Author/s:
O'Sullivan, K;Martensson, J;Robbins, R;Farley, KJ;Johnson, D;Jones, D

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The epidemiology of long stay patients in a university teaching hospital

Kim O'Sullivan. RN, CCRN, MBA. Director Patient flow, Austin Health.

Johan Martensson. MD, PhD. Department of Intensive Care, Austin Hospital, The University of Melbourne, Melbourne, VIC, Australia. Section of Anaesthesia and Intensive Care Medicine, Department of Physiology and Pharmacology, Karolinska Institutet, SE-171 77 Stockholm, Sweden.

Raymond Robbins. BSc (Hons), PhD. Department of administrative informatics, Austin Health.

KJ Farley. MB BS, BMedSci, FCICM, FRACP, PGCerClinUS. Intensive Care Specialist. Western Health, Melbourne, Victoria.

Doug Johnson MBBS (Hons), B.Com, CTH, PhD, FRACP. Departments of General Medicine and infectious Diseases Austin health, Melbourne University, Department of Medicine Austin health. Honorary A/Prof Department of Medicine, University of Melbourne

Daryl Jones

Author for correspondence

A/Prof Daryl Jones

BSc(Hons), MBBS, FRACP, FCICM, MD, PhD

A/Prof SPHPM, DEPM Monash University

Consultant Intensive Care specialist, Austin Health

Honorary A/Prof Department of Surgery University of Melbourne

Intensive Care Unit

Austin Hospital, Studley Road Heidelberg,

Victoria, Australia, 3084

Email: Daryl.Jones@austin.org.au

Tel: 61 39496 5000

Fax: 61 39496 3932

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Abstract

Background: Patients admitted to acute care hospitals may have multiple co-morbidities, and a small proportion may stay a protracted period.

Aims: To assess the proportion of hospital patients who are long stay (> 14 days), evaluate associations with baseline variables and subsequent in-patient morbidity and mortality.

Methods: Retrospective observational study of patients aged > 18 years staying in hospital for at least 24 hr between 1-7-2013 and 30-6-2014.

Results: There were 22,094 admissions in 15,623 patients. The median (IQR) length of stay was 4 (2-8) days, and 10% had a length of stay > 16 days. Long stay admissions comprised 13.1% of admissions but used 49.1% of bed days. Long stay admissions were more likely to be associated with intensive care unit admission (21.2% vs 6.0%), medical emergency team review (20.5% vs 4.3%), and a longer duration of mechanical ventilation (p<0.0001 all comparisons). Long stay patients were more likely to develop in-hospital complications, to die in hospital (8.2% vs 3.1%), and less likely to be discharged home (p< 0.001 all comparisons). Multiple variable analysis revealed several associations with prolonged stay, including multiple admissions in the study period, the nature of the admitting unit, the Charlson co-morbidity index at admission, admission from another hospital, and any history of smoking.

Conclusions: Patients staying at least 14 days comprised one seventh of hospital admissions, but used half of bed days, and suffer increased in-hospital morbidity and mortality. Several pre-admission associations with prolonged stay were identified.

~~**Abstract**~~

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~~Aims: To assess the proportion of hospital patients who are long stay (≥ 14 days), evaluate associations with baseline variables and subsequent in-patient morbidity and mortality.~~

~~Methods: Retrospective observational study of patients aged ≥ 18 years staying in hospital for at least 24 hr between 1-7-2013 and 30-6-2014.~~

~~Results: There were 23,101 admissions in 16,120 patients. The median (IQR) length of stay was 4 (2-8) days, and 10% had a length of stay > 16 days. Long stay admissions comprised 13.5% of admissions but used 50.8% of bed days. Long stay patients were more likely to be admitted to the intensive care unit (22.9% vs 6.1%), receive a medical emergency team review (21.7% vs 4.4%), and had longer durations of mechanical ventilation (p<0.001 all comparisons). Long stay patients were more likely to develop in-hospital complications, to die in hospital (8.2% vs 3.1%), and less likely to be discharged home (p< 0.001 all comparisons). Multiple variable analysis revealed several associations with prolonged stay, including multiple admissions in the study period, the nature of the admitting unit, the Charlson co-morbidity index at admission, admission from another hospital, and any history of smoking.~~

~~Conclusions: Patients staying at least 14 days comprise one seventh of hospital admissions, but use half of bed days, and suffer increased in-hospital morbidity and mortality. Several pre-admission associations with prolonged stay were identified.~~

Introduction

Patients admitted to acute care hospitals are becoming more complex and have advancing age and increasing co-morbidity. Studies identifying risk factors for prolonged hospital admissions have generally been small, retrospective, single centre studies whichand have mostly been limited to narrow cohort of patient e.g. heart failure [1], high cost users [2], colo-rectal surgery [3], and geriatric patients [4, 5]

Such studies have generated a very broad list of factors which may be associated with prolonged hospital length of stay (Appendix 1) [1-12]. To our knowledge there has been no study to examine the epidemiology of a diverse cohort of hospitalised patients, and the implication of such patients in regard to overall hospital bed utilization and occupancy. This information may be important, as it has been argued that bed utilization in public hospitals could be better otpimised[13].

We have established a long stay committee for patients with a hospital length of stay greater than 14 days. The purpose of this study was to examine how common long stay was in our hospital, and the proportion of overall bed utilization such admissions utilized. In addition, we assessed for associations with long stay in terms of patient demographics, and details of hospital admissions. Finally, we examined whether long stay was more likely to be associated with the development of a number of pre-defined complications, including in-hospital mortality.

Methods

Ethics approval

Ethics approval was obtained to conduct the audit (LNR/15/Austin/21) and the need for informed patient consent was waived.

Details of hospital

The Austin Hospital is a tertiary level teaching hospital in metropolitan Melbourne, Australia. It has 400 acute care beds and is a statewide referral centre for spinal cord injuries, chronic ventilatory failure, and liver transplant medicine. There is a separate mental health precinct co-located on the acute care campus.

The hospital has two tiers of emergency response team termed a "Respond Blue" team for immediately life-threatening emergencies, and a Medical Emergency Team (MET) to review all other emergencies. The intensive care unit (ICU) contains 20 beds and admits a mixture of intensive care and high dependency patients.

Details of long stay committee

The Long stay and complex patient monitoring committee assists with discharge planning for complex long stay patients within Austin Health. Representation at this committee is wide-spread and includes a rotating executive member, frontline clinical managers, allied health and medical representation. The purpose of the committee is to:

1. review discharge planning issues affecting:
    a) long stay patients (>14 Day LOS) as identified by the Care Coordination and Discharge Team or any member of the Committee.
    b) all acute patients with a >40 day LOS.
    c) any patient with complex issues that are likely to delay discharge
2. develop strategies for the resolution of patient management issues or barriers to discharge and to identify and solve systemic problems delaying discharge planning or flow.
3. enable executive support for the resolution of issues.
4. monitor the performance of Austin Health with this cohort of patients

Each week patient length of stay data is generated for review and all long stay patients are categorised according to the factors that are leading them to stay in hospital. The long stay Committee is the only formalised committee to assist with escalation of complex long stay patients at a set time point to assist with minimising lost bed days with delay and strongly focused on ensuring appropriate medical discussions about treatment.

Participant details

We included all adult (aged > 18yr) patients who are admitted to the Austin Hospital for more than 24 hours (excluding day surgery, dialysis and short stay admissions). ~~–~~We excluded highly specialized patients admitted under the liver transplant, acute spinal, and chronic ventilation units to increase the generalizability of our findings to other settings. The study period included all patients admitted July 1st 2013 to June 30th 2014 to ensure hospital outcome data could be obtained.

Details of data source and information collected

Data was obtained from the hospitals clinical information systems. We obtained details on patient demographics including age, gender, place of residence, information to calculate Charlson Co-morbidity index; details of admission including day and month of admission, time of day of admission (day [08:00-18:00], evening [18:01 – 22:00], overnight [22:01-07:59], elective vs non-elective, source of admission (home, aged care facility, other hospital, other), and initial parent unit, the number of previous admissions prior to the index admission and whether the patient had ever smoked.

We also collected information on critical care resource use including the number of ICU admissions, and total number of hours in ICU and hours of mechanical ventilation. We also documented the number of MET and Respond Blue calls.

Finally, we collected information on several pre-defined complications based on ICD 10 diagnostic codes for the development of anemia, delirium, falls, pressure injury, wound infection and renal failure, as well as the disposition at hospital discharge (died, home, nursing home, hospital transfer, other).

Details of data analysis

Data ~~are~~ were presented as counts and percentages or as median (interquartile range). Continuous variables were compared using the Mann-Whitney U test while categorical variables were compared using the chi-square test for equal proportion. To assess the frequency and consequences of long stay (defined as a hospital length of stay ≥ 14 days) we examined all hospital admissions in the study period.

When assessing for associations with long stay, repeat admissions were removed, and the hospital length of stay of greatest duration was used as the index admission. We graphed the parent units according to increasing median hospital length of stay ~~according which permitted arbitrary classification of the admitting unit (by JM and DJ)~~which were then divided ~~-~~into four equal groups (quartiles) ~~(~~labelled 0,1,2,3 (Figure 1)~~)~~.

We used multivariable logistic regression analysis to identify variables independently associated with long stay. All baseline characteristics were considered and included in the final model if they were significant at P<0.2 in the univariable analysis. In addition, we calculated the area under the receiver operating characteristics curve for the final model. Statistical analysis was performed using SPSS-version 20 (IBM, New York, USA) and STATA® version 11.2 software (Stata Corporation, College Station, TX, USA). A two-sided P-value < 0.05 was considered statistically significant.

Results

Details of patient cohort

Over the study period there were 2322,101094 admissions in patients aged ≥ 18yo that lasted more than 24hr. The admission type was classified as medical (5452.54%), surgical (3738.29%), emergency/toxicology (3.46%), mental health (2.34%) and other (2.57%).

There were 1615,120623 patients admitted during this time period, with a median (IQR) age of 64 (4647-7778) years, 4647.94% were female, and 2721-2546 patients who had an admission with a hospital length of stay (LOS) of ≥ 14 days.

Overall utilization of bed days

Amongst the 2322,101094 admissions, the median (IQR) LOS was 4 (2-8) days. In addition, 10% of admissions had a hLOS > 16 days, and 5% had a LOS > 24 days. A small proportion of hospital admissions utilized a disproportionate number of bed days (Table 1). Thus, 13.51% of admissions were at least 14 days long, and these comprised 5049.81% of all hospital bed days. In addition, 43.07% of admissions were at least 28 days long, and used almost as many bed days as 68.16% of admissions (Table 1).

Differences in critical care utilization associated with long stay admissions

Admissions of at least 14 days duration were associated with much greater use of critical care resources (Table 2). Thus, almost ½21.2% of long stay admissions were associated with an ICU admission and the ICU length of stay and duration of mechanical ventilation was longer in patients with a LOS ≥ 14 days (P<0.0001). Furthermore, long stay admissions were more likely to be associated with the need for a MET call and repeat MET calls (p<0.0001) (Table 2).

Differences in outcomes associated with long stay admissions

Admissions of at least 14 days duration were associated with accumulation and acquisition of significant morbidity when compared with those of less than 14 days (Table 3). Thus, long stay admissions were more likely to be associated with an increase in the Charlson co-morbidity index and development of one or more of the six pre-defined complications-morbidities (p<0.0001). In addition, long stay admissions were more likely to be associated with in-hospital death, and much less likely to be associated with a discharge to home (p< 0.0001) (Table 3).

Differences in baseline characteristics and in-hospital outcome for patients

Among the 15,623 patients tThere were marked differences in the hLOS based on the parent unit associated with index (longest) admission (Figure 1). On uni-variable analysis, there were a number of differences between the characteristics of patients who had an admission of stayed at least 14 days, compared with those who did not (Table 4). Thus, long stay patients were older, had a higher admission Charlson co-morbidity index, were more likely to have smoked, to have had previous admissions, less likely to be admitted from home, and more likely to be admitted under unit category 2 or 3 (p<0.0001).

In contrast, patients with long stay admissions were less likely to be admitted overnight, in the context of an emergency admission or during spring or autumn (Table 4).

Patients with a hLOS of at least 14 days were more likely to die during their index admission (8.2% vs 3.1%; $p < 0.001$).

Multiple variable logistic regression analysis identified several associations with a hLOS of at least 14 days in the index admission (Table 5). The variables with the strongest association with prolonged hLOS included: 1) the number of hospital admissions in the study period; 2) the category of the admitting unit (Category 2 or 3); 3) the Charlson co-morbidity index; 4) admission from another hospital; and 5) a prior history of smoking. The variables in the final model developed yielded a receiver operator curve with and AUC of 0.~~75~~ 74 (Figure 2).

Discussion

Summary of major findings

We conducted a retrospective study involving more than ~~23~~ 22 thousand admissions and ~~16~~ 15 thousand patients to evaluate the epidemiology of protracted in-hospital stay. We found that admissions lasting longer than 14 days used half of all bed days but comprised only one seventh~~7th~~ of admissions. In addition, such admissions were more likely to be associated with ICU admission, ~~and~~ need for MET calls, and acquisition of complications, co-morbidity, and in-hospital death. Finally, we identified several important and readily measurable clinical associations with a hLOS of more than 14 days.

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Comparison with previous studies

Several previous studies have been performed to examine associations with, and complications of protracted hospital stay. However, all of these studies focussed on relatively narrow patient cohorts, rather than a heterogeneous cohort (Appendix).

Similar to our study, these studies identified increasing age [1-3, 11, 12], co-morbidity [1, 2, 9, 11], and source of admission [6, 8] as associations with prolonged hospital stay. In addition, these studies also revealed that prolonged hospital stay was associated with increased development of in-hospital complications [4, 5, 8, 10] and in-hospital death [10].

Study strengths and limitations

Our study involves a large number of admissions and patients in a heterogenous cohort, and demonstrates the consequences of protracted hospital stay. It also revealed several clinically relevant and readily identifiable~~ed~~ associations with prolonged hospital stay at the time of hospital admission.

Despite these strengths, our study has several weakness including single centre (in a tertiary referral hospital) and retrospective study design, and use of ICD-10 coding to identify pre-morbid co-morbidity and hospital associated complications. We have excluded highly specialised patients from our cohort to improve the generalizability of our findings. In addition, we are not able to comment on functional disability ~~and~~ or mortality after discharge from hospital.

Implications for clinicians and policy makers

We have revealed that a small proportion of hospital admissions account for a large and disproportionate number of hospital bed days. Any intervention that can reduce the length of stay of such patients is likely to markedly improve the efficiency of healthcare utilisation and bed access for other patients.

Areas of future research

We are currently conducting a prospective observational study to better understand the reasons why long stay patients are remaining in hospital. There is a need to better understand the nature of the relationship between the development of co-morbidity and hospital length of stay. Specifically, it remains to be seen how much of the protracted hLOS is reversible or preventable, and whether prolonged hLOS is a cause, or consequence of acquired in-patient morbidity.

Table 1: Relative utilisation of bed days

Hospital LOS	Number (%) admissions	Number (%) bed days	Length of stay Median (IQR) days
1-6 days	15152 (68.6)	43887 (27.5)	3.0 (2.0-4.0)
≥ 7 days	6942 (31.4)	115955 (72.5)	12.0 (8.0-19.0)
≥ 14 days	2897 (13.1)	78533 (49.1)	21.0 (16.0-29.0)
≥ 21 days	1473 (6.7)	55166 (34.5)	29.0 (24.0-39.0)
≥ 28 days	813 (3.7)	39697 (24.8)	37.0 (31.0-48.0)

Table 2: Differences in critical care utilization of long stay patients

	Admission with hLOS 1-13 days	Admission with hLOS ≥ 14 days
ICU transfers n (%)		
0	18044 (94.0)	2282 (78.8)
1	1098 (5.7)	488 (16.8)
2	53 (0.3)	100 (3.5)
3 or more	2 (0)	27 (0.9)
ICU hours * Median (IQR)	32.0 (18.0-65.0)	69.0 (24.0-155.0)
Hours of mechanical ventilation * Median (IQR)	0 (0-12.0)	7.0 (0-34.0)
MET calls n (%)		
0	18362 (95.7)	2302 (79.5)
1	664 (3.5)	371 (12.8)
2	133 (0.7)	133 (4.6)
3	34 (0.2)	59 (2.0)
4	3 (0)	18 (0.6)
5 or more	1 (0)	14 (0.5)
Respond Blue calls n (%)	72 (0.4)	44 (1.5)

P< 0.0001 for all comparisons

* ICU hours and hours of mechanical ventilation only presented for patients admitted to ICU

ICU = Intensive care unit, hLOS = hospital length of stay, MET = Medical Emergency Team

Table 3: Differences in outcomes of admissions associated with hLOS > 14 days

	Stayed 1-13 days	Stayed ≥ 14 days
CCI at acute campus discharge Median (IQR)	4 (2-6)	6 (3-8)
Change CCI admission to discharge n (%)		
0	18914 (98.5)	2634 (90.9)
1	204 (1.1)	159 (5.5)
2	59 (0.3)	64 (2.2)
3	14 (0.1)	30 (1.0)
4 or more	6 (0)	10 (0.3)
Total complications n (%) *		
0	18217 (94.9)	1974 (68.1)
1	846 (4.4)	616 (21.3)
2	113 (0.6)	206 (7.1)
3	21 (0.1)	74 (2.6)
4 or more	0 (0)	27 (0.9)
Anemia n (%)	315 (1.6)	331 (11.4)
Delirium n (%)	239 (1.2)	293 (10.1)
Fall n (%)	69 (0.4)	89 (3.1)
Pressure injury n (%)	140 (0.7)	258 (8.9)
Renal failure n (%)	277 (1.5)	266 (9.1)
Wound infection n (%)	81 (0.4)	112 (3.9)
Discharge destination n (%)		
died	659 (3.4)	232 (8.0)
home	16206 (84.4)	1593 (55.0)
nursing home	462 (2.4)	78 (2.7)
other	409 (2.1)	133 (4.6)
hospital transfer	1461 (7.6)	861 (29.7)

P<0.0001 for all comparisons

* denotes total number of six pre-defined complications: ~~from~~ anemia, delirium, fall, pressure injury, renal failure, wound infection.

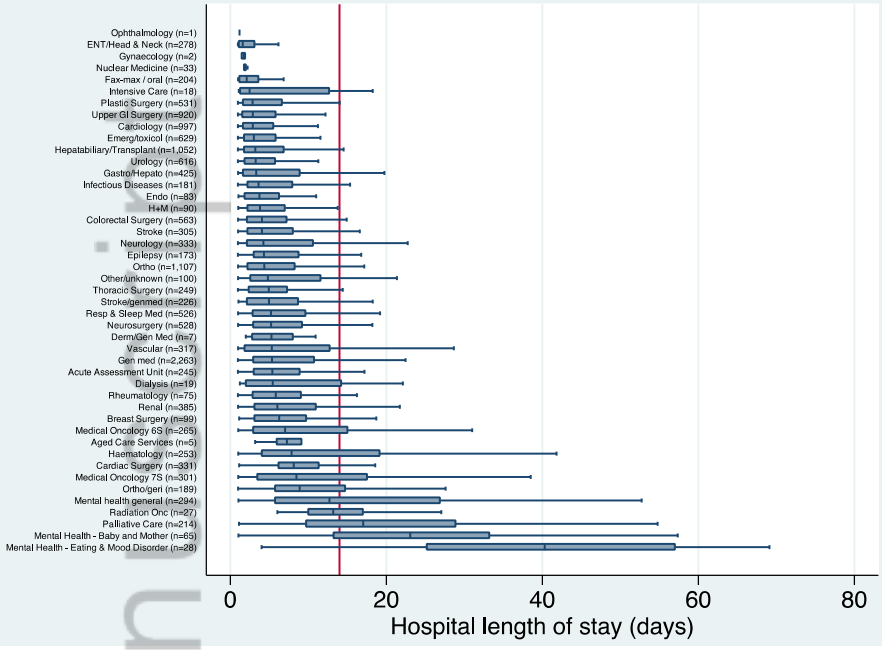

Figure 1. Median hospital length of stay according to admission unit. Group 0 includes ophthalmology- Hepatabiliary/Transplant; group 1 includes Urology-other/unknown; group 2 includes thoracic surgery-renal; group 3 includes breast surgery - mental health.

Table 4: Differences in baseline characteristics of long stay patients

Variable	Length of stay 1-13 days (n=13,077)	Length of stay ≥14 days (n=2,546)	P value
Age, years Median (IQR)	63.0 (45.0-77.0)	70.0 (54.0-81.0)	<0.001
Charlson Index n (%)			
0	2191 (16.8)	252 (9.9)	
1-2	2496 (19.1)	267 (10.5)	
3-4	3289 (25.2)	432 (17.0)	<0.001
5-6	2832 (21.7)	648 (25.5)	
>6	2269 (17.4)	947 (37.2)	
Ever smoked n (%)	4529 (34.6)	976 (38.3)	<0.001
Emergency admission n (%)	9097 (69.6)	1618 (63.6)	<0.001
No. of previous admissions n (%)			
0	11797 (90.2)	1784 (70.1)	
1	984 (7.5)	448 (17.6)	<0.001
>1	296 (2.3)	314 (12.3)	
Admission source, n (%)			
Home	12215 (93.4)	2176 (85.5)	
Age care residential facility	241 (1.8)	29 (1.1)	<0.001
Other hospital/rehab/geri	574 (4.4)	249 (9.8)	
Other	47 (0.4)	92 (3.6)	
Admitted time of day n (%)			
Daytime	6892 (52.7)	1468 (57.7)	
Evening	1995 (15.3)	429 (16.8)	<0.001
Overnight	4190 (32.0)	649 (25.5)	
Admitted on a weekend, n (%)	2686 (20.5)	454 (17.8)	0.002
Season n (%)			
Spring (Sep-Nov)	3302 (25.3)	591 (23.2)	
Summer (Dec-Feb)	2969 (22.7)	638 (25.1)	0.032
Autumn (Mar-May)	3408 (26.1)	653 (25.6)	
Winter (Jun-Aug)	3398 (26.0)	664 (26.1)	
Risk category based on admission unit, n (%)			
0	4251 (32.5)	431 (16.9)	
1	3511 (26.8)	504 (19.8)	<0.001
2	3999 (30.6)	855 (33.6)	
3	1316 (10.1)	756 (29.7)	
Mortality, n (%)	411 (3.1%)	208 (8.2%)	<0.001

Table 5. Multivariable logistic regression analysis showing the association with hospital length of stay of at least 14 days.

Variable	Odds Ratio	[95% Conf.	Interval]	P-value
Charlson co-morbidity Index				
0	Referent			
1-2	0.90	0.75	1.09	0.276
3-4	1.05	0.89	1.25	0.568
5-6	1.71	1.45	2.01	<0.001
>6	2.40	2.04	2.83	<0.001
Ever smoked				
No	Referent			
Yes	1.18	1.07	1.29	0.001
No. of previous admissions				
0	Referent			
1	2.26	1.98	2.58	<0.001
>1	4.29	3.58	5.15	<0.001
Admitted time of day				
Daytime	Referent			
Evening	1.09	0.96	1.23	0.205
Overnight	0.86	0.77	0.95	0.005
Season				
Spring (Sep-Nov)	Referent			
Summer (Dec-Feb)	1.19	1.05	1.36	0.009
Autumn (Mar-May)	1.02	0.90	1.17	0.729
Winter (Jun-Aug)	1.14	1.00	1.29	0.053
Weekday or weekend				
Weekday	Referent			
Weekend	0.86	0.77	0.97	0.014
Admission source				
Home	Referent			
Age care residential facility	0.50	0.33	0.74	0.001
Other hospital/rehab/geri	2.23	1.89	2.63	<0.001
Other	2.02	1.37	3.00	<0.001
Admission unit category				
0	Referent			
1	1.31	1.14	1.51	<0.001
2	1.54	1.35	1.76	<0.001
3	3.27	2.83	3.78	<0.001

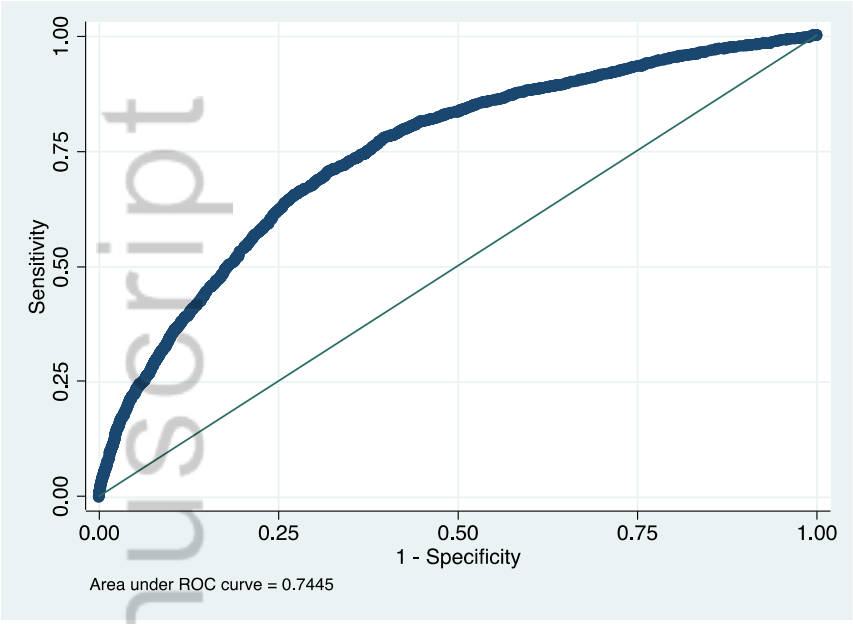

Figure 2. Model prediction of length of stay ≥14 days.

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Appendix 1: Summary of articles reporting on associations with prolonged length of hospital stay

First author year	Study population, location	Study Design	Variables associated with prolonged length of stay (LOS)	Variables not associated with prolonged length of stay	Definition of prolonged length of stay
Fox MT [1] 2013	Mostly USA 1736 patients, 9 trials, >65yo, randomised, controlled & quasi-experimental designs, acute hospital admissions	Systematic review and meta-analysis	Increasing age Dementia	Early discharge planning	Not provided
Wright SP [6] 2003	197 patients admitted with heart failure in Auckland, New Zealand	Prospective, single centre, 1996-97	***Admission variables*** (explained 31% LOS variance): oedema present, home alone, oral diuretics, cardiothoracic ratio. ***Inpatient variables*** (55% variance in LOS) : duration of IV diuretic, renal or other complications , weight change, comorbid respiratory problems, social problems needing inpatient assessment		LOS greater than the median length of hospital stay NB: LOS was not normally distributed so analysed according to above or below the top quartile, as well as above the 95th centile
Calver J [2] 2006	Patients discharged from public or private West Australian hospitals in 2002	Database retrospective	Actually looked at "high cost users": age > 65yo, dialysis, chemotherapy, angina, heart failure, myocardial infarcts, depression, schizophrenia, complications of orthopaedic devices. Higher comorbidity score, more chronic conditions		"high cost user" = top 5% " long stay" was defined as > 35 days
Schofield DJ [12] 2006	Projected data from Australian bureau of statistics	Data projections	Age associated with higher average LOS currently (>85yo stay 6.3 days)		Overall LOS decreasing steadily over 1994-2004. Population aging will create increased demand on beds by 2050

First author year	Study population, location	Study Design	Variables associated with prolonged length of stay	Variables not associated with prolonged length of stay	Definition of prolonged length of stay
Rickard MJ [11] 2004	1095 consecutive admissions 1995-2001 from Concord Hospital, Sydney	Retrospective data analysis	On multivariate: urgent surgery, peripheral vascular disease, stoke, age, respiratory disease, tumour site. Length of pre-op stay, transfusion, tumour involving adjacent structure, stoma formation, ASA, mobilisation of splenic flexure, private hospital	All the factors combined accounted for only 21.2% variance in LOS. LOS not associated with sex, smoking, diabetes, hypertension, tumour size, perforation, tumour stage.	Not provided
Vather R [3] 2007	294 patients elective colorectal resection 2002-2005 at two hospitals in Auckland, NZ	Retrospective database search	Patients at the Middlemore (median LOS 11D) stayed 1.52 times longer than those at Manukau surgery centre (median LOS 7D). Age >80yo associated increased LOS. Duration of surgery; every extra hour increased LOS 1.15. ASA score; every extra point increased LOS 1.15	Race, stoma formation, gender, type of surgery	Not provided
Nathavitharana RL [10] 2011	1491 non-elective internal medicine inpatients at Palmerston Nth Hospital, NZ, 2008	Retrospective cohort study	Anaemia (5.1days in non-anaemic patients vs 7.3 days in anaemic pts) after adjusting for age, reason for admission, gender, race. Anaemia also associated with mortality & unplanned readmission.		Not provided

First author year	Study population, location	Study Design	Variables associated with prolonged length of stay	Variables not associated with prolonged length of stay	Definition of prolonged length of stay
Basic D [8] 2009	Emergency admissions 2000-2005 of older patients in a tertiary Sydney hospital	Prospective	Intra-hospital transfers cause delirium & increased LOS Things which increased median LOS included: delirium, infection, anaemia, GIT disorder not bleeding, stroke.	Things that predicted SHORT LOS were: syncope, ability to perform *timed up and go test, Modified Barthel score > 15*, *no delirium*, as well as no infection, no anaemia, no GIT disorder, no stroke.	Not provided
Campbell SE [9] 2004	Systematic review of acutely admitted medical (not surgical or psych) patients >60yo	Systematic review, 14 papers included in article	Functional status score Illness severity Cognitive score Comorbidity score ?Polypharmacy	Depression Age Gender ? Presenting illness ? Poor nutrition	Not provided
Vetrano DL [5] 2013	1123 patients >65 yo admitted to geriatric or internal med wards in 7 Italian hospitals. Analysed in groups of elective vs. ER admissions.	Prospective	Polypharmacy (10 or more drugs) Pressure ulcers Elective admissions For ER admissions, female & ESR level	Alcohol consumption Walking speed >0.8m/s Cerebrovascular disease Dementia Emergency admissions	> Median LOS which was 10 days.
Nobili A [4] 2011	38 internal medicine wards in Italy. 1332 patients over 65 yo.	Prospective cohort study	Adverse event while inpatient	Polypharmacy (5 or more drugs), Charlson Index, age, sex	Not provided
Agarwal E [7] 2013	3122 patients across Australia & NZ hospitals.	Prospective cohort study or patients recruited in a previous point prevalence study	Malnourishment Eats <50% of food offered		Not provided