2017	163	162	1.73	8.39	2.31	1.37
2018	168	166	1.39	7.47*	2.76	1.22

*$p < 0.0001$ compared to 2016.

occupancy, thus demonstrating the significance of discharge time for inpatient throughput.

Decreasing LOS is the primary critical challenge facing the NHS in England.[14] Reducing the LOS is a valuable approach to fulfill the rising need for beds.[15] Institutional standard operating procedures develop adequate services that constitute a successful approach to lessen the LOS.[16] The LOS differs considerably for both comparable patients and those with extended stays.[17] Previous studies have highlighted the importance of proactive and multidisciplinary care in reducing LOS.[13,18–21]

The NHS, through two published guidelines regarding LOS, stated that all physicians must write the order and medications 24 hours before discharge. If the physician failed to do so, the consultant would face consequences by hospital administration.[14,18] This active management is reflected in substantial reductions in the LOS.

The limitation of the study is our focus on the numbers, excluding other factors. Our outcomes were captured from a built-in database that was manually entered by clerks and prone to error. In addition, we did not examine exact cost analysis or patient satisfaction. The review is limited by the quality of underlying studies.

CONCLUSION

The results of our study prove that a quality improvement intervention using the FOCUS-PDSA methodology can reduce LOS with practical approaches, such as the creation of a multidisciplinary committee that works to facilitate the best discharge mechanism through the available resources. FOCUS-PDSA is an effective quality improvement methodology used to evaluate complex operational processes that have multiple stakeholders. Institutions aspiring to tackle delays in the discharge process should focus on adopting the core principles of FOCUS-PDSA rather than interventions that may be institution specific.

Acknowledgments

References

1. Hussey PS, Wertheimer S, Mehrotra A. The association between health care quality and cost: a systematic review. *Ann Intern Med*. 2013;158:27–34.
2. Belciug S, Gorunescu F. Improving hospital bed occupancy and resource utilization through queuing modeling and evolutionary computation. *J Biomed Inform*. 2015;53:261–269.
3. Mohebbifar R, Hasanpoor E, Mohseni M, et al. Outpatient waiting time in health services and teaching hospitals: a case study in Iran. *Glob J Health Sci*. 2014;6:172–180.
4. Gabutti I, Mascia D, Cicchetti A. Exploring "patient-centered" hospitals: a systematic review to understand change. *BMC Health Serv Res*. 2017;17:364.
5. Bryan K, Gage H, Gilbert K. Delayed transfers of older people from hospital: causes and policy implications. *Health Policy*. 2006;76:194–201.
6. Baumann M, Evans S, Perkins M, Curtis L. Transition between inpatient hospital 9 settings and community or care home 10 settings for adults with social care needs. *Health Soc Care Community*. 2007;15:295–305.
7. Glasby J, Littlechild R, Pryce K. Transition between inpatient hospital 9 settings and community or care home 10 settings for adults with social care needs. *J Health Serv Res Policy*. 2006;11:52–58.
8. Godden S, McCoy D, Pollock AM. Delay in discharge and its impact on unnecessary hospital bed occupancy. *J R Soc Med*. 2009;102:22–28.
9. Health Canada: 2008. Canada Health Act Annual Report 2007–2008. Accessed June 24, 2013. http://www.hc-sc.gc.ca
10. Discharge Abstract Database metadata (DAD). (2006). www.cihi.cawww.cihi.ca
11. Ahmad A, Purewal TS, Sharma D, Weston PJ. Improving the quality and safety of care on the medical ward: a review and synthesis of the evidence base. *Clin Med*. 2011;11:524–528.
12. Barnes DE, Palmer RM, Kresevic DM, et al. Acute care for elders units produced shorter hospital stays at lower cost while maintaining patients' functional status. *PMC*. 2012;31:1227–1236.
13. Lewis R, Edwards N. Improving length of stay: what can hospitals do?. 2015. Accessed September 9, 2015. https://www.nuffieldtrust.org.uk/research/improving-length-of-stay-what-can-hospitals-do
14. NHS review of winter 2017/18. Accessed September 2018. https://improvement.nhs.uk/documents/3201/NHS_review_of_winter_2017.18.pdf
15. Baker SJ, Esbenshade A. Emergency department throughput. *Adv Emerg Nurs J*. 2015;37:65–71.
16. Weiner BJ, Alexander JA, Shortell SM. Quality improvement implementation and hospital performance on quality indicators. *Health Serv Res*. 2006;41:307–334.
17. Heggestad T. Estimating the effect of early discharge policy on readmission rate. An instrumental variable approach. *Health Serv Res*. 2002;37:647–665.
18. Guide to reducing long hospital stays. Accessed June 2018. https://improvement.nhs.uk/documents/2898/Guide_to_reducing_long_hospital_stays_FINAL_v2.pdf
19. Cherlin EJ, Curry LA, Thompson JW. Features of high quality discharge planning for patients following acute myocardial infarction. *J Gen Intern Med*. 2013;28:436–443.
20. Wong H, Wu RC, Tomlinson G. How much do operational processes affect hospital inpatient discharge rates? *J Public Health*. 2009;31:546–553.
21. Kalra AD, Fisher RS, Axelrod P. Encephalitis hospitalization rates and inpatient mortality in the United States, 2000-2010. *J Gen Intern Med*. 2010;25:930–935.