Centre for Primary Health Care and Equity

Central and Eastern Sydney Primary and Community Health Cohort/Linkage Resource

General Practitioner follow-up after hospitalisation in the Central and Eastern Sydney area

Prepared by:
A/Prof Margo Barr, Ms Heidi Welberry, A/Prof Elizabeth Comino,
A/Prof Ben Harris-Roxas, A/Prof Jane Lloyd, A/Prof Elizabeth Harris, Prof John Hall, Prof Mark Harris

Website: https://cphce.unsw.edu.au/research/gp-follow-up-after-hospitalisation/central-and-eastern-sydney

Suggested citation:
Barr M, Welberry H, Comino E, Harris-Roxas B, Lloyd J, Harris E, Hall J, Harris M (2018) General Practitioner follow-up after hospitalisation in the Central and Eastern Sydney area, CPHCE, UNSW.

For further information, please contact Centre for Primary Health Care and Equity (CPHCE).

The Central and Eastern Sydney Primary and Community Health Cohort/Linkage Resource is jointly funded by NSW Health Sydney Local Health District, NSW Health South East Sydney Local Health District and the Central and Eastern Sydney Primary Health Network. Current members of the management committee are Mark Harris (Chair), Margo Barr, Lou-Anne Blunden, Fiona Blyth, Kathy Clinch, Elizabeth Comino, AnnMarie Croser, Deb Donnelly, John Hall, Liz Harris, Ben Harris-Roxas, Tony Jackson, Jane Lloyd, Belinda Michie, Kylie Vuong, Liam Shanahan and Heidi Welberry.

This research was completed using data collected through the 45 and Up Study (www.saxinstitute.org.au). The 45 and Up Study is managed by the Sax Institute in collaboration with major partner Cancer Council NSW; and partners: the National Heart Foundation of Australia (NSW Division); NSW Ministry of Health; NSW Government Family & Community Services – Ageing, Carers and the Disability Council NSW; and the Australian Red Cross Blood Service. We thank the many thousands of people participating in the 45 and Up Study.

We also wish to thank the staff at Centre for Health Record Linkage and all the data custodians for their assistance with data linkage as well as the following individuals for their invaluable advice and input into the project: Dr Michael Falster, Centre for Big Data Research in Health, and Ms Tina Navin Cristina, Sax Institute.

Executive Summary

Integration and co-ordination of health care are key performance indicators for health services (DuGoff et al. 2013). One measure of transition is return to general practice for follow-up care after a hospital admission (Jackson et al 2015). This research study investigated both the factors associated with and the impact of seeing a General Practitioner (GP) within 2 weeks of hospital discharge on patient outcomes including re-admission, in a community-dwelling population in the Central and Eastern Sydney (CES) region.

Methods

CES hospitalisations (2006-2014) were linked with the 45 and Up Study data, Medical Benefits Schedule (MBS) claims data and deaths. Time to first GP and/or Specialist visit post-discharge was calculated.

For those participants who saw/did not see a GP/Specialist within 2 weeks of discharge:

- participant characteristics were compared using logistic regression
- time to event (first subsequent hospitalisation in next 12 months) linkage analysis was undertaken.

A major strength was the use of an extremely large community-dwelling cohort of older people. A limitation was that the cohort varied slightly from the NSW population because of non-response at baseline.

Eligible participants

All eligible participants were residing in CES at baseline (n=30,645) with a hospitalisation that:

- occurred between January 2007 and December 2014
- was not an overnight stay
- was not for rehabilitation, dialysis or joint replacement.

This resulted in 10,240 index hospitalisations.

Of the eligible participants, 6,587 (64.3%) saw a GP and 7,426 (72.5%) saw a GP and/or Specialist within 2 weeks of discharge. The participant characteristics associated with increased odds of seeing a GP and/or Specialist within 2 week of discharge, after controlling for all other factors, included:

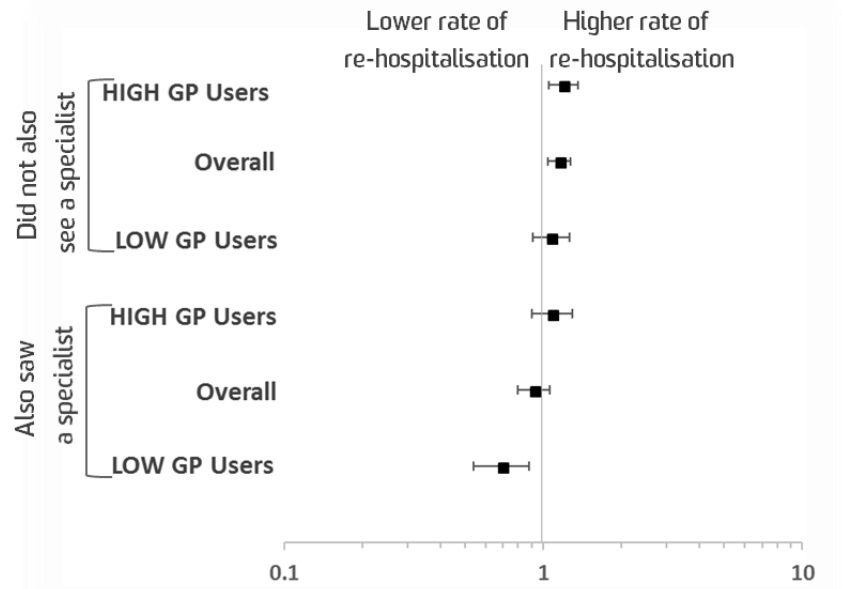
- increasing age or being male
- lower household income
- working full-time
- not having private health insurance
- increasing Duke Social Support Index (DSSI)
- self-reported cardiovascular disease at baseline
- having a longer length of stay for the index hospitalisation
- more GP visits in the 12 months prior to the index hospitalisation
- fewer hospitalisations in the 12 months prior to the index hospitalisation
- fewer Specialist visits in the 12 months prior to the index hospitalisation.

Findings

Of the 7,426 participants who saw a GP and/or Specialist within 2 weeks of discharge, within a year:

- 68.1% did not have a subsequent hospitalisation in the next 12 months
- 30.9% had a subsequent hospitalisation in the next 12 months
- 0.7% died without a subsequent hospitalisation in the next 12 months.

Hazard Ratios (HR) with 95% Confidence Intervals (CI) are shown in the figure below. As the HRs show, after controlling for other factors in the multivariant models, seeing a GP was significantly associated with lower rates of subsequent hospitalisation if they also saw a Specialist.



Group	Also saw a Specialist	Did not also see a Specialist
Overall	0.92; 95% CI 0.80-1.06	1.13; 95% CI 1.02-1.25
LOW GP Users	0.68; 95% CI 0.53-0.87	1.05; 95% CI 0.89-1.23
HIGH GP Users	1.09; 95%CI 0.90-1.31	1.18; 95% CI 1.03-1.35

Subsequent hospitalisations in those who saw a GP/Specialist were:

- more likely if they were older, had inadequate physical activity, had poorer self-rated health, had ever had cardiovascular disease, had ever had cancer, had severe functional limitations, had longer lengths of stay, or were hospitalised multiple times prior to index hospitalisation.
- less likely if they were female, spoke a language other than English, had a partner or had private health cover.

Contribution to policy, practice and/or research

The groups with increased odds of seeing a GP/Specialist within 2 weeks of discharge were not in the at-risk 30-day readmission groups identified by other researchers (i.e. older, males, low incomes, no insurance), suggesting that follow-up is being targeted to those with the highest need (Silverstein et al. 2008). Discharge planning and transfer of care from hospital to general practice through discharge arrangements was shown to have substantial benefits for both patients and the health system.

Further research to examine in more detail the effect of GP/Specialist follow-up within 2 weeks of discharge by specific conditions, such as neoplasms, heart failure, and respiratory disease, could be informative. However, because of the small numbers of patients by condition in CES, this analysis may need to be expanded to include all of NSW. “Familiar” GP versus any GP follow-up could also be explored to see if there is any effect.

Table of Contents

List of Figures

List of Tables

Abbreviations

AIHW	Australian Institute of Health and Welfare
ACSQHC	Australian Commission on Safety and Quality in Health Care
AMA	Australian Medical Association
AMI	Acute Myocardial Infarctions
APDC	Admitted Patient Data Collection
BMI	Body Mass Index
CES	Central and Eastern Sydney
CESPHN	Central and Eastern Sydney Primary Health Network
CES-P&CH	Central and Eastern Sydney Primary and Community Health Cohort/Linkage Resource
CI	Confidence Interval
CHeReL	Centre for Health Record Linkage
COPD	Chronic Obstructive Pulmonary Disease
DHS	Department of Human Services
DVA	Department of Veterans Affairs
DSSI	Duke Social Support Index
GP	General Practitioner
HF	Heart Failure
HR	Hazard Ratio
ICD	International Classification of Diseases
K10	Kessler 10
LHD	Local Health District
MBS	Medical Benefits Schedule
NSQHS	National Safety and Quality Health Service Standards
NSW	New South Wales
OS	Other Sydney metropolitan areas
PHI	Private Health Insurance
QoL	Quality of Life
SD	Standard Deviation
SESLHD	South Eastern Sydney Local Health District
SLHD	Sydney Local Health District

Introduction

Integration and co-ordination of health care are key performance indicators for health services. One measure of transition is return to general practice for follow-up care after a hospital admission. The National Safety and Quality Health Service Standards (NSQHS) and the Australian Commission on Safety and Quality in Health Care (ACSQHC) define clinical handover as 'the transfer of professional responsibility and accountability for some or all aspects of care for a patient, or group of patients, to another person or professional group'. Appropriate clinical handover is a requirement of the NSQHS. The ACSQHC notes the importance of 'transition of care' that 'ends only when the patient is received into the next clinical setting'. The ACSQHC (2017) in standard 6 of the NSQHS states that there should be timely, relevant and structured clinical handover that supports safe patient care. Patient information within Central and Eastern Sydney (CES) regarding hospital discharge and when to see a GP are only time specific with regard to medications, i.e. for 2 or 5 days and then need to see a GP (South Eastern Sydney Local Health District 2018, Sydney Local Health District 2018).

Scott (2010) found, from his meta-analysis, that discharge processes are effective in reducing readmissions if they include: early and complete assessment of discharge needs and medication reconciliation; enhanced patient (and care-giver) education and counselling specifically focussed on gaining an understanding of the patient's condition and its self-management; timely and complete communication of a management plan between clinicians at discharge when patient care is transferred from hospital staff to primary care teams; early post-acute follow-up with either a doctor or nurse within 24–72 hours for high-risk patients; early post-discharge nurse (or pharmacist) phone calls or home visits to confirm understanding of management and follow-up plans in high-risk patients; appropriate referrals for home care and community support services when needed provided and coordinated by one, or at most two, clinicians assigned to that patient for both pre-discharge and post-discharge phases.

The Australian Medical Association (AMA) has a position paper on appropriate and effective transfer of care arrangements. This includes the need for comprehensive, accurate and timely two-way communication regarding admission, treatment and patients' on-going care needs (AMA 2013). The Canadian Institute for Health Information in their Physicians Follow-up After Hospitalisation Discharge: Progress in Meeting Best Practices (2015), states 'there is some variation in follow-up recommendations across organizations and diseases'. Both in Canada and internationally, guidelines typically suggest that follow-up for Chronic Obstructive Pulmonary Disease (COPD) should be between 1 and 2 weeks (Health Quality Ontario 2010; Abramson et al. 2014; Health PEI 2011). Similar guidelines exist for heart failure (HF) patients, suggesting that follow-up occur within 2 to 4 weeks (Howlett et al. 2010, Yancy et al. 2013). A set of Canadian quality indicators for Acute Myocardial Infarctions (AMI) care suggests follow-up within 1 month (Tran et al. 2003). Although not stating a follow-up period, the National Heart Foundation does recommend that all patients hospitalised for HF should have post-discharge access to best-practice multidisciplinary care (National Heart Foundation of Australia, Cardiac Society of Australia and New Zealand 2011).

Jackson et al. (2015), when examining timeliness of follow-up following hospital discharge and its impact on subsequent hospitalisations, concluded that most patients do not meaningfully benefit from early outpatient/primary care follow-up and that transitional care resources would be best allocated towards ensuring that highest risk patients receive follow-up within 7 days. Hansen et al. (2011) stated, from their systematic review, that no single intervention implemented alone was regularly associated with reduced risk for 30-day rehospitalization. However, Shen et al. (2017) found in their study of 71,231 patients in California, USA, that patients who completed any outpatient/primary care visit within 7 days had a 12% to 24% lower risk for 30-day readmission.

Research Questions

Research questions included:

- What are the appropriate hospitalisation inclusions that would benefit from a 2-week GP and/or Specialist follow-up?
- What MBS items should be included as a GP and/or Specialist attendance following hospitalisation?
- What proportion of patients saw a GP and/or Specialist within 2 weeks of discharge from an index hospitalisation?
- What is the change over time in the proportion of people seeing a GP and/or Specialist within 2 weeks of discharge?
- How did rates of GP and/or Specialist follow-up vary over time for specific age groups?
- What are the characteristics of patients who saw a GP and/or Specialist within 2 weeks of hospital discharge?
- After controlling for demographic, lifestyle, wellbeing and health service utilisations, is GP and/or Specialist follow-up within 2 weeks of hospitalisation associated with subsequent hospitalisations?
- Does this differ by condition/service use/severity?

Methods

Sample population and linkage datasets

The sample population was from the Sax Institute's 45 and Up Study. The 45 and Up Study was conducted in NSW, Australia. Prospective participants were randomly sampled from the Department of Human Services' (DHS) (formerly Medicare Australia) enrolment database, which provides near complete coverage of the population. People 80+ years of age and residents of rural and remote areas were oversampled. A total of 267,153 participants joined the 45 and Up Study by completing a baseline questionnaire (between Jan 2006 and December 2009) and giving signed consent for follow-up and linkage of their information to routine health databases. About 18% of those invited participated, and participants included about 11% of the NSW population aged 45 years and over (45 and Up Study Collaborators 2008).

This research used the newly established CES Primary and Community Health Cohort/Linkage Resource (CES-P&CH) based on the Sax Institute's 45 and Up Study to identify a community-dwelling population in CES to be used to answer policy relevant research questions. There were 30,645 participants recruited within the CES area at baseline. The CES-P&CH demographics and health behaviour questionnaire data was linked to primary care records, prescribing information, hospital records, emergency department records and vital statistics. Ethical Approval was granted for this research project by the NSW Population and Health Services Research Ethics Committee (Ref # 2016/06/642) and from the UNSW HREC for the 45 and Up Study overall.

This specific analysis included the 45 and Up Study questionnaire data linked by the Sax Institute using a unique identifier to MBS data supplied by the DHS for the period 2006-2014. It also included data from the Admitted Patient Data Collection (APDC) and Deaths Registry linked by the NSW Centre for Health Record Linkage (CHeReL) using probabilistic techniques (NSW Ministry of Health 2017).

Inclusion and exclusion criteria

All individuals residing in the CES area at baseline were included (n=30,645). Participants were excluded if there were possible data linkage errors (n=11), or if they reported holding a Department of Veterans Affairs (DVA) card due to incomplete MBS data (n=585).

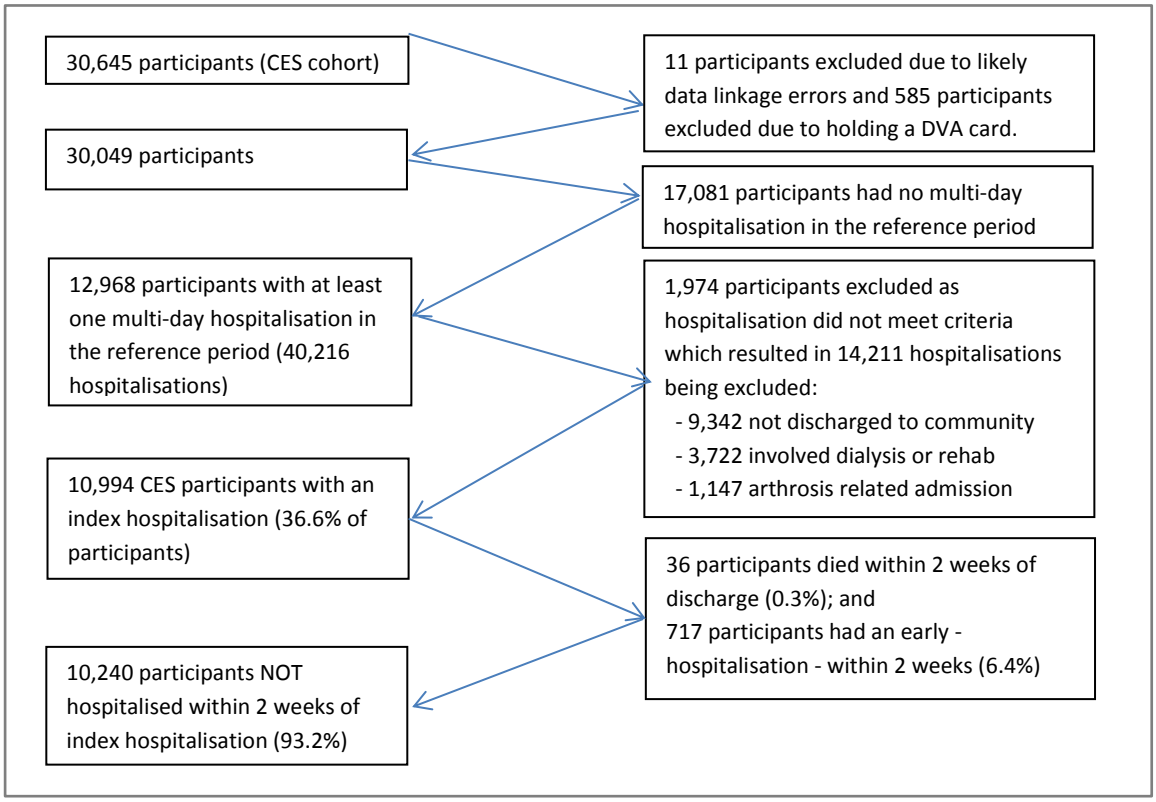
All first hospitalisations to public and private facilities that occurred for an individual in the period starting at recruitment to the 45 and Up Study or 1 Jan 2007 (whichever occurred latest) up to the end of 2014 were included. Participants were excluded if:

- they did not experience a multi-day hospitalisation in the period 2007-2014 (n= 17,081)
- they were not discharged back to a community setting (includes discharge to a nursing home, transfer to another facility and those where the patient died within hospital) (n=9,342 admissions)
- they were admitted for rehabilitation or dialysis, as these participants would be expected to be part of an on-going treatment plan (n=3,722 admissions)
- they were admitted for a joint replacement, as post-operative care would be expected to include rehabilitation that would be part of an on-going treatment plan and may not include the GP (n=1,147 admissions).

This resulted in 10,994 participants with an index hospitalisation (36.6% of cohort participants in CES).

In order to assess the characteristics of those who visited a GP/Specialist within the first two weeks following discharge, participants were further excluded if they died within 2 weeks of discharge (n=36) or had an early hospitalisation (i.e. a hospitalisation with length of stay > 1 day that occurred within two weeks of discharge from index hospitalisation) (n=717). This left 10,240 participants within the sample for the descriptive analysis. Figure 1 shows a summary of the inclusion and exclusion criteria and the resultant eligible participants.

Figure 1: Participant inclusion and exclusion criteria and resultant sample for the CES Cohort



For the time series analysis, the definition of index hospitalisation remained the same, with the difference being that the hospitalisation was the first that occurred for that participant within that calendar year. A participant could therefore be included across multiple years if they experienced hospitalisations that met the definitions across multiple years. Age-adjusted rates were calculated using direct standardisation based on the age structure of the NSW cohort in 2006. To account for the younger age groups transitioning out over time, the analysis was restricted to those aged 55 years and over within each calendar year.

See Appendix A for additional details on inclusion and exclusion criteria for hospitalisations.

GP and/or Specialist occasions of service

First occasions of service included for the GP follow-up after discharge from an index hospitalisation were defined using MBS items (Australian Government Department of Human Services 2018). All items in groups A1, A2, A5, A11, A14, A15, A17, A20, A22, A23 were included except for case conferences (735-880). First occasions of service included for the Specialist follow-up after discharge from an index hospitalisation were defined using MBS items. All items in groups A3, A4, A8, A24, A26, A28 were included except items related to case conferences (2946-3000 and 3032-3093). More details, including the specific items included, are in Appendix B.

Subsequent hospitalisations

All subsequent hospitalisations, with length of stay greater than 1 day, that occurred more than 2 weeks following discharge from an index hospitalisation to public and private facilities were included. Participants were excluded if they were admitted for rehabilitation, as these participants were expected to be part of an on-going treatment plan. Additional details are provided in Appendix A.

Results

Index hospitalisations

Using the 3-digit principal International Classification of Diseases-Australian Modification (ICD-10-AM) Code (National Centre for Classification in Health 2006), the top 20 reasons for the 10,240 index hospital admissions are provided in Table 1 as number of admissions and percentages of all index admissions. Details by ICD-10-AM Chapters are provided in Appendix C.

The admissions are also ranked overall as well as by GP use prior to admission i.e. LOW GP users (defined as 7 or fewer visits) and HIGH GP users (defined as 8 or more visits). The top 10 admissions for LOW and HIGH GP users are also provided in Supplementary Tables S2 and S3 respectively.

Table 1: Number and percent of index admissions by 3-digit principal diagnosis (ICD-10-AM) – Top 20 diagnosis codes

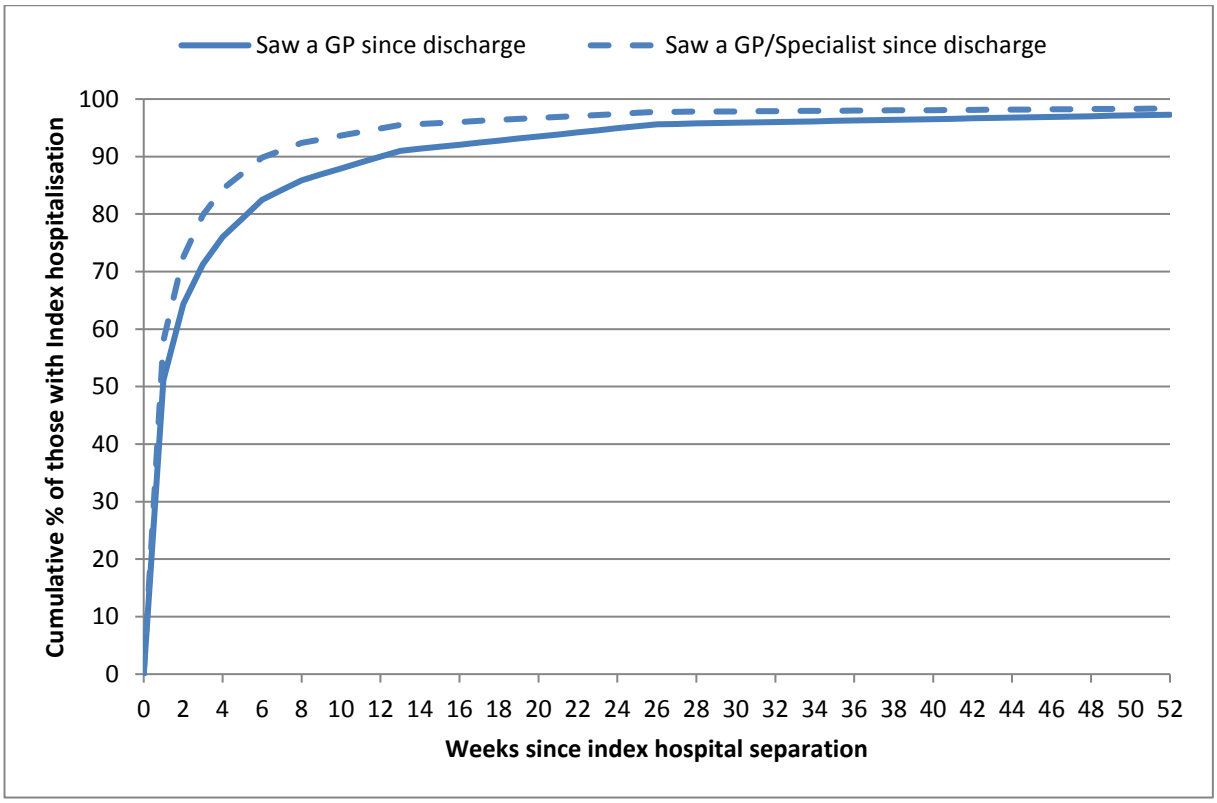
3-digit Principal diagnosis ICD-10-AM code	Description	Number of admissions	Percent all admissions	Rank within all admissions	Rank within LOW GP user admissions	Rank within HIGH GP user admissions
N40	Hyperplasia of prostate	275	2.7	1	4	2
C61	Malignant neoplasm of prostate	274	2.7	2	1	4
N81	Female genital prolapse	262	2.6	3	2	7
I21	Acute myocardial infarction	251	2.5	4	3	6
I48	Atrial fibrillation and flutter	242	2.4	5	5	3
J18	Pneumonia organism unspecified	222	2.2	6	13	1
I20	Angina pectoris	205	2.0	7	6	5
L03	Cellulitis	180	1.8	8	7	8
K80	Cholelithiasis	167	1.6	9	7	12
N39	Other disorders of urinary system	152	1.5	10	15	9
M48	Other spondylopathies	147	1.4	11	19	10
I25	Chronic ischaemic heart disease	140	1.4	12	9	18
R07	Pain in throat and chest	139	1.4	13	18	15
K57	Diverticular disease of intestine	135	1.3	14	15	16
C50	Malignant neoplasm of breast	135	1.3	14	10	19
J44	Other COPD	133	1.3	16	30	11
M51	Other intervertebral disc disorders	133	1.3	16	23	13
I50	Heart failure	129	1.3	18	25	13
R55	Syncope and collapse	121	1.2	19	25	16
S52	Fracture of forearm	115	1.1	20	10	23
Sum of Top 20		**3,557**	**34.7**			

Proportion of participants seeing a GP and/or Specialist within 2 weeks of discharge from an index hospitalisation

Of the 10,240 eligible participants with an index hospitalisation, 6,587 (64.3%) saw a GP within 2 weeks of discharge and 7,426 (72.5%) saw a GP and/or Specialist within 2 weeks of discharge.

As shown in Figure 2, within the first month of being discharged from hospital over 75% of participants had seen a GP and just less than 85% had seen a GP and/or Specialist. Only 4.4% did not see a GP (2.3% did not see a GP and/or Specialist) in the first 6 months following discharge from the index hospitalisation (See supplementary Table S1 for additional information).

Figure 2: Proportion of participants seeing a GP and/or Specialist after discharge from an index hospitalisation by week



Proportion of participants seeing a GP and/or Specialist within 2 weeks of discharge over time

As shown in Figure 3, the proportion of participants seeing a GP within 2 weeks of discharge from an index hospitalisation remained consistent across the time period 2007-2014 within both the CES area and the Other Sydney metropolitan areas (OS). The proportion of participants seeing a GP within 2 weeks of discharge within the CES area was consistently slightly less than the OS, but this difference was not statistically significant.

When considering whether someone saw a GP and/or Specialist within 2 weeks of discharge, there was again no change over time for CES or OS and also no difference between CES and OS (Figure 4).

Figure 3: Percentage of participants discharged from an index hospitalisation that saw a GP within 2 weeks of discharge (age standardised)

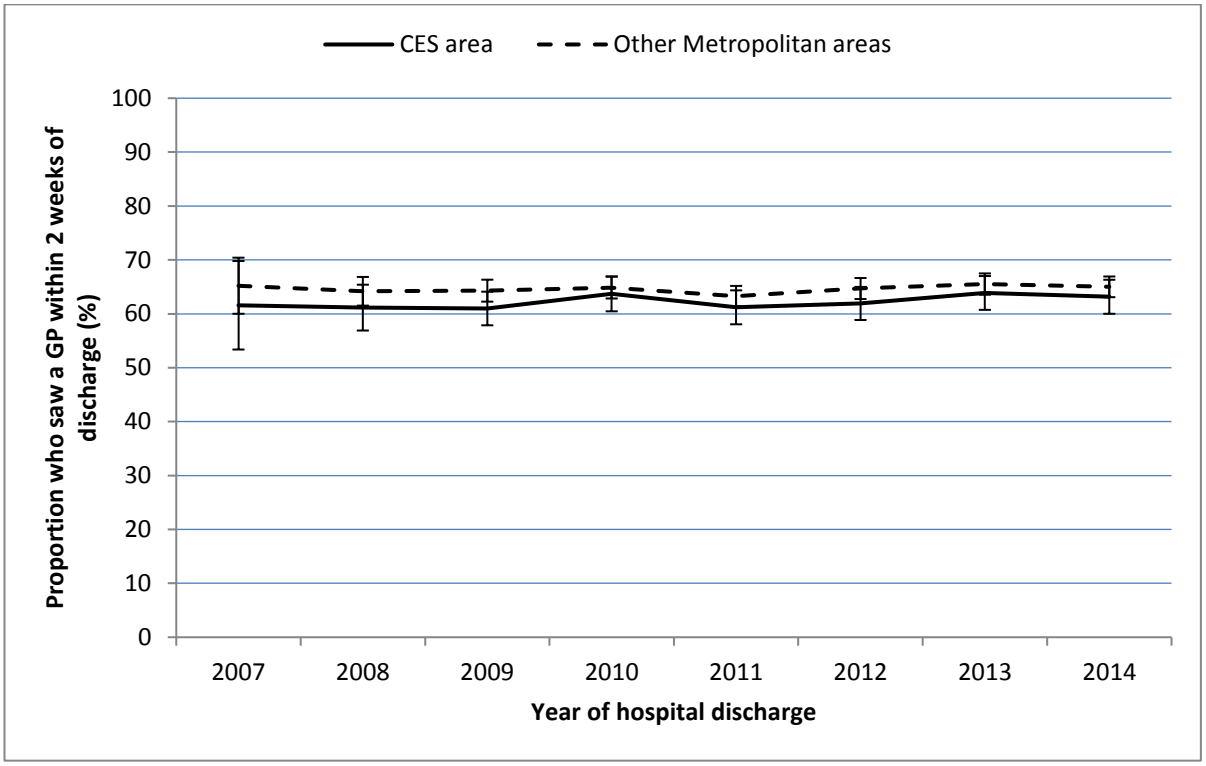


Figure 4: Percentage of participants discharged from an index hospitalisation that saw a GP and/or Specialist within 2 weeks of discharge (age standardised)

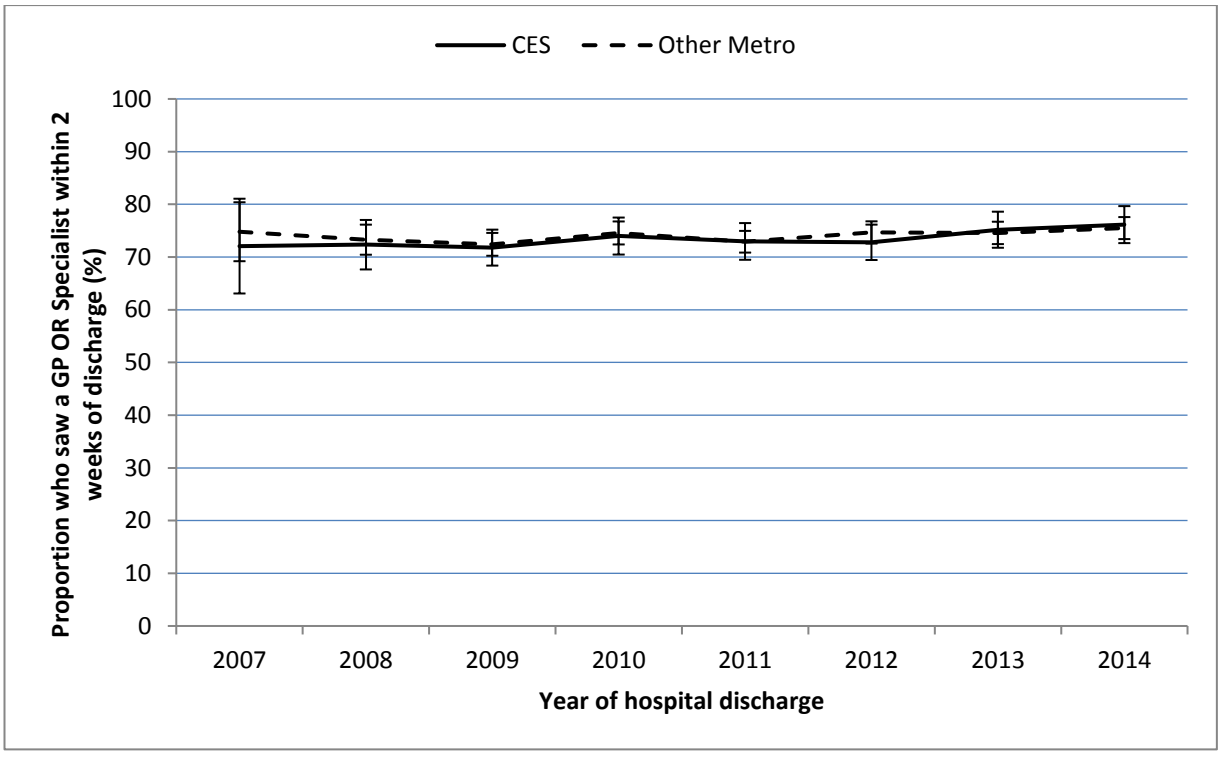
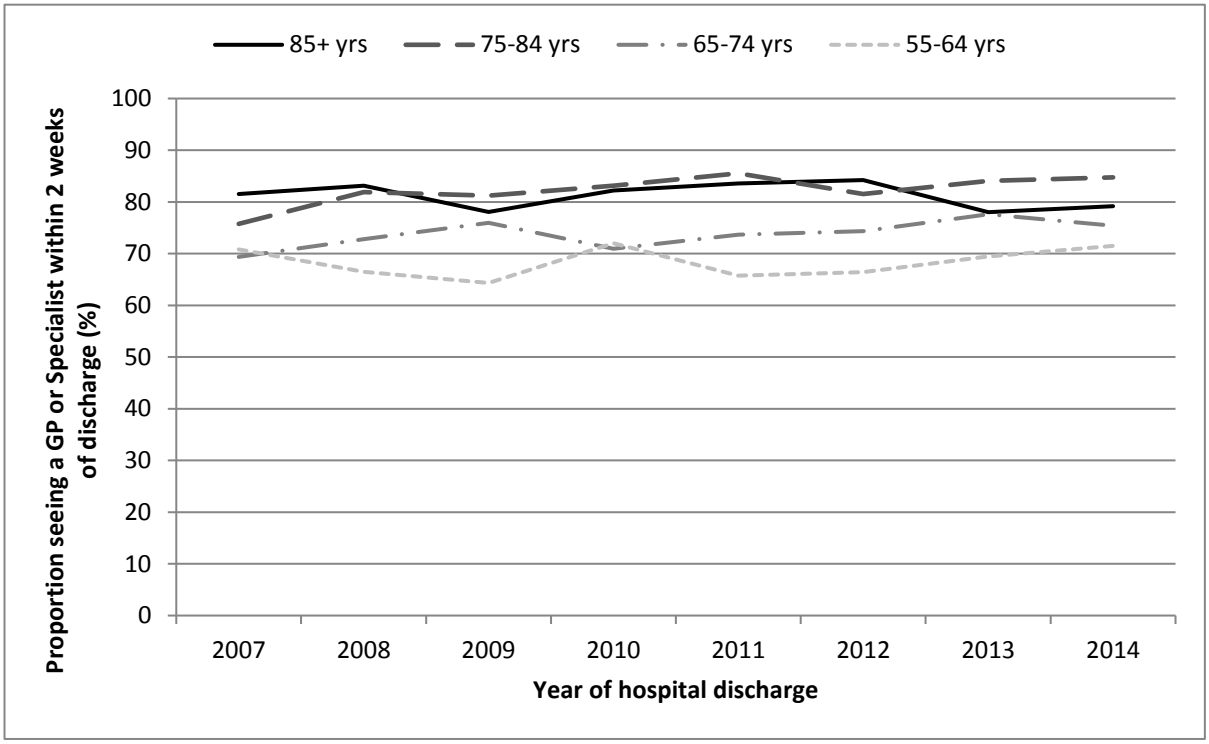


Figure 5 shows the age specific rates for participants who saw a GP and/or Specialist within 2 weeks of discharge across time within the CES area. Overall, those in the two oldest age groups had the highest rates compared to the younger age groups. There was no significant increase or decrease across time for any of the age specific rates.

Figure 5: Percentage of CES participants discharged from an index hospitalisation that saw a GP and/or Specialist within 2 weeks of discharge by age group at time of hospitalisation



Characteristics of patients who saw a GP and/or Specialist within 2 weeks of hospital discharge

Seeing a GP within 2 weeks of discharge

Analysis was undertaken to explore the relationship between participant factors and seeing a GP within 2 weeks of discharge. Seeing a GP within 2 weeks of discharge was associated with nearly all participant factors investigated (see Supplementary Table S4). Without adjusting for other factors, participants had higher odds of seeing a GP within 2 weeks of discharge if they: were older, were male, had a lower level of education, had lower household income, did not work (compared to working full-time), did not have private health insurance, held a health care concession, did not have a partner/spouse, were a current smoker (compared to non-smokers), did not report adequate levels of physical activity, did not drink alcohol (compared to low risk and high risk drinkers), were underweight or obese (compared to being within the healthy weight range), were being treated for high blood pressure or high cholesterol at baseline, had more physical limitations, had higher levels of psychological distress, had poorer self-rated health or quality of life, needed help with daily activities, had previously reported a fall, had experienced a longer length of stay for the index hospitalisation, had seen a GP frequently in the year prior to the index hospitalisation, had not seen a specialist in the year prior to the index hospitalisation (compared to seeing a specialist between 1 and 4 times), had not been hospitalised in the year prior to the index hospitalisation (compared to being hospitalised once), had reported a diagnosis of diabetes, osteoporosis/arthritis or cardiovascular disease.

When controlling for all other factors, the relationships were slightly different. The factors that were still independently associated with increased odds of seeing a GP within 2 weeks of discharge included: increasing age, being male, having a lower income, not having private health insurance, not drinking alcohol (compared to low risk and high risk drinkers), being underweight (compared to being within the healthy weight range), having a longer length of stay for index admission, having seen a GP frequently in the year prior to the index hospitalisation, having not seen a specialist in the year prior to the index hospitalisation, having not been hospitalised in the year prior to the index hospitalisation (compared to being hospitalised once or multiple times).

The other factor that was not significant at the univariate level but became significantly associated with increased odds of seeing a GP within 2 weeks of discharge after controlling for other factors, was not having reported a cancer diagnosis.

Comparing seeing a GP to seeing a GP and/or Specialist within 2 weeks of discharge

Analysis was undertaken to explore the relationship between participant factors and seeing a GP and/or Specialist within 2 weeks of discharge. Seeing a GP and/or Specialist within 2 weeks of discharge was associated with similar participants factors as seeing a GP (Supplementary Table S5). However, there were some minor differences. After controlling for other factors, a comparison of modelling the outcome 'seeing a GP within 2 weeks of discharge' versus modelling the outcome 'seeing a GP and/or Specialist within 2 weeks of discharge' is summarised below and provided in Table 2.

Factors that were significantly associated with increased odds of both seeing a GP within 2 weeks of discharge and seeing a GP and/or Specialist within 2 week of discharge included: increasing age at time of hospitalisation, being male, lower household income, not having private health insurance, increasing length of stay for the index hospitalisation, more GP visits in the year prior to hospitalisation, fewer hospitalisations in the year prior to the index hospitalisation, fewer Specialist visits in the year prior to the index hospitalisation.

Participant factors that were different between the seeing a GP within 2 weeks of discharge model and the seeing a GP and/or Specialist within 2 weeks of discharge model were as follows:

- Working part-time (compared to full-time) was associated with lower odds of seeing a GP and/or Specialist within 2 weeks of discharge but not with seeing a GP within 2 weeks of discharge
- Higher Duke Social Support Index (social interaction) score was associated with higher odds of seeing a GP and/or Specialist within 2 weeks of discharge but not with seeing a GP within 2 weeks of discharge
- Drinking alcohol (compared to zero alcohol) was associated with lower odds of seeing a GP within 2 weeks of discharge but not with seeing a GP and/or Specialist within 2 weeks of discharge
- Being underweight was significantly associated with higher odds of seeing a GP within 2 weeks of discharge but not with seeing a GP and/or Specialist within 2 weeks of discharge
- Having a diagnosis of cardiovascular disease was associated with higher odds of seeing a GP and/or Specialist within 2 weeks of discharge but not of seeing a GP within 2 weeks of discharge
- Having a diagnosis of cancer was associated with lower odds of seeing a GP within 2 weeks of discharge but not of seeing a GP and/or Specialist within 2 weeks of discharge.

Most of these differences were minimal and can be explained by slightly different propensities among the participants who saw a GP within 2 weeks of discharge rather than seeing a Specialist within 2 weeks of discharge and/or seeing both.

Table 2: Relationship between participant factors and (i) seeing a GP within 2 weeks of discharge and (ii) seeing a GP and/or Specialist within 2 weeks of discharge

Patient factors	(i) Saw a GP only within 2 weeks of discharge	(ii) Saw a GP and/or Specialist within 2 weeks of discharge	Model 1: GP controlling for all other factors	Model 2: GP and/or Specialist controlling for all other factors	Same/diff Model 1 (GP) and Model 2 (GP/Spec)
	Yes (%)	Yes (%)	OR (95%CI)	OR (95%CI)	
Age at time of hospitalisation (Mean and SD)	72.6 (12.0)	72.3 (12.0)	**1.02 (1.01-1.02)**	**1.02 (1.01-1.02)**	Both
Gender					
Male	3415 (65.5)	3851 (73.9)	1	1	
Female	3172 (63.1)	3575 (71.1)	***0.85 (0.77-0.94)***	***0.84 (0.76-0.94)***	Both
Speaks a language other than English at home					
No	5213 (62.8)	5897 (71.0)	1	1	
Yes	1374 (70.8)	1529 (78.8)	1.12 (0.96-1.32)	1.12 (0.95-1.33)	Neither
Highest educational qualification					
University or higher	1531 (56.2)	1787 (65.6)	1	1	
Trade/ diploma	1888 (64.3)	2141 (72.9)	1.02 (0.91-1.15)	1.06 (0.94-1.20)	Neither
Year 12 or equivalent	749 (65.8)	853 (74.9)	1.03 (0.88-1.20)	1.12 (0.95-1.32)	Neither
less than high school	2419 (70.4)	2645 (76.9)	1.01 (0.89-1.15)	0.99 (0.87-1.13)	Neither
Household income at baseline					
$70,000 or more	1201 (50.4)	1438 (60.4)	1	1	
$40,000 to $69,999	943 (60.5)	1089 (69.9)	1.10 (0.95-1.27)	1.13 (0.97-1.31)	Neither
$20,000 to $39,999	1036 (67.3)	1155 (75.0)	1.12 (0.96-1.32)	1.12 (0.95-1.33)	Neither
<$20,000	1708 (75.6)	1841 (81.5)	**1.25 (1.05-1.48)**	**1.24 (1.03-1.49)**	Both
Won't disclose	1699 (67.9)	1903 (76.1)	**1.18 (1.02-1.37)**	**1.23 (1.06-1.44)**	Both
Work status at baseline					
Full time	1270 (53.7)	1492 (63)	1	1	
Part time	886 (55.3)	1034 (64.6)	0.87 (0.75-1.00)	***0.85 (0.74-0.99)***	GP/Spec
Not working	4431 (70.6)	4900 (78.1)	0.95 (0.83-1.10)	0.94 (0.81-1.09)	Neither
Having private health insurance					
No	2239 (75.7)	2380 (80.5)	1	1	
Yes	4348 (59.7)	5046 (69.3)	***0.70 (0.62-0.79)***	***0.78 (0.69-0.88)***	Both
Having a health care concession card					
No	4297 (59.7)	4959 (68.8)	1	1	
Yes	2290 (75.4)	2467 (81.2)	1.12 (1.00-1.26)	1.06 (0.94-1.21)	Neither
Duke Social Support Index (social interaction) Mean and SD	8.9 (1.6)	8.9 (1.6)	1.03 (1.00-1.06)	**1.05 (1.02-1.08)**	GP/Spec
Marital status					
No partner	2454 (67.6)	2718 (74.9)	1	1	
Partner	4133 (62.5)	4708 (71.2)	1.06 (0.96-1.17)	1.07 (0.96-1.19)	Neither
Smoking status at baseline					
Never smoke	3578 (63.3)	4062 (71.9)	1	1	
Ex-smoker	2497 (65.1)	2797 (72.9)	1.07 (0.97-1.17)	1.01 (0.91-1.12)	Neither
Current smoker	512 (67.9)	567 (75.2)	1.16 (0.97-1.39)	1.18 (0.98-1.43)	Neither
Adequate physical activity at baseline					
Yes	2509 (66.9)	2809 (74.9)	1	1	
No	4078 (62.8)	4617 (71.1)	0.94 (0.85-1.03)	0.95 (0.86-1.06)	Neither

Patient factors	(i) Saw a GP only within 2 weeks of discharge	(ii) Saw a GP and/or Specialist within 2 weeks of discharge	Model 1: GP controlling for all other factors	Model 2: GP and/or Specialist controlling for all other factors	Same/diff Model 1 (GP) and Model 2 (GP/Spec)
	Yes (%)	Yes (%)	OR (95%CI)	OR (95%CI)	
Adequate fruit and vegetable intake at baseline					
Yes	5216 (64.0)	5882 (72.2)	1	1	
No	1371 (65.4)	1544 (73.7)	0.96 (0.86-1.07)	0.96 (0.86-1.08)	Neither
Alcohol consumption at baseline					
Zero	2614 (70.7)	2850 (77.1)	1	1	
1-13 drinks	2856 (60.8)	3282 (69.8)	***0.84 (0.76-0.93)***	0.92 (0.82-1.02)	GP only
14+ drinks	1117 (60.6)	1294 (70.2)	***0.84 (0.74-0.96)***	0.95 (0.82-1.09)	GP only
BMI category at baseline					
Normal weight	2064 (62.4)	2359 (71.3)	1	1	
Underweight	774 (69.8)	848 (76.5)	**1.24 (1.06-1.44)**	1.15 (0.97-1.36)	GP only
Overweight	2374 (63.7)	2687 (72.1)	1.05 (0.95-1.17)	1.03 (0.92-1.15)	Neither
Obese	1375 (65.5)	1532 (73.0)	1.13 (0.99-1.28)	1.07 (0.93-1.22)	Neither
Being treated for high blood pressure at baseline					
No	4519 (62.4)	5126 (70.8)	1	1	
Yes	2068 (69.0)	2300 (76.7)	1.04 (0.93-1.15)	1.05 (0.94-1.18)	Neither
Being treated for high cholesterol at baseline					
No	5296 (63.5)	5991 (71.9)	1	1	
Yes	1291 (67.8)	1435 (75.3)	0.99 (0.88-1.12)	0.93 (0.82-1.07)	Neither
Physical functioning at baseline					
No limitations	1199 (54.8)	1408 (64.3)	1	1	
Minor limitations	1341 (60.7)	1527 (69.2)	1.10 (0.96-1.25)	1.04 (0.91-1.19)	Neither
Moderate limitations	1729 (67.7)	1925 (75.3)	1.14 (1.00-1.31)	1.07 (0.93-1.24)	Neither
Severe limitations	1458 (73.0)	1602 (80.3)	1.17 (0.98-1.40)	1.10 (0.91-1.33)	Neither
Not available	860 (66.6)	964 (74.6)	0.98 (0.83-1.16)	0.96 (0.80-1.14)	Neither
Psychological distress at baseline					
Low psychological distress	4074 (62.2)	4631 (70.7)	1	1	
Moderate psychological distress	867 (63.1)	975 (71.0)	0.97 (0.85-1.11)	0.96 (0.84-1.11)	Neither
High psychological distress	352 (66.5)	401 (75.8)	1.05 (0.85-1.30)	1.16 (0.92-1.46)	Neither
Very high psychological distress	229 (70.2)	250 (76.7)	1.08 (0.82-1.41)	1.06 (0.79-1.42)	Neither
Not available	1065 (72.7)	1169 (79.8)	1.01 (0.87-1.17)	1.02 (0.87-1.20)	Neither
Self-rated good/v good/ excellent health at baseline					
Yes	1749 (70.6)	1934 (78.1)	1	1	
No	4838 (62.3)	5492 (70.7)	0.99 (0.86-1.14)	0.97 (0.84-1.13)	Neither
Self-rated good/v good/ excellent QoL at baseline					
Yes	1519 (70.5)	1680 (77.9)	1	1	
No	5068 (62.7)	5746 (71.1)	0.98 (0.85-1.13)	1.01 (0.86-1.17)	Neither
Reported needing help with daily activities at baseline					
No	5983 (63.6)	6753 (71.8)	1	1	
Yes	604 (72.5)	673 (80.8)	0.93 (0.77-1.13)	1.01 (0.81-1.24)	Neither

Patient factors	(i) Saw a GP only within 2 weeks of discharge	(ii) Saw a GP and/or Specialist within 2 weeks of discharge	Model 1: GP controlling for all other factors	Model 2: GP and/or Specialist controlling for all other factors	Same/diff Model 1 (GP) and Model 2 (GP/Spec)
	Yes (%)	Yes (%)	OR (95%CI)	OR (95%CI)	
Reported at least one fall in 12 months prior to baseline					
No	5158 (63.7)	5818 (71.8)	1	1	
Yes	1429 (66.7)	1608 (75.1)	0.90 (0.80-1.00)	0.93 (0.82-1.05)	Neither
Length of stay for index admission (Mean days and SD)	6.3 (6.7)	6.3 (6.8)	**1.02 (1.01-1.02)**	**1.03 (1.02-1.04)**	Both
Number of GP visits in 12 months prior to Index hospitalisation					
3 or fewer visits	625 (43.9)	760 (53.4)	1	1	
4-7 visits	1495 (55.5)	1765 (65.5)	**1.66 (1.45-1.91)**	**1.67 (1.45-1.91)**	Both
8-12 visits	1905 (66.7)	2124 (74.4)	**2.48 (2.15-2.87)**	**2.26 (1.95-2.62)**	Both
13+ visits	2562 (78.4)	2777 (85.0)	**4.06 (3.47-4.75)**	**3.85 (3.27-4.54)**	Both
Number of Specialist visits in 12 months prior to Index hospitalisation					
None	955 (67.1)	1021 (71.7)	1	1	
One-four	2569 (62.7)	2853 (69.7)	***0.72 (0.63-0.83)***	***0.81 (0.70-0.94)***	Both
More than four	3063 (64.9)	3552 (75.2)	***0.59 (0.51-0.69)***	***0.79 (0.68-0.93)***	Both
Number of hospitalisations in 12 months prior to Index hospitalisation					
None	3600 (65.7)	3983 (72.7)	1	1	
One	1661 (61.1)	1904 (70.0)	***0.82 (0.74-0.91)***	***0.82 (0.73-0.91)***	Both
Multiple	1326 (64.9)	1539 (75.4)	***0.83 (0.74-0.94)***	0.90 (0.79-1.02)	GP only
Self-reported diabetes diagnosis at baseline					
No	5741 (63.4)	6487 (71.7)	1	1	
Yes	846 (71.3)	939 (79.1)	1.06 (0.91-1.22)	1.08 (0.92-1.27)	Neither
Self-reported osteoarthritis/osteoporosis diagnosis at baseline					
No	5341 (63.1)	6037 (71.3)	1	1	
Yes	1246 (70.1)	1389 (78.2)	1.04 (0.92-1.18)	1.08 (0.94-1.24)	Neither
Self-reported cardiovascular disease diagnosis at baseline					
No	4959 (62.1)	5612 (70.3)	1	1	
Yes	1628 (72.2)	1814 (80.4)	1.12 (1.00-1.26)	**1.21 (1.06-1.37)**	GP/Spec
Self-reported asthma diagnosis at baseline					
No	5710 (64.3)	6434 (72.4)	1	1	
Yes	877 (64.7)	992 (73.2)	0.98 (0.86-1.12)	1.02 (0.89-1.18)	Neither
Self-reported depression/anxiety diagnosis at baseline					
No	5426 (64.4)	6113 (72.6)	1	1	
Yes	1161 (63.8)	1313 (72.1)	0.92 (0.81-1.04)	0.93 (0.82-1.06)	Neither
Self-reported cancer diagnosis at baseline					
No	5304 (64.3)	5948 (72.1)	1	1	
Yes	1283 (64.4)	1478 (74.2)	***0.88 (0.79-0.98)***	0.94 (0.84-1.06)	GP only
TOTAL	6587 (64.3)	7426 (72.5)			

Subsequent hospitalisations

Of the 10,240 eligible participants with an index hospitalisation, 2,883 (28.2%) had a subsequent hospitalisation and 88 died. Of the participants who had a subsequent hospitalisation, 6.7% were first hospitalised 3 weeks after discharge from the index hospitalisation, 6.3% at 4 weeks, 8.3% at 5 weeks, 8.7% at 7-8 weeks, 13.8% at 9-13 weeks, 23.0% at 14-26 weeks and 33.2% at 6-12 months (see further details in Supplementary Table S6). Of the participants who had a subsequent hospitalisation, 58.5% were hospitalised once, 22.7% had two hospitalisations, 9.9% had three, 4.3% had four, 2.3% had five and 2.3% had more than five. The top 20 reasons (using the 3-digit principal ICD-10-AM Code) for the first subsequent hospital admissions are provided in Table 3 as numbers and percentages of all first subsequent hospital admissions. Details of the subsequent hospitalisation by ICD-10-AM Chapters, compared to the initial hospitalisation, are provided in Appendix C. The subsequent hospitalisations are ranked overall as well as by the GP use prior to the index hospital admission (i.e. LOW GP users and HIGH GP users). The top 10 subsequent hospital admissions for LOW and HIGH users are also provided in Supplementary Tables S7 and S8 respectively.

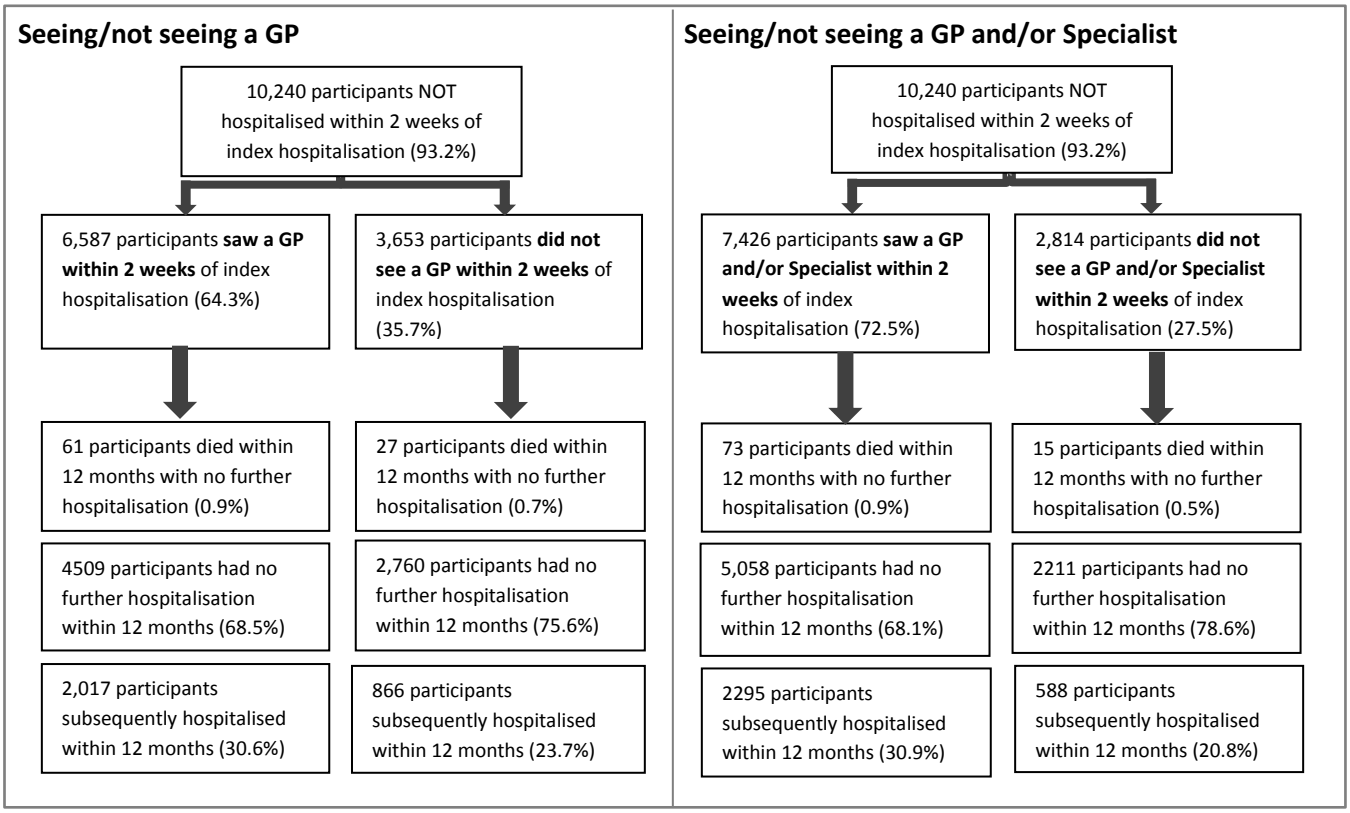
Table 3: Number and percent of first SUBSEQUENT admissions by 3-digit principal diagnosis (ICD-10-AM) – Top 20 diagnosis codes

3-digit Principal diagnosis ICD-10-AM code	Description	Subsequent admission		Rank within admissions		
		n	%	All	LOW GP user	HIGH GP user
I50	Heart failure	90	3.1	2	2	2
I48	Atrial fibrillation and flutter	66	2.3	3	10	3
J18	Pneumonia organism unspecified	64	2.2	4	7	4
J44	Other COPD	58	2.0	5	3	5
N39	Other disorders of urinary system	50	1.7	6	5	6
K80	Cholelithiasis	42	1.5	7	13	7
I21	Acute myocardial infarction	41	1.4	8	6	12
C79	Secondary malignant neoplasm of other and unspecified sites	40	1.4	9	13	9
N40	Hyperplasia of prostate	40	1.4	9	19	8
S72	Fracture of femur	40	1.4	9	7	12
T81	Complications of procedures NEC	40	1.4	9	10	11
L03	Cellulitis	39	1.4	13	19	9
M48	Other spondylopathies	37	1.3	14	10	17
I20	Angina pectoris	35	1.2	15	27	12
R55	Syncope and collapse	34	1.2	16	13	18
A41	Other sepsis	33	1.1	17	19	18
R07	Pain in throat and chest	33	1.1	17	37	12
K56	Paralytic ileus and intestinal obstruction without hernia	32	1.1	19	19	20
E11	Type 2 diabetes mellitus	31	1.1	20	63	12
I70	Atherosclerosis	29	1.0	21	13	25
Top 20		**874**	**30.3**			

Seeing a GP and/or Specialist within 2 weeks of index hospital discharge and subsequent hospitalisations

As shown in Figure 6, of the 6,587 participants who saw a GP within 2 weeks of discharge from their index hospitalisation, 68.5% did not have a subsequent hospitalisation within the next 12 months, 30.6% had a subsequent hospitalisation and 0.9% died without further hospitalisation. Of the 7,426 participants who saw a GP and/or Specialist within 2 weeks of discharge from the index hospitalisation, 68.1% did not have a subsequent hospitalisation in the next 12 months, 30.9% had a subsequent hospitalisation and 0.7% died without a subsequent hospitalisation.

Figure 6: Participants seeing/not seeing a GP and seeing/not seeing a GP and/or Specialist within 2 weeks and subsequent outcomes



As shown in Table 4, a higher percentage of those who saw a GP within 2 weeks of discharge had a subsequent hospitalisation within 12 months (30.6%) of discharge compared to those who did not see a GP within 2 weeks of discharge (23.7%). Table 4 also shows these higher rates of subsequent hospitalisation after seeing a GP and/or Specialist within 2 weeks of discharge.

Table 4: Seeing a GP and/or Specialist within 2 weeks of the index hospitalisation and subsequent hospitalisations.

	Subsequent hospitalisation status		
	No subsequent hospitalisation	Admitted within 12 months	Died without subsequent hospitalisation
	n(%)	n(%)	n(%)
Saw a GP within 2 weeks			
No	2760 (75.6)	866 (23.7)	27 (0.7)
Yes	4509 (68.5)	2017 (30.6)	61 (0.9)
Saw a GP and/or Specialist within 2 weeks			
No	2211 (78.6)	588 (20.9)	15 (0.5)
Yes	5058 (68.1)	2295 (30.9)	73 (1.0)

As shown in Table 5, the number of admissions that the participants had over the next 12 months following the index hospitalisation is twice as high in those who saw a GP within 2 weeks of discharge compared to those who did not see a GP within 2 weeks of discharge (30.6%). Table 5 also shows higher numbers of admissions after seeing a GP and/or Specialist within 2 weeks of discharge.

Table 5: Number of subsequent hospitalisations by seeing a GP and/or Specialist within 2 weeks of the index hospitalisation

	Number of subsequent hospitalisations within a year					
	One	**Two**	**Three**	**Four**	**Five**	**>five**
	n(%)	**n(%)**	**n(%)**	**n(%)**	**n(%)**	**n(%)**
Saw a GP within 2 weeks						
No	520 (14.2)	200 (5.5)	81 (2.2)	33 (0.9)	18 (0.5)	14 (0.4)
Yes	1167 (17.7)	454 (6.9)	205 (3.1)	90 (1.4)	49 (0.7)	52 (0.8)
Saw a GP and/or Specialist within 2 weeks						
No	372 (13.2)	131 (4.7)	47 (1.7)	19 (0.7)	13 (0.5)	6 (0.2)
Yes	1315 (17.7)	523 (7.0)	239 (3.2)	104 (1.4)	54 (0.7)	60 (0.8)

As shown in Figures 7a and 7b (and Supplementary Table S2), time to subsequent hospitalisation follows a different pattern for low (7 or fewer visits) and high GP users (8 or more visits). For low GP users, those seeing a specialist only had the highest rate of return, followed by those seeing both specialist and GP, those seeing a GP only, and then those seeing neither a GP or Specialist. Among high GP users, those seeing both a GP and Specialist had the highest rate of return, followed by Specialist only, GP only, and then those seeing neither.

Figure 7a: Days to first subsequent hospitalisation for those who saw a GP and/or Specialist within 2 weeks of the index hospitalisation - Low GP Users.

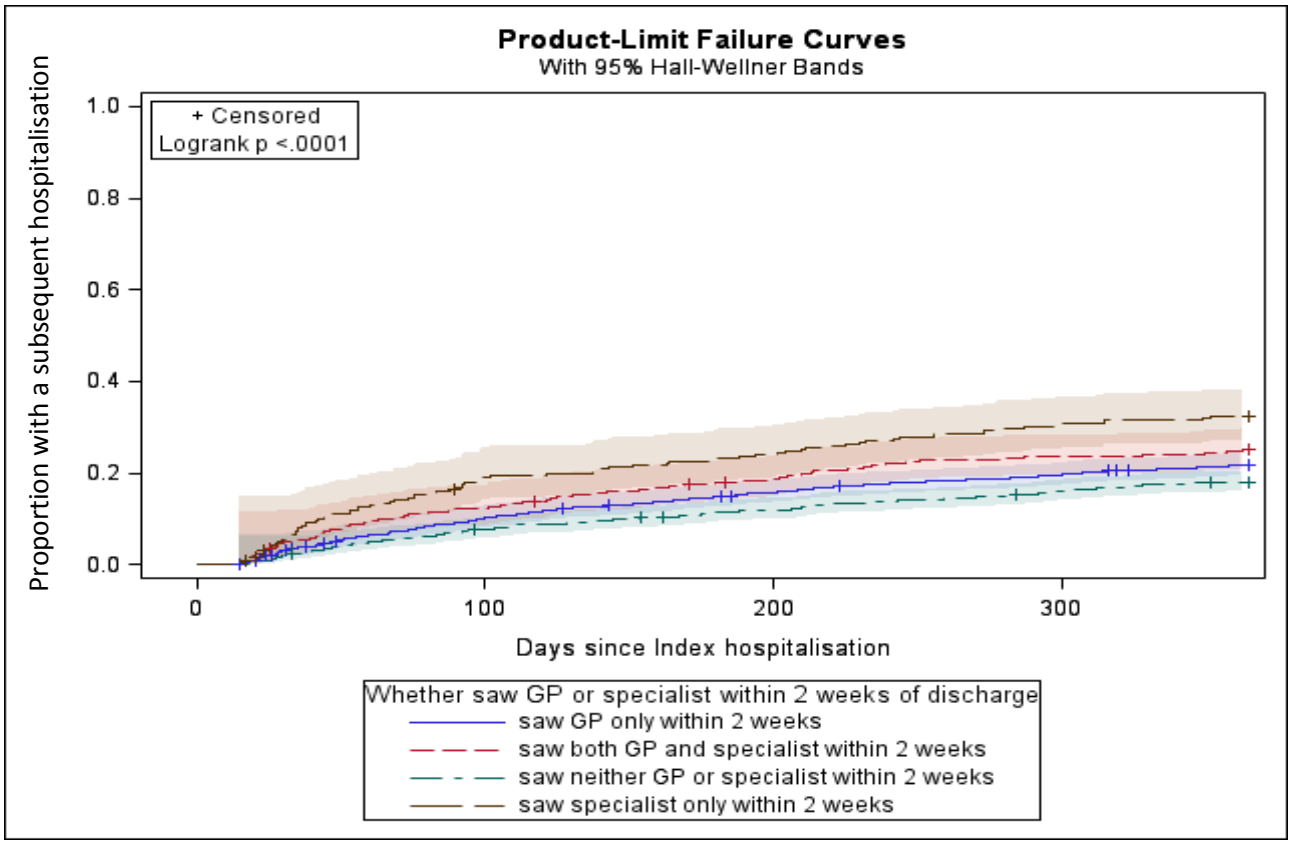
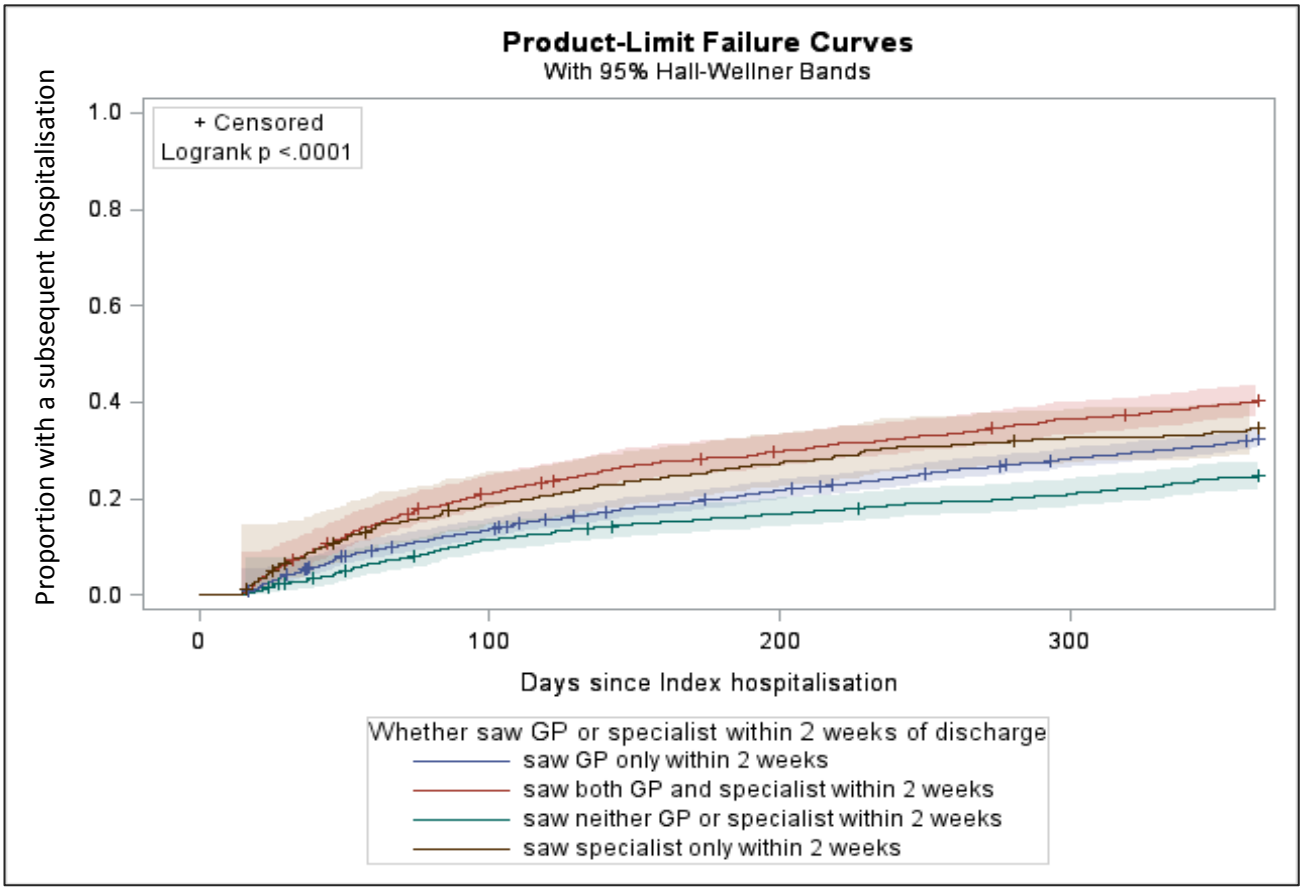


Figure 7b: Days to first subsequent hospitalisation for those who saw a GP and/or Specialist within 2 weeks of the index hospitalisation - High GP Users.



Associations between seeing a GP and Specialist within 2 weeks of discharge and subsequent hospitalisations

The association between seeing a GP within 2 weeks of discharge from the index hospitalisation and the first subsequent hospitalisation, controlling for demographic, lifestyle, wellbeing, and health service utilisations, was examined (See Table 6). As a significant interaction was detected between seeing a GP and seeing a Specialist, seeing a GP was examined at both levels of seeing a Specialist (yes and no). There was a significant association between seeing a GP within 2 weeks of discharge from the index hospitalisation and subsequent hospitalisation in the unadjusted univariable model for both those who also saw a Specialist (HR 1.47; 95% CI 1.36-1.59) and those who did not (HR 1.35; 95% CI 1.25-1.46). However, once all of the other factors were controlled for this was significant only for those participants who had not seen a Specialist (HR 1.13; 95% CI 1.02-1.25) and not for those who also saw a Specialist (HR 0.92; 95% CI 0.80-1.06).

Also, as shown in Table 6, subsequent hospitalisations, controlling for all other factors, were less likely in participants who saw a GP and/or Specialist within 2 weeks of discharge if they were female, spoke a language other than English, had private health insurance cover or had a partner. Subsequent hospitalisations, controlling for all other factors, were more likely in participants if they were older, had inadequate physical activity at baseline, had severe physical functioning limitations at baseline, had self-reported poor health at baseline, had longer index admission lengths of stay, had self-reported ever having been diagnosed with cardiovascular disease at baseline, had self-reported ever having been diagnosed with cancer at baseline, or had been hospitalised multiple times before the index hospitalisation.

Because of the two distinctive service use profiles being evident for participants who had an index hospitalisation, i.e. LOW GP users (7 or fewer visits per year) and HIGH GP users (8 or more visits per year), the models were re-run for these two distinct groups. In the LOW GP users, for those who saw a GP within 2 weeks of discharge but did not see a Specialist, 21.6 % experienced a subsequent hospitalisation compared to 18.1% in those who did not see a GP and also did not see a Specialist. This pattern was the opposite amongst those who had also seen a specialist. Those who saw a GP were less frequently hospitalised (25.0%) compared to those who saw a Specialist only (32.1%). After controlling for other factors in the multivariable model, seeing a GP was significantly associated with a lower rate of hospitalisations amongst those who also saw a Specialist (HR 0.68, 95% CI 0.53-0.87) but was non-significant amongst those who did not see a Specialist (HR 1.05, 95% CI 0.89-1.23).

In the HIGH GP users, for those who saw a GP within 2 weeks of discharge, the proportion subsequently experiencing a hospitalisation was higher regardless of whether they had seen a Specialist (32.2% compared to 24.5% for those who saw a Specialist and 40.0% compared to 29.5% for those who had also seen a Specialist). After controlling for other factors in the multivariable model, seeing a GP was not associated with higher or lower rates of hospitalisation amongst those who also saw a Specialist (HR 1.09; 95%CI 0.90-1.31) but was associated with higher rates of hospitalisation amongst those who did not see a Specialist (HR1.18; 95%CI 1.03-1.35).

Subsequent hospitalisations in the LOW GP user group, controlling for all other factors, were less likely if participants had private health insurance cover. Subsequent hospitalisations in the LOW GP user group, controlling for all other factors, were more likely if participants were older, were a current smoker (compared to non-smokers), had severe functional limitations at baseline (compared to no limitations), had longer index admission lengths of stay, had self-reported ever having been diagnosed with cancer at baseline or had been hospitalised multiple times before the index hospitalisation.

Subsequent hospitalisations in the HIGH GP user group, controlling for all other factors, were less likely in participants if they were female, spoke a language other than English, worked part-time (compared to working full time), had a partner or drank 14 or more drinks a week at baseline. Subsequent hospitalisations in the HIGH GP user group, controlling for all other factors, were more likely if participants were older, had inadequate physical activity at baseline, had severe functional limitations at baseline (compared to no limitations), had longer index admission lengths of stay, had self-reported ever having been diagnosed with cancer at baseline or had been hospitalised multiple times before the index hospitalisation.

Table 6: Association between seeing a GP and/or Specialist within 2 weeks of the index hospitalisation and subsequent hospitalisations

Patient factors	Subsequent hospitalisation within 12 months of index hospitalisation			Likelihood of a subsequent hospitalisation within 12 months after seeing a GP/Specialist within 2 weeks days			
				Unadjusted	controlling for all other factors		
	ALL	LOW GP users	HIGH GP users	ALL	Model 1: ALL	Model 2: LOW GP users	Model 3: HIGH GP users
	N (%)	N (%)	N (%)	HR (95%CI)	HR (95%CI)	HR (95%CI)	HR (95%CI)
Age at time of Index hospitalisation (Mean and SD)	75.0 (11.8)	70.8 (12.5)	76.9 (10.9)	**1.04 (1.03-1.04)**	**1.02 (1.01-1.02)**	**1.02 (1.01-1.03)**	**1.02 (1.01-1.02)**
Gender							
Male	1592 (30.5)	520 (23.9)	957 (34.7)	1	1	1	1
Female	1291 (25.7)	374 (19.3)	837 (29.3)	***0.81 (0.76-0.88)***	***0.78 (0.72-0.86)***	0.87 (0.74-1.01)	***0.74 (0.67-0.83)***
Speaks a language other than English at home							
No	2336 (28.1)	743 (21.3)	1453 (32.4)	1	1	1	1
Yes	547 (28.2)	151 (23.9)	341 (30)	**1.01 (0.92-1.11)**	***0.87 (0.78-0.96)***	0.96 (0.8-1.17)	***0.82 (0.73-0.93)***
Household income at baseline							
<$20,000	814 (36.0)	176 (30.8)	576 (37.9)	**1.94 (1.74-2.17)**	0.90 (0.78-1.05)	0.81 (0.62-1.06)	0.91 (0.75-1.09)
$20,000 to $39,999	443 (28.8)	117 (23.3)	300 (31.2)	**1.48 (1.30-1.68)**	0.89 (0.76-1.03)	0.84 (0.66-1.08)	0.87 (0.72-1.05)
$40,000 to $69,999	365 (23.4)	136 (19.3)	222 (27.0)	**1.16 (1.01-1.33)**	0.89 (0.77-1.02)	0.88 (0.71-1.10)	0.84 (0.70-1.01)
$70,000 or more	489 (20.5)	258 (17.3)	226 (26.1)	1	1	1	1
Won't disclose	772 (30.9)	207 (24.5)	470 (32.5)	**1.61 (1.44-1.80)**	0.93 (0.81-1.06)	0.90 (0.72-1.13)	0.91 (0.76-1.08)
Highest educational qualification							
less than high school	1143 (33.2)	274 (27.2)	759 (35.0)	**1.52 (1.38-1.68)**	1.07 (0.96-1.20)	1.05 (0.87-1.27)	1.08 (0.94-1.24)
Year 12 or equivalent	327 (28.7)	82 (19.3)	223 (34.1)	**1.28 (1.12-1.46)**	1.03 (0.90-1.18)	0.82 (0.64-1.06)	1.12 (0.94-1.32)
Trade/ diploma	777 (26.5)	251 (20.9)	479 (29.8)	**1.15 (1.04-1.28)**	0.97 (0.87-1.09)	1.00 (0.84-1.20)	0.96 (0.83-1.10)
University or higher	636 (23.3)	287 (19.3)	333 (28.1)	**1**	**1**	**1**	**1**
Work status at baseline							
Not working	2128 (33.9)	528 (29.0)	1427 (35.4)	**2.01 (1.81-2.22)**	1.06 (0.92-1.21)	1.21 (0.98-1.5)	0.93 (0.78-1.11)
Part time	314 (19.6)	138 (16.6)	169 (23.2)	1.05 (0.91-1.22)	0.90 (0.77-1.04)	0.97 (0.78-1.21)	***0.80 (0.65-0.99)***
Full time	441 (18.6)	228 (15.5)	198 (23.2)	**1**	**1**	**1**	**1**
Having private health insurance							
No	1001 (33.9)	281 (30.2)	624 (34.8)	1	1	1	1
Yes	1882 (25.8)	613 (19.2)	1170 (30.6)	***0.72 (0.67-0.78)***	***0.88 (0.81-0.97)***	***0.69 (0.58-0.82)***	0.97 (0.87-1.08)
Having a health care concession card							
No	1808 (25.1)	667 (19.7)	1036 (29.5)	1	1	1	1
Yes	1075 (35.4)	227 (31.2)	758 (36.1)	**1.52 (1.41-1.64)**	1.00 (0.91-1.09)	0.97 (0.80-1.16)	1.02 (0.92-1.13)
Duke Social Support Index (social interaction) Mean and SD	8.85 (1.6)	8.81 (1.6)	8.87 (1.6)	***0.96 (0.94-0.98)***	0.98 (0.96-1.00)	0.97 (0.92-1.01)	0.99 (0.96-1.01)
Marital status							
No partner	1178 (32.5)	334 (26.0)	750 (35.2)	1	1	1	1
Partner	1705 (25.8)	560 (19.8)	1044 (30)	***0.75 (0.70-0.81)***	***0.86 (0.79-0.93)***	0.90 (0.77-1.04)	***0.84 (0.77-0.93)***
Smoking status at baseline							
Never smoke	1521 (26.9)	460 (20)	963 (31.3)	1	1	1	1
Ex-smoker	1147 (29.9)	342 (22.9)	717 (33.3)	**1.13 (1.05-1.22)**	1.07 (0.99-1.17)	1.12 (0.97-1.30)	1.04 (0.94-1.15)
Current smoker	215 (28.5)	92 (28.0)	114 (30.1)	1.09 (0.94-1.25)	1.17 (1.00-1.36)	**1.44 (1.13-1.84)**	1.01 (0.83-1.24)
Adequate physical activity at baseline							
Yes	1276 (34.0)	344 (26.4)	802 (37.3)	1	1	1	1
No	1607 (24.8)	550 (19.5)	992 (28.7)	**1.48 (1.38-1.59)**	**1.15 (1.06-1.24)**	1.09 (0.94-1.26)	**1.17 (1.07-1.29)**
Adequate fruit and vegetable intake at baseline							
Yes	2304 (28.3)	732 (21.9)	1411 (32.2)	1	1	1	1
No	579 (27.6)	162 (21.1)	383 (31.2)	1.03 (0.94-1.13)	0.99 (0.90-1.09)	0.98 (0.82-1.17)	0.99 (0.89-1.11)

Patient factors	Subsequent hospitalisation within 12 months of index hospitalisation			Likelihood of a subsequent hospitalisation within 12 months after seeing a GP/Specialist within 2 weeks days			
				Unadjusted	controlling for all other factors		
	ALL	LOW GP users	HIGH GP users	ALL	Model 1: ALL	Model 2: LOW GP users	Model 3: HIGH GP users
	N (%)	N (%)	N (%)	HR (95%CI)	HR (95%CI)	HR (95%CI)	HR (95%CI)
Alcohol consumption at baseline							
Zero	1162 (31.4)	273 (23.5)	788 (34.6)	1	1	1	1
1-13 drinks	1251 (26.6)	437 (20.9)	744 (30.7)	***0.82 (0.76-0.89)***	0.98 (0.90-1.07)	1.07 (0.91-1.26)	0.96 (0.86-1.06)
14+ drinks	470 (25.5)	184 (21.3)	262 (28.7)	***0.78 (0.70-0.87)***	0.89 (0.79-1.00)	0.99 (0.80-1.22)	***0.85 (0.74-0.98)***
BMI category at baseline							
Underweight	362 (32.6)	109 (27.0)	220 (35.0)	**1.21 (1.07-1.36)**	1.06 (0.94-1.20)	1.15 (0.92-1.44)	1.02 (0.88-1.19)
Normal weight	936 (28.3)	296 (21.3)	577 (32.7)	**1**	**1**	**1**	**1**
Overweight	1037 (27.8)	338 (22.4)	633 (31.1)	0.98 (0.90-1.07)	1.00 (0.91-1.09)	1.12 (0.95-1.31)	0.96 (0.86-1.07)
Obese	548 (26.1)	151 (18.6)	364 (30.6)	0.91 (0.82-1.01)	0.89 (0.80-1.00)	0.86 (0.70-1.05)	0.92 (0.80-1.05)
Being treated for high blood pressure at baseline							
No	1940 (26.8)	674 (21.0)	1135 (30.9)	1	1	1	1
Yes	943 (31.5)	220 (24.4)	659 (34.0)	**1.20 (1.11-1.30)**	0.99 (0.90-1.08)	0.96 (0.80-1.14)	1.00 (0.90-1.11)
Being treated for high cholesterol at baseline							
No	2307 (27.7)	746 (21.2)	1405 (31.9)	1	1	1	1
Yes	576 (30.2)	148 (24.9)	389 (32.0)	**1.11 (1.01-1.22)**	0.99 (0.89-1.09)	1.10 (0.90-1.34)	0.96 (0.85-1.08)
Physical functioning at baseline							
No limitations	408 (18.6)	196 (15.4)	198 (23.1)	1	1	1	1
Minor limitations	486 (22.0)	198 (18.8)	272 (24.8)	**1.19 (1.05-1.36)**	1.00 (0.87-1.14)	1.10 (0.89-1.34)	0.92 (0.77-1.10)
Moderate limitations	743 (29.1)	207 (24.3)	504 (31.3)	**1.66 (1.47-1.87)**	1.14 (1.00-1.30)	1.21 (0.98-1.50)	1.07 (0.91-1.27)
Severe limitations	839 (42.0)	182 (36.7)	591 (43.5)	**2.63 (2.34-2.96)**	**1.40 (1.21-1.63)**	**1.42 (1.09-1.86)**	**1.36 (1.13-1.63)**
Not available	407 (31.5)	111 (25.2)	229 (33.1)	**1.83 (1.60-2.10)**	**1.21 (1.04-1.41)**	1.18 (0.90-1.54)	1.17 (0.96-1.42)
Psychological distress at baseline							
Low psychological distress	1697 (25.9)	605 (20.4)	1036 (30.3)	1	1	1	1
Moderate psychological distress	375 (27.3)	94 (18.9)	269 (32.3)	1.06 (0.95-1.19)	1.00 (0.89-1.12)	0.89 (0.71-1.11)	1.03 (0.89-1.18)
High psychological distress	166 (31.4)	46 (23.5)	118 (36.5)	**1.26 (1.08-1.48)**	1.08 (0.91-1.28)	0.95 (0.69-1.32)	1.12 (0.91-1.38)
Very high psychological distress	104 (31.9)	27 (27.8)	74 (34.1)	**1.28 (1.05-1.56)**	1.05 (0.85-1.29)	1.05 (0.68-1.61)	1.01 (0.79-1.30)
Not available	541 (37.0)	122 (33.4)	297 (35.9)	**1.53 (1.39-1.68)**	0.98 (0.88-1.10)	1.10 (0.89-1.37)	0.96 (0.84-1.08)
Self-rated good/v good/ excellent health at baseline							
Yes	945 (38.2)	228 (32.5)	622 (40.1)	1	1	1	1
No	1938 (25)	666 (19.5)	1172 (28.8)	**1.68 (1.55-1.81)**	**1.14 (1.03-1.27)**	1.20 (0.98-1.48)	1.12 (0.99-1.27)
Self-rated good/v good/ excellent QoL at baseline							
Yes	791 (36.7)	190 (29.4)	501 (39.1)	1	1	1	1
No	2092 (25.9)	704 (20.3)	1293 (29.8)	**1.53 (1.41-1.66)**	0.98 (0.88-1.09)	0.97 (0.78-1.20)	1.00 (0.88-1.13)
Reported needing help with daily activities at baseline							
No	2508 (26.7)	807 (20.6)	1536 (30.4)	1	1	1	1
Yes	375 (45.0)	87 (43.7)	258 (45.3)	**1.94 (1.74-2.16)**	1.14 (1.00-1.29)	1.31 (1.00-1.71)	1.08 (0.93-1.25)
Reported at least one fall in 12 months prior to baseline							
No	2164 (26.7)	717 (20.9)	1304 (30.5)	1	1	1	1
Yes	719 (33.6)	177 (26.1)	490 (36.7)	**1.31 (1.2-1.43)**	1.02 (0.93-1.11)	1.03 (0.86-1.22)	1.01 (0.91-1.12)
Length of stay for index Admission (Mean days and SD)	7.2 (7.7)	6.9 (7.1)	7.4 (7.9)	**1.03 (1.02-1.03)**	**1.02 (1.01-1.02)**	**1.02 (1.01-1.02)**	**1.02 (1.01-1.03)**
Self-reported diabetes diagnosis at baseline							
No	2456 (27.1)	803 (21.1)	1499 (31.0)	1	1	1	1
Yes	427 (36.0)	91 (28.8)	295 (38.0)	**1.40 (1.27-1.55)**	1.10 (0.98-1.22)	1.02 (0.81-1.29)	1.11 (0.98-1.25)

Patient factors	Subsequent hospitalisation within 12 months of index hospitalisation			Likelihood of a subsequent hospitalisation within 12 months after seeing a GP/Specialist within 2 weeks days			
				Unadjusted	controlling for all other factors		
	ALL	LOW GP users	HIGH GP users	ALL	Model 1: ALL	Model 2: LOW GP users	Model 3: HIGH GP users
	N (%)	N (%)	N (%)	HR (95%CI)	HR (95%CI)	HR (95%CI)	HR (95%CI)
Self-reported osteoarthritis/osteoporosis diagnosis at baseline							
No	2281 (27.0)	771 (21.3)	1357 (30.6)	**1**	**1**	**1**	**1**
Yes	602 (33.9)	123 (25.1)	437 (37.1)	**1.30 (1.19-1.43)**	0.96 (0.87-1.06)	0.83 (0.68-1.02)	1.01 (0.90-1.13)
Self-reported cardiovascular disease diagnosis at baseline							
No	2029 (25.4)	698 (19.8)	1209 (29.5)	1	1	1	1
Yes	854 (37.9)	196 (32.9)	585 (38.6)	**1.61 (1.49-1.75)**	**1.10 (1.01-1.20)**	1.18 (0.99-1.40)	1.07 (0.97-1.19)
Self-reported asthma diagnosis at baseline							
No	2490 (28)	802 (21.9)	1516 (31.8)	1	1	1	1
Yes	393 (29.0)	92 (20.0)	278 (33.0)	1.04 (0.94-1.16)	1.03 (0.92-1.15)	0.93 (0.74-1.15)	1.07 (0.94-1.21)
Self-reported depression/anxiety diagnosis at baseline							
No	2379 (28.3)	773 (22.0)	1431 (32.1)	1	1	1	1
Yes	504 (27.7)	121 (20.3)	363 (31.5)	0.97 (0.88-1.07)	0.95 (0.85-1.05)	0.97 (0.79-1.20)	0.94 (0.83-1.06)
Self-reported cancer diagnosis at baseline							
No	2150 (26.1)	693 (20.0)	1296 (29.7)	1	1	1	1
Yes	733 (36.8)	201 (30.5)	498 (39.8)	**1.51 (1.39-1.64)**	**1.23 (1.13-1.34)**	**1.32 (1.12-1.55)**	**1.21 (1.09-1.34)**
Number of GP visits in 12 months prior to Index hospitalisation							
3 or fewer visits	300 (21.1)	300 (21.1)	-	1	1	1	-
4-7 visits	594 (22.0)	594 (22.0)	-	1.05 (0.92-1.21)	0.94 (0.81-1.08)	0.95 (0.81-1.10)	-
8-12 visits	775 (27.1)		708 (26.7)	**1.33 (1.17-1.52)**	0.99 (0.85-1.14)	-	1
13+ visits	1214 (37.1)		1086 (36.6)	**1.95 (1.72-2.21)**	1.10 (0.95-1.27)	-	**1.13 (1.02-1.24)**
Number of Specialist visits in 12 months prior to Index hospitalisation							
None	346 (24.3)	209 (22.7)	115 (25.4)	1	1	1	1
One-four	939 (22.9)	346 (17.8)	535 (27.2)	0.93 (0.82-1.05)	0.91 (0.80-1.03)	0.84 (0.70-1.00)	0.99 (0.82-1.20)
More than four	1598 (33.8)	339 (27.1)	1144 (35.8)	**1.46 (1.30-1.64)**	1.09 (0.96-1.25)	1.10 (0.90-1.35)	1.14 (0.94-1.37)
Number of hospitalisations in 12 months prior to Index hospitalisation							
None	1357 (24.8)	508 (20.2)	764 (28.1)	1	1	1	1
One	728 (26.8)	205 (20.1)	479 (30.6)	1.09 (0.99-1.19)	1.04 (0.95-1.15)	1.01 (0.86-1.20)	1.06 (0.95-1.19)
Multiple	798 (39.1)	181 (31)	551 (41.4)	**1.73 (1.59-1.89)**	**1.36 (1.24-1.50)**	**1.30 (1.08-1.56)**	**1.38 (1.24-1.54)**
Saw a GP within 2 weeks, but did not see a Specialist within 2 weeks							
No	588 (20.9)	288 (18.1)	300 (24.5)	1	1	1	1
Yes	1358 (28.7)	341 (21.6)	1017 (32.2)	**1.35 (1.25-1.46)**	**1.13 (1.02-1.25)**	1.05 (0.89-1.23)	**1.18 (1.03-1.35)**
Saw a GP within 2 weeks and saw a Specialist within 2 weeks							
No	278 (33.1)	130 (32.1)	1182 (29.5)	1	1	1	1
Yes	659 (35.6)	135 (25.0)	524 (40.0)	**1.47 (1.36-1.59)**	0.92 (0.80-1.06)	***0.68 (0.53-0.87)***	1.09 (0.90-1.31)
TOTAL	**2883 (28.2)**	**894 (21.7)**	**1794 (32.0)**				

NOTE: Significantly higher associations in bold and significantly lower associations in italics and bold.

Associations between seeing a GP and Specialist and subsequent hospitalisations - sensitivity test comparing 2 weeks and 7 days.

As a sensitivity analysis, the association between seeing a GP within 7 days of discharge from the index hospitalisation and the first subsequent hospitalisation, controlling for demographic, lifestyle, wellbeing, and health service utilisations, was examined (See Supplementary Table S9). There were significant associations between seeing a GP within 7 days of discharge from the index hospitalisation and subsequent hospitalisation in the unadjusted univariable model for both those who also saw a Specialist (HR 1.46; 95% CI 1.32-1.60) and those who did not (HR 1.36; 95% CI 1.27-1.47), this was similar to what was seen for the 2-week follow-up. Also, as was the case for the 2-week follow-up, once we controlled for all other factors, this was significant only for those who had not seen a Specialist (HR 1.17; 95% CI 1.07-1.27) and not for those who also saw a Specialist (HR 1.00; 95% CI 0.84-1.20).

When looking at the different GP user groups, as was the case for the 2-week follow-up, the HIGH GP user group was significantly associated for those who had not seen a Specialist (HR 1.22; 95% CI 1.10-1.35). However, there was no significant association between seeing a GP within 7 days of discharge from the index hospitalisation with/without also seeing a Specialist, and subsequent hospitalisation in the LOW GP user group, whereas there were associations for the 2-week follow-up.

As shown in Supplementary Table S9, the likelihood of subsequent hospitalisations after seeing a GP and/or Specialist within 7 days of discharge, controlling for all other factors, was overall the same as for the 2-week follow-up, except for current smoking at baseline was now more likely. In the LOW GP users there was no change. In the HIGH GP users had a partner at baseline was no longer less likely.

Discussion

With regard to the specific research questions, we found the following:

What are the appropriate hospitalisation inclusions that would benefit from a 2-week GP and/or Specialist follow-up?

Initial hospitalisations included all multi-day hospitalisations where the person was discharged back to the community setting, excluding those admitted for rehabilitation or dialysis or a joint replacement as these would be expected to be part of an on-going treatment plan.

What MBS items should be included as a GP and/or Specialist attendance following hospitalisation?

GP Items included were: all items in groups A1, A2, A5, A11, A14, A15, A17, A20, A22, A23 except for case conferences (735-880). Specialist items included were: all items in groups A3, A4, A8, A24, A26, A28 were included except items related to case conferences (2946-3000 and 3032-3093).

What proportion of patients saw a GP and/or Specialist within 2 weeks of discharge from an Index hospitalisation?

Of the 10,240 eligible participants with an index hospitalisation, 6,587 (64.3%) saw a GP within 2 weeks of discharge and 7,426 (72.5%) saw a GP and/or Specialist within 2 weeks of discharge.

What is the change over time in the proportion of people seeing a GP and/or Specialist within 2 weeks of discharge?

The proportion of participants seeing a GP and/or a Specialist within 2 weeks of discharge from an index hospitalisation remained consistent across the time period 2007-2014.

How did rates of GP and/or Specialist follow-up vary over time for specific age groups?

Overall, those in the two oldest age groups (75-84 years and 85 years plus) had the highest rates of GP and/or Specialist follow-up (around 80%) compared to the younger age groups (around 70%). There was no significant increase or decrease across time for any of the age specific rates.

What are the characteristics of patients who saw a GP and/or Specialist within 2 weeks of hospital discharge?

The factors that were independently associated with increased odds of seeing a GP within 2 weeks of discharge, controlling for all other factors, included: increasing age, being male, having a lower income, not having private health insurance, not drinking alcohol (compared to low risk and high risk drinkers), being underweight (compared to being within the healthy weight range), having a longer length of stay for index admission, having seen a GP frequently in the year prior to the index hospitalisation, having not seen a specialist in the year prior to the index hospitalisation, having not been hospitalised in the year prior to the index hospitalisation (compared to being hospitalised once or multiple times), working part-time (compared to full-time), and not having reported a cancer diagnosis.

The factors that were significantly associated with increased odds of both seeing a GP within 2 weeks of discharge and seeing a GP and/or Specialist within 2 week of discharge included: increasing age at time of hospitalisation, being male, lower household income, not having private health insurance, increasing length of stay for the index hospitalisation, more GP visits in the year prior to hospitalisation, fewer

hospitalisations in the year prior to the index hospitalisation and fewer Specialist visits in the year prior to the index hospitalisation.

After controlling for demographic, lifestyle, wellbeing and health service utilisations, is GP and/or Specialist follow-up within 2 weeks of hospitalisation associated with subsequent hospitalisations?

There was a significant association between seeing a GP within 2 weeks of discharge from the index hospitalisation and subsequent hospitalisation in the unadjusted univariable model for both those who also saw a Specialist (HR 1.47; 95% CI 1.36-1.59) and those who did not (HR 1.35; 95% CI 1.25-1.46). However, once we controlled for all other factors this was significant only for those who had not seen a Specialist (HR 1.13; 95% CI 1.02-1.25), and not for those who also saw a Specialist (HR 0.92; 95% CI 0.80-1.06).

Does this differ by condition/service use/severity? – high/low GP users

Because of two distinctive service use profiles being evident for participants who had an index hospitalisation, i.e. LOW GP users (7 or fewer visits per year) and HIGH GP users (8 or more visits per year), the models were re-run for these two distinct groups.

Among the LOW GP users, for those who saw a GP within 2 weeks of discharge but did not see a Specialist, 21.6 % experienced a subsequent hospitalisation compared to 18.1% of those participants who did not see a GP and also did not see a Specialist. This pattern was the opposite among those who had also seen a Specialist: those who saw a GP were less frequently hospitalised (25.0%) compared to those who saw a Specialist only (32.1%). After controlling for other factors in the multivariable model, seeing a GP was significantly associated with a lower rate of hospitalisations among those who also saw a Specialist (HR 0.68, 95% CI 0.53-0.87) but was non-significant amongst those who did not see a Specialist (HR 1.05, 95% CI 0.89-1.23).

Among the HIGH GP users, for those who saw a GP within 2 weeks of discharge, the proportion subsequently experiencing a hospitalisation was higher regardless of whether they had seen a Specialist (32.2% compared to 24.5% for those who saw a Specialist, and 40.0% compared to 29.5% for those who had also seen a Specialist). After controlling for other factors in the multivariable model, seeing a GP was not associated with higher or lower rates of hospitalisation among those who also saw a Specialist (HR 1.09; 95%CI 0.90-1.31) but was associated with higher rates of hospitalisation among those who did not see a Specialist (HR 1.18; 95%CI 1.03-1.35).

A summary of the likelihood of subsequent hospitalisations after seeing a GP and/or Specialist within 2 weeks of discharge, controlling for all other factors, is provided in the Table 7 for LOW GP users, all participants and HIGH GP users.

Table 7: Summary of the likelihood of subsequent hospitalisations after seeing a GP and/or Specialist within 2 weeks (and within 7 days for comparison) of discharge, controlling for all other factors

Subsequent hospitalisations after seeing a GP and/or Specialist		Within 2 weeks			Within 7 days		
		LOW GP Users	All	HIGH GP users	LOW GP Users	All	HIGH GP users
More likely	Poor self-rated health at baseline						
	Ever been diagnosed with cardiovascular disease						
	Inadequate physical activity at baseline						
	Older						
	Longer index admission lengths of stay						
	Ever been diagnosed with cancer						
	Hospitalised multiple times prior to index hospitalisation						
	Severe functional limitations at baseline						
	Current smoker at baseline						
Less likely	Work part time						
	Drank more than 14 drinks of alcohol a week at baseline						
	Female						
	Spoke a language other than English						
	Had a partner at baseline						
	Private health cover at baseline						

Does this differ by condition/service use/severity? – 7 day follow-up compared to 2 weeks

As a sensitivity analysis, the association between seeing a GP within 7 days of discharge from the index hospitalisation and the first subsequent hospitalisation, controlling for demographic, lifestyle wellbeing, and health service utilisations, was examined (See Supplementary Table S9). There were significant associations between seeing a GP within 7 days of discharge from the index hospitalisation and subsequent hospitalisation in the unadjusted univariable model for both those who also saw a Specialist (HR 1.46; 95% CI 1.32-1.60) and those who did not (HR 1.36; 95% CI 1.27-1.47), this was similar to what was seen for the 2-week follow-up. Also, as was the case for the 2-week follow-up, once we controlled for all other factors, this was significant only for those who had not seen a Specialist (HR 1.17; 95% CI 1.07-1.27) and not for those who also saw a Specialist (HR 1.00; 95% CI 0.84-1.20).

When looking at the different GP user groups, as was the case for the 2-week follow-up, the HIGH GP user group was significantly associated for those who had not seen a Specialist (HR 1.22; 95% CI 1.10-1.35). However, there was no significant association between seeing a GP within 7 days of discharge from the index hospitalisation, with/without also seeing a Specialist, and subsequent hospitalisation in the LOW GP user group, whereas there were associations for the 2-week follow-up.

A summary of the likelihood of subsequent hospitalisations after seeing a GP and/or Specialist within 7 days of discharge, controlling for all other factors, is also provided in Table 7 for LOW GP users, all participants and HIGH GP users.

Contribution to policy, practice and/or research

The groups less likely to see a GP/Specialist within 2 weeks of discharge were not in the at-risk 30-day readmission groups identified by other researchers (i.e. older, males, low incomes, no insurance) suggesting that follow-up is being targeted to those with the highest need (Silverstein et al. 2008). This was in contrast to what was found in Alberta and Saskatchewan, Canada, for patients with chronic conditions (HF or COPD), where those from lower-income neighbourhoods and rural areas, and patients discharged home with support services or from community hospitals (as opposed to teaching hospitals), had lower 7-day follow-up rates. However, follow-up visits increased when patients had a 'familiar' physician, especially for patients with COPD (Canadian Institute for Health Information 2015).

Contrary to the no protective effects found by Jackson et al. (2015) and Field et al. (2015), our participants did benefit (31% less likely to have a subsequent hospitalisation in the next 12 months) from GP follow-up within 2 weeks of discharge from hospital if they were LOW GP users (7 or fewer per year) and also saw a Specialist within 2 weeks of discharge. They were also 19% more likely to have a subsequent hospitalisation in the next 12 months if they were HIGH GP users (8 or more visits per year) and did not also see a Specialist within 2 weeks of discharge. These differences are similar to the 30-day readmission rates found by Shen et al. (2017), that being 12% to 24% lower.

A major strength of the current study is the use of an extremely large community-dwelling cohort of older people which was not limited to only those who have contact with health services which provides a more realistic denominator. The cohort spans a range of ages between aged 45 years and up, and this allows a unique perspective on the use of health services by age both within the cohort and across time. There were some limitations: while the 45 and Up Study cohort is reasonably representative of the NSW population from which it was drawn, non-response at baseline may mean that the cohort varies slightly from the NSW population; for example smoking rates were observed to be lower within the 45 and Up Study (Mealing et al. 2010) compared to the NSW Population Health Survey (Barr et al. 2008, Centre for Epidemiology and Evidence 2007), this means that the rates reported may vary from those within the NSW population. Nevertheless, comparison of these rates over time and between sub-groups is still valid. Another limitation of the MBS data is the lack of any information regarding the reason for the primary care consultation.

The models provided in this report control for all demographic, lifestyle, wellbeing and health service utilisations factors, regardless of their significance. While this is informative, it may not result in the model of best fit (i.e. how well the model describes the observed data). Thus, for any publication the models will only include a set of confounders such as age, sex, self-rated health status and education, with the other variables only being included if they are significant.

Further research to examine in more detail the effect of GP and/or Specialist follow-up within 2 weeks of discharge by specific conditions, such as neoplasms, HF, and respiratory disease, could be informative. However, because of the small numbers of patients by condition in CES, this analysis may need to be expanded to include all of NSW. 'familiar' GP versus any GP follow-up could also be explored to see if there is any effect.

References

Abramson M, Crockett AJ, Dabscheck E, et al., on behalf of Lung Foundation Australia and Thoracic Society of Australia and New Zealand (2014) The COPDX Plan: Australian and New Zealand Guidelines for the Management of Chronic Obstructive Pulmonary Disease 2014. Milton, Australia: Lung Foundation Australia and Thoracic Society of Australia.

Australian Commission on Safety and Quality in Health Care (2017) National Safety and Quality Health Service Standards. 2nd ed. Sydney: ACSQHC.

Australian Government Department of Human Services (2018) Medicare Benefits Schedule Book, ISBN: 978-1-76007-293-3, Publications Number: 11720. Available at http://www.mbsonline.gov.au/internet/mbsonline/publishing.nsf/Content/CF1350417910EAE6CA25817D0015AF5B/$File/201709-MBS.pdf [Verified 29 May 2018]

Australian Medical Association (2013) General practice/hospitals transfer of care arrangements. Available at https://ama.com.au/position-statement/general-practicehospitals-transfer-care-arrangements-2013 [Verified 1 Sept 2018].

Barr M, Baker D, Gorringe M, Fritsche L (2008) NSW Population Health Survey: Description of Methods Sydney: NSW Department of Health. Available at: http://www.health.nsw.gov.au/surveys/other/Documents/health-survey-methods.pdf [Verified 29 May 2018]

Canadian Institute for Health Information (2015) Physician Follow-up After Hospital Discharge: Progress in meeting Best Practice. Ottawa, ON: CIHI. Available at https://secure.cihi.ca/free_products/Physician-Follow-Up-Study-mar2015_EN.pdf [Verified 1 Sept 2018]

Centre for Epidemiology and Research (2007) 2007 Report on Adult Health from the New South Wales Population Health Survey, Sydney: NSW Department of Health. Available at: http://www.health.nsw.gov.au/surveys/adult/Pages/adults-07.aspx [Verified 29 May 2018]

DuGoff EH, Dy S, Giovannetti ER, Leff B, & Boyd CM (2013) Setting Standards at the Forefront of Delivery System Reform: Aligning Care Coordination Quality Measures for Multiple Chronic Conditions. J Healthc Qual: 35(5), 58–69;

Field TS, Ogarek J, Garber L, Reed G, Gurwitz JH (2015) Association of early post-discharge follow-up by a primary care physician and 30-day rehospitalization among older adults. J Gen Intern Med. 30(5):565-571.

45 and Up Study Collaborators (2008) Cohort profile: The 45 and Up Study. International Journal of Epidemiology 37(5), 941–7.

Hansen LO, Young RS, Hinami K, Leung A, Williams MV (2011). Interventions to reduce 30-day rehospitalization: a systematic review. Ann Intern Med. 155(8):520-528.

Health Quality Ontario (2010) Quality Monitor: 2010 Report on Ontario's Health System. Toronto, ON: Queen's Printer for Ontario. Available at http://www.hqontario.ca/portals/0/Documents/pr/qmonitor-full-report-2012-en.pdf. [Verified 1 Sept 2018].

Health PEI (2011) Chronic Obstructive Pulmonary Disease Clinical Pathway. Charlottetown, PE: Health PEI. Available at http://www.gov.pe.ca/photos/original/hpei_clinicalpa.pdf [Verified 1 Sept 2018].

Howlett JG, McKelvie RS, Costigan J, et al. (2010) The 2010 Canadian Cardiovascular Society guidelines for the diagnosis and management of heart failure update: heart failure in ethnic minority populations, heart failure and pregnancy, disease management, and quality improvement/assurance programs. Can J Cardiol. 26(4):185-202.

Jackson C, Shahsahebi M, Wedlake T, & DuBard CA (2015) Timeliness of Outpatient Follow-up: An Evidence-Based Approach for Planning After Hospital Discharge. Annals of Family Medicine, 13(2), 115–122.

Mealing NM, Banks E, Jorm LR, Steel DG, Clements MS, Rogers KD (2010) Investigation of relative risk estimates from studies of the same population with contrasting response rates and designs. BMC Medical Research Methodology 10, 26.

National Centre for Classification in Health (2006) The International statistical classification of diseases and related health problems, 10th Revision, Australian Modification (ICD-10-AM). Australian Coding Standards. Sydney: NCCH.

National Heart Foundation of Australia, Cardiac Society of Australia and New Zealand (2011). Guidelines for the prevention, detection and management of chronic heart failure in Australia. Available at https://www.heartfoundation.org.au/images/uploads/publications/Chronic_Heart_Failure_Guidelines_2011.pdf [Verified 1 Mar 2018].

NSW Ministry of Health (2017). Centre for Health Record Linkage. Retrieved from http://www.cherel.org.au/.

Scott IA (2010) Preventing the rebound: improving care transition in hospital discharge processes. Australian Health Review 34(4) 445-451 https://doi.org/10.1071/AH09777

Shen E, Koyama SY, Huynh DN, Watson HL, Mittman B, Kanter MH, Nguyen HQ (2017) Association of a Dedicated Post–Hospital Discharge Follow-up Visit and 30-Day Readmission Risk in a Medicare Advantage Population; JAMA Intern Med. 177(1):132-135. doi:10.1001/jamainternmed.2016.7061.

Silverstein MD, Qin H, Mercer SQ, Fong J, & Haydar Z (2008) Risk factors for 30-day hospital readmission in patients ≥65 years of age. Proceedings (Baylor University. Medical Center), 21(4), 363–372.

Sydney Local Health District (2018) Royal Prince Alfred Hospital; Going Home. Available at https://www.slhd.nsw.gov.au/rpa/pt_home.html [Verified 1 Sept 2018].

South Eastern Sydney Local Health District (2018) Prince of Whales Hospital; When you leave our hospital. Available at https://www.seslhd.health.nsw.gov.au/prince-of-wales-hospital/patients-visitors/when-you-leave-our-hospital [Verified 1 Sept 2018].

Tran CTT, Lee DS, Flintoft VF, eds (2003) CCORT/CCS quality indicators for acute myocardial infarction care. Can J Cardiol. 2003;19(1):38-45.

Yancy CW, Jessup M, Bozkurt B, et al. (2013) ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. Circulation. 128(16):e240-e327.

Appendices

Appendix A: Hospitalisation inclusion definitions

Type of hospitalisation	Inclusions	Exclusions	Purpose
Index hospitalisation	The first hospitalisation with length of stay greater than 1 day that occurred for an individual in the period starting at recruitment to the 45 and Up Study, or 1 Jan 2007 (whichever occurred latest) up to the end of 2014. All hospitalisations to public and private facilities were included.	Those that included discharge to a nursing home, transfer to another facility and those where the patient died within hospital. Admissions for rehabilitation or dialysis were excluded as these would be expected to be part of an on-going treatment plan. Admissions related to joint replacement were also excluded as post-operative care would be expected to include rehabilitation that would be part of an on-going treatment plan and may not include the GP.	Purpose is to identify hospital discharges where the patient is highly likely to benefit from GP care/ follow-up.
Early hospitalisation	Any hospitalisation with length of stay > 1 day that occurred within two weeks of discharge from index hospitalisation.		To exclude patients who were not in the community setting in the weeks following discharge. These patients would be precluded from seeing their GP due to re-hospitalisation.
Subsequent hospitalisation	Any hospitalisation with length of stay > 1 day that occurred between 2 weeks and 1 year after the index hospitalisation.	Admissions for rehabilitation.	To identify hospitalisations that could potentially have been prevented or delayed through good GP management post-hospitalisation.

Appendix B: Groups –Codes included for GP/Specialist follow-up

MBS Group	Name of Group	Item numbers	Included
GP Items			
Group A1	GP attendances to which no other item applies	**3, 4, 20, 23, 24, 35, 36, 37, 43, 44, 47, 51**	Include all
Group A2	Other non-referred attendances to which no other item applies	**52, 53, 54, 57, 58, 59, 60, 65, 92, 93, 95, 96**	Include all
Group A5	Prolonged attendances to which no other item applies	**160, 161, 162, 163, 164**	Include all
Group A11	Urgent attendances after hours	**597, 598, 599, 600**	Include all
Group A14	Health assessments	**701, 703, 705, 707**, **715**	Include all
Group A15	GP care plans and multidisciplinary case conferences	**721, 723, 729, 731, 732,** *735, 739, 743, 747, 750, 758, 820, 822, 823, 825, 826, 828, 830, 832, 834, 835, 837, 838, 855, 857, 858, 861, 864, 866, 871, 872, 880*	Include only CDMP items. Do not include items 735-880 as these are case-conferences and do not involve a patient attendance
Group A17	Medication management review	**900, 903**	Include all
Group A20	GP mental health care	**2700, 2701, 2712, 2713, 2715, 2717, 2721, 2723, 2725, 2727**	Include all
Group A22	GP after-hours attendances to which no other item applies	**5000, 5003, 5010, 5020, 5023, 5028, 5040, 5043, 5049, 5060, 5063, 5067**	**Include all**
Group A23	Other non-referred after-hours attendances to which no other item applies	**5200, 5203, 5207, 5208, 5220, 5223, 5227, 5228, 5260, 5263, 5265, 5267**	Include all
Specialist Items			
Group A3	Specialist attendances to which no other item applies	**99, 104, 105, 106, 107, 108, 109, 111, 113**	Include all
Group A4	Consultant Physician attendances to which no other item applies	**110, 112, 114, 116, 117, 119, 120, 122, 128, 131, 132, 133**	Include all
Group A8	Consultant Psychiatrist attendances to which no other item applies	**288, 289, 291, 293, 296, 297, 299, 300, 302, 304, 306, 308, 310, 312, 314, 316, 318, 319, 320, 322, 324, 326, 328, 330, 332, 334, 336, 338, 342, 344, 346, 348, 350, 352, 353, 355, 356, 357, 358, 359, 361, 364, 366, 367, 369, 370,**	Include all

MBS Group	Name of Group	Item numbers	Included
Group A24	Pain and palliative medicine	**2799, 2801, 2806, 2814, 2820, 2824, 2832, 2840,** *2946, 2949, 2954, 2958, 2972, 2974, 2978, 2984, 2988, 2992, 2996, 3000*, **3003, 3005, 3010, 3014, 3015, 3018, 3023, 3028**, *3032, 3040, 3044, 3051, 3055, 3062, 3069, 3074, 3078, 3083, 3088, 3093*	Include bold items only. Those in italics represent case conference item numbers and will be excluded.
Group A26	Neurosurgery attendances to which no other item applies	**6004, 6007, 6009, 6011, 6013, 6015, 6016**	Include
Group A28	Geriatric medicine	**141, 143, 145, 147, 149**	Include all
Excluded Items			
Group A6	Group therapy	170, 171, 172	Exclude
Group A7	Acupuncture	173, 193, 195, 197, 199	Exclude
Group A9	Contact Lenses - attendances	10801, 10802, 10803, 10804, 10805, 10806, 10807, 10808, 10809, 10816	Exclude
Group A10	Optometrical services	10905, 10907, 10910, 10911, 10912, 10913, 10914, 10915, 10916, 10918, 10921, 10922, 10923, 10924, 10925, 10926, 10927, 10928, 10929, 10930, 10931, 10932, 10933, 10940, 10941, 10942, 10943, 10944, 10945, 10946, 10947, 10948	Exclude
Group A12	Consultant Occupational Physician attendances to which no other item applies	384, 385, 386, 387, 388, 389	Exclude
Group A13	Public Health Physician attendances to which no otheritem applies	410, 411, 412, 413, 414, 415, 416, 417	Exclude
Group A18	GP attendances associated with Practice Incentives Program (PIP) payments	2497, 2501, 2503, 2504, 2506, 2507, 2509, 2517, 2518, 2521, 2522, 2525, 2526, 2546, 2547, 2552, 2553, 2558, 2559,	Exclude
Group A19	Other non-referred attendances associated with Practice Incentives Program (PIP) payments to which no other item applies	2598, 2600, 2603, 2606, 2610, 2613, 2616, 2620, 2622, 2624, 2631, 2633, 2635, 2664, 2666, 2668, 2673, 2675, 2677	Exclude
Group A21	Medical Practitioner (Emergency Physician) attendances to which no other item applies	501, 503, 507, 511, 515, 519, 520, 530, 532, 534, 536	Exclude (emergency room attendance)

MBS Group	Name of Group	Item numbers	Included
Group A27	Pregnancy support counselling	4001	Exclude
Group A29	Early intervention services for children with autism, pervasive developmental disorder or disability	135, 137, 139	Exclude
Group A30	Medical Practitioners – telehealth attendances	2100, 2122, 2125, 2126, 2137, 2138, 2143, 2147, 2179, 2195, 2199, 2220	Exclude
Group A31	Addiction medicine	6018, 6019, 6023, 6024, 6025, 6026, 6028, 6029, 6031, 6032, 6034, 6035, 6037, 6038, 6042	Exclude
Group A32	Sexual health medicine	6051, 6052, 6057, 6058, 6059, 6060, 6062, 6063, 6064, 6065, 6067, 6068, 6071, 6072, 6074, 6075	Exclude
Group A33	Transcatheter aortic valve implantation case conference	6080, 6081	Exclude
Group A34	Health care homes	6087	Exclude

Appendix C: Index hospitalisations by first subsequent hospitalisations –principal diagnosis (ICD10)

	Index hospitalisation		1	2	3	4	5	6	7	8	9	10	11	12	13	14	18	19	21	Subsequent hospitalisation		TOTAL index	% sub-hospn's
Cpt	Code Range	Description	Certain infectious and parasitic diseases	Neoplasms	Diseases of the blood and blood-forming organs and the immune mechanism	Endocrine, nutritional and metabolic diseases	Mental, behavioural andneuro-developmental disorders	Diseases of the nervous system	Diseases of the eye and adnexa	Diseases of the ear and mastoid process	Diseases of the circulatory system	Diseases of the respiratory system	Diseases of the digestive system	Diseases of the skin and subcutaneous tissue	Diseases of the musculo-skeletal system and connective tissue	Diseases of the genito-urinary system	Symptoms, signs etc not elsewhere classified	Injury, poisoning and certain other external causes	Factors influencing health status and contact with health services	Yes	No		
1	A00-B99	Certain infectious and parasitic diseases	5	15	<5	<5	<5	<5	<5	0	<5	<5	6	0	<5	8	5	8	0	63	174	237	26.6
2	C00-D49	Neoplasms	10	185	23	<5	<5	6	<5	<5	39	21	43	6	9	18	37	27	31	464	974	1438	32.3
3	D50-D89	Diseases of the blood and blood-forming organs and the immune mechanism	<5	8	7	<5	<5	0	0	0	10	<5	5	0	<5	0	5	<5	<5	51	39	90	56.7
4	E00-E89	Endocrine, nutritional and metabolic diseases	0	<5	0	10	<5	0	0	0	14	<5	<5	<5	<5	<5	<5	<5	<5	50	192	242	20.7
5	F01-F99	Mental, behavioural and neurodevelopmental disorders	<5	<5	<5	0	48	<5	<5	0	7	5	<5	0	0	<5	<5	<5	<5	82	152	234	35.0
6	G00-G99	Diseases of the nervous system	<5	<5	<5	<5	<5	13	0	0	12	6	<5	0	<5	<5	7	8	<5	68	159	227	30.0
7	H00-H59	Diseases of the eye and adnexa	0	<5	0	0	0	0	0	0	<5	<5	<5	0	0	<5	0	0	0	6	43	49	12.2
8	H60-H95	Diseases of the ear and mastoid process	0	<5	0	0	0	<5	0	<5	<5	0	0	0	0	0	<5	<5	0	8	57	65	12.3
9	I00-I99	Diseases of the circulatory system	11	35	7	16	7	12	<5	<5	236	32	31	12	23	22	53	47	7	555	1174	1729	32.1
10	J00-J99	Diseases of the respiratory system	<5	17	<5	10	<5	7	0	0	33	85	9	5	11	<5	18	21	<5	229	406	635	36.1
11	K00-K95	Diseases of the digestive system	11	32	<5	8	6	<5	0	0	31	13	103	<5	16	21	28	28	<5	307	863	1170	26.2
12	L00-L99	Diseases of the skin and subcutaneous tissue	<5	7	0	<5	<5	<5	0	<5	13	6	<5	19	6	<5	<5	8	0	78	170	248	31.5
13	M00-M99	Diseases of the musculoskeletal system and connective tissue	5	13	<5	0	<5	5	0	<5	21	15	7	<5	59	8	11	27	0	179	687	866	20.7
14	N00-N99	Diseases of the genitourinary system	6	28	0	6	<5	<5	<5	<5	21	14	22	<5	10	69	12	23	<5	223	840	1063	21.0
18	R00-R99	Symptoms, signs etc, not elsewhere classified	7	20	<5	6	6	9	<5	<5	40	13	25	<5	9	18	29	23	<5	215	445	660	32.6
19	S00-T88	Injury, poisoning and certain other consequences of external causes	7	14	<5	9	7	6	0	0	33	8	24	11	24	10	20	71	5	252	834	1086	23.2
21	Z00-Z99	Factors influencing health status and contact with health services	<5	<5	0	0	0	<5	0	0	11	<5	<5	0	5	5	<5	7	<5	49	135	184	26.6
	TOTAL		77	392	53	73	99	70	7	12	527	229	293	67	181	194	240	310	57	2879	7344	10223	28.2

Note: 17 not included as index hospitalisation in chapter had <5 participants

Supplementary Tables

Supplementary Table S1: Saw GP and/or Specialist within 2 weeks of discharge from index hospitalisation

Saw GP and/or Specialist within 2 weeks of discharge from index hospitalisation		Week 1	Week 2	Week 3	Week 4	Weeks 5-6	Weeks 7-8	Weeks 9-13	Weeks 14-26	6-12 months	Not seen within a year
GP	Number	5234	1353	706	491	661	350	524	473	169	279
	%	51.1	13.2	6.9	4.8	6.5	3.4	5.1	4.6	1.7	2.7
GP and/or Specialist	Number	5938	1488	748	466	557	265	317	233	59	169
	%	58.0	14.5	7.3	4.6	5.4	2.6	3.1	2.3	0.6	1.7

Supplementary Table S2: Number and percent of index admissions for LOW GP users by 3-digit principal diagnosis (ICD-10-AM) – Top 10 diagnosis codes

3-digit Principal diagnosis ICD-10-AM code	Description	Number of admissions	Percent of LOW GP user admissions	Rank within LOW GP user admissions
C61	Malignant neoplasm of prostate	146	3.5	1
N81	Female genital prolapse	140	3.4	2
I21	Acute myocardial infarction	128	3.1	3
N40	Hyperplasia of prostate	113	2.7	4
I48	Atrial fibrillation and flutter	82	2.0	5
I20	Angina pectoris	79	1.9	6
K80	Cholelithiasis	69	1.7	7
L03	Cellulitis	69	1.7	7
I25	Chronic ischaemic heart disease	62	1.5	9
C50	Malignant neoplasm of breast	61	1.5	10
S52	Fracture of forearm	61	1.5	10
Sum of Top 10		**1010**	**24.5**	

Supplementary Table S3: Number and percent of index admissions for HIGH GP users by 3-digit principal diagnosis (ICD-10-AM) – Top 10 diagnosis codes

3-digit Principal diagnosis ICD-10-AM code	Description	Number of admissions	Percent of HIGH GP user admissions	Rank within HIGH GP user admissions
J18	Pneumonia organism unspecified	163	2.7	1
N40	Hyperplasia of prostate	162	2.6	2
I48	Atrial fibrillation and flutter	160	2.6	3
C61	Malignant neoplasm of prostate	128	2.1	4
I20	Angina pectoris	126	2.1	5
I21	Acute myocardial infarction	123	2.0	6
N81	Female genital prolapse	122	2.0	7
L03	Cellulitis	111	1.8	8
N39	Other disorders of urinary system	102	1.7	9
M48	Other spondylopathies	101	1.6	10
Sum of Top 10		**1298**	**21.2**	

Supplementary Table S4: Association of participant factors with whether they saw a GP within 2 weeks of discharge from an index hospitalisation

Patient factors	Saw a GP within 2 weeks of discharge		Unadjusted	Model 1: Controlling for all other factors
	No	Yes	OR (95%CI)	OR (95%CI)
	N(%)	N (%)		
Age at time of hospitalisation (Mean and SD)	67.9 (11.7)	72.6 (12)	**1.03 (1.03-1.04)**	**1.02 (1.01-1.02)**
Gender				
Male	1797 (34.5)	3415 (65.5)	1	1
Female	1856 (36.9)	3172 (63.1)	***0.9 (0.83-0.98)***	***0.85 (0.77-0.94)***
Speaks a language other than English at home				
No	3087 (37.2)	5213 (62.8)	1	1
Yes	566 (29.2)	1374 (70.8)	1.09 (0.97-1.23)	1.12 (0.96-1.32)
Highest educational qualification				
University or higher	1195 (43.8)	1531 (56.2)	1	1
Trade/ diploma	1049 (35.7)	1888 (64.3)	**1.41 (1.26-1.56)**	1.02 (0.91-1.15)
Year 12 or equivalent	390 (34.2)	749 (65.8)	**1.50 (1.30-1.73)**	1.03 (0.88-1.20)
Less than high school	1019 (29.6)	2419 (70.4)	**1.85 (1.67-2.06)**	1.01 (0.89-1.15)
Household income at baseline				
$70,000 or more	1181 (49.6)	1201 (50.4)	1	1
$40,000 to $69,999	616 (39.5)	943 (60.5)	**1.51 (1.32-1.71)**	1.10 (0.95-1.27)
$20,000 to $39,999	503 (32.7)	1036 (67.3)	**2.03 (1.77-2.31)**	1.12 (0.96-1.32)
<$20,000	551 (24.4)	1708 (75.6)	**3.05 (2.69-3.46)**	**1.25 (1.05-1.48)**
Won't disclose	802 (32.1)	1699 (67.9)	**2.08 (1.86-2.34)**	**1.18 (1.02-1.37)**
Work status at baseline				
Full time	1097 (46.3)	1270 (53.7)	1	1
Part time	715 (44.7)	886 (55.3)	1.07 (0.94-1.22)	0.87 (0.75-1.00)
Not working	1841 (29.4)	4431 (70.6)	**2.08 (1.89-2.29)**	0.95 (0.83-1.10)
Having private health insurance				
No	717 (24.3)	2239 (75.7)	1	1
Yes	2936 (40.3)	4348 (59.7)	***0.47 (0.43-0.52)***	***0.70 (0.62-0.79)***
Having a health care concession card				
No	2906 (40.3)	4297 (59.7)	1	1
Yes	747 (24.6)	2290 (75.4)	**2.07 (1.89-2.28)**	1.12 (1.00-1.26)
Duke Social Support Index (social interaction) Mean and SD	9 (1.6)	8.9 (1.6)	0.99 (0.97-1.02)	1.03 (1.00-1.06)
Marital status				
No partner	1174 (32.4)	2454 (67.6)	1	1
Partner	2479 (37.5)	4133 (62.5)	***0.80 (0.73-0.87)***	1.06 (0.96-1.17)
Smoking status at baseline				
Never smoke	2071 (36.7)	3578 (63.3)	1	1
Ex-smoker	1340 (34.9)	2497 (65.1)	1.08 (0.99-1.18)	1.07 (0.97-1.17)
Current smoker	242 (32.1)	512 (67.9)	**1.23 (1.04-1.44)**	1.16 (0.97-1.39)

Patient factors	Saw a GP within 2 weeks of discharge		Unadjusted	Model 1: Controlling for all other factors
	No	Yes	OR (95%CI)	OR (95%CI)
	N(%)	N (%)		
Adequate physical activity at baseline				
Yes	1239 (33.1)	2509 (66.9)	1	1
No	2414 (37.2)	4078 (62.8)	**1.20 (1.10-1.31)**	0.94 (0.85-1.03)
Adequate fruit and vegetable intake at baseline				
Yes	2928 (36)	5216 (64)	1	1
No	725 (34.6)	1371 (65.4)	0.94 (0.85-1.04)	0.96 (0.86-1.07)
Alcohol consumption at baseline				
Zero	1084 (29.3)	2614 (70.7)	1	1
1-13 drinks	1844 (39.2)	2856 (60.8)	***0.64 (0.59-0.70)***	***0.84 (0.76-0.93)***
14+ drinks	725 (39.4)	1117 (60.6)	***0.64 (0.57-0.72)***	***0.84 (0.74-0.96)***
BMI category at baseline				
Normal weight	1243 (37.6)	2064 (62.4)	1	1
Underweight	335 (30.2)	774 (69.8)	**1.39 (1.20-1.61)**	**1.24 (1.06-1.44)**
Overweight	1352 (36.3)	2374 (63.7)	1.06 (0.96-1.17)	1.05 (0.95-1.17)
Obese	723 (34.5)	1375 (65.5)	**1.15 (1.02-1.28)**	1.13 (0.99-1.28)
Being treated for high blood pressure at baseline				
No	2723 (37.6)	4519 (62.4)	1	1
Yes	930 (31)	2068 (69)	**1.34 (1.22-1.47)**	1.04 (0.93-1.15)
Being treated for high cholesterol at baseline				
No	3039 (36.5)	5296 (63.5)	1	1
Yes	614 (32.2)	1291 (67.8)	**1.21 (1.09-1.34)**	0.99 (0.88-1.12)
Physical functioning at baseline				
No limitations	990 (45.2)	1199 (54.8)	1	1
Minor limitations	867 (39.3)	1341 (60.7)	**1.28 (1.13-1.44)**	1.10 (0.96-1.25)
Moderate limitations	826 (32.3)	1729 (67.7)	**1.73 (1.54-1.95)**	1.14 (1.00-1.31)
Severe limitations	538 (27)	1458 (73)	**2.24 (1.97-2.55)**	1.17 (0.98-1.40)
Not available	432 (33.4)	860 (66.6)	**1.64 (1.43-1.90)**	0.98 (0.83-1.16)
Psychological distress at baseline				
Low psychological distress	2474 (37.8)	4074 (62.2)	1	1
Moderate psychological distress	506 (36.9)	867 (63.1)	1.04 (0.92-1.17)	0.97 (0.85-1.11)
High psychological distress	177 (33.5)	352 (66.5)	1.21 (1.00-1.46)	1.05 (0.85-1.30)
Very high psychological distress	97 (29.8)	229 (70.2)	**1.43 (1.13-1.83)**	1.08 (0.82-1.41)
Not available	399 (27.3)	1065 (72.7)	**1.62 (1.43-1.84)**	1.01 (0.87-1.17)
Self-rated good/v good/ excellent health at baseline				
Yes	727 (29.4)	1749 (70.6)	1	1
No	2926 (37.7)	4838 (62.3)	**1.46 (1.32-1.61)**	0.99 (0.86-1.14)
Self-rated good/v good/ excellent QoL at baseline				
Yes	637 (29.5)	1519 (70.5)	1	1
No	3016 (37.3)	5068 (62.7)	**1.42 (1.28-1.57)**	0.98 (0.85-1.13)

Patient factors	Saw a GP within 2 weeks of discharge		Unadjusted	Model 1: Controlling for all other factors
	No	Yes	OR (95%CI)	OR (95%CI)
	N(%)	N (%)		
Reported needing help with daily activities at baseline				
No	3424 (36.4)	5983 (63.6)	1	1
Yes	229 (27.5)	604 (72.5)	**1.51 (1.29-1.77)**	0.93 (0.77-1.13)
Reported at least one fall in 12 months prior to baseline				
No	2940 (36.3)	5158 (63.7)	1	1
Yes	713 (33.3)	1429 (66.7)	**1.14 (1.03-1.26)**	0.90 (0.80-1.00)
Length of stay for index admission (Mean days and SD)	5.3 (6)	6.3 (6.7)	**1.03 (1.02-1.04)**	**1.02 (1.01-1.02)**
Number of GP visits in 12 months prior to Index hospitalisation				
3 or fewer visits	798 (56.1)	625 (43.9)	1	1
4-7 visits	1199 (44.5)	1495 (55.5)	**1.59 (1.40-1.81)**	**1.66 (1.45-1.91)**
8-12 visits	950 (33.3)	1905 (66.7)	**2.56 (2.25-2.92)**	**2.48 (2.15-2.87)**
13+ visits	706 (21.6)	2562 (78.4)	**4.63 (4.05-5.30)**	**4.06 (3.47-4.75)**
Number of Specialist visits in 12 months prior to Index hospitalisation				
None	468 (32.9)	955 (67.1)	1	1
One-four	1526 (37.3)	2569 (62.7)	***0.83 (0.73-0.94)***	***0.72 (0.63-0.83)***
More than four	1659 (35.1)	3063 (64.9)	0.91 (0.80-1.03)	***0.59 (0.51-0.69)***
Number of hospitalisations in 12 months prior to Index hospitalisation				
None	1878 (34.3)	3600 (65.7)	1	1
One	1059 (38.9)	1661 (61.1)	***0.82 (0.74-0.90)***	***0.82 (0.74-0.91)***
Multiple	716 (35.1)	1326 (64.9)	0.97 (0.87-1.08)	***0.83 (0.74-0.94)***
Self-reported diabetes diagnosis at baseline				
No	3312 (36.6)	5741 (63.4)	1	1
Yes	341 (28.7)	846 (71.3)	**1.43 (1.25-1.63)**	1.06 (0.91-1.22)
Self-reported osteoarthritis/osteoporosis diagnosis at baseline				
No	3122 (36.9)	5341 (63.1)	1	1
Yes	531 (29.9)	1246 (70.1)	**1.37 (1.23-1.53)**	1.04 (0.92-1.18)
Self-reported cardiovascular disease diagnosis at baseline				
No	3025 (37.9)	4959 (62.1)	1	1
Yes	628 (27.8)	1628 (72.2)	**1.58 (1.43-1.75)**	1.12 (1.00-1.26)
Self-reported asthma diagnosis at baseline				
No	3174 (35.7)	5710 (64.3)	1	1
Yes	479 (35.3)	877 (64.7)	1.02 (0.90-1.15)	0.98 (0.86-1.12)
Self-reported depression/anxiety diagnosis at baseline				
No	2993 (35.6)	5426 (64.4)	1	1
Yes	660 (36.2)	1161 (63.8)	0.97 (0.87-1.08)	0.92 (0.81-1.04)
Self-reported cancer diagnosis at baseline				
No	2944 (35.7)	5304 (64.3)	1	1
Yes	709 (35.6)	1283 (64.4)	1.00 (0.91-1.11)	***0.88 (0.79-0.98)***
	3653 (35.7)	6587 (64.3)		

NOTE: Significantly higher associations in bold and significantly lower associations in italics and bold.

Supplementary Table S5: Association of participant factors with whether they saw a GP and/or Specialist within 2 weeks of discharge from an index hospitalisation

Patient factors	Saw a GP or Specialist within 2 weeks of discharge		Unadjusted	Model 1: Controlling for all other factors
	No	Yes	OR (95%CI)	OR (95%CI)
	N(%)	N (%)		
Age at time of hospitalisation (Mean and SD)	67.4 (11.6)	72.3 (12)	**1.04 (1.03-1.04)**	**1.02 (1.01-1.02)**
Gender				
Male	1361 (26.1)	3851 (73.9)	1	1
Female	1453 (28.9)	3575 (71.1)	***0.87 (0.80-0.95)***	***0.84 (0.76-0.94)***
Speaks a language other than English at home				
No	2403 (29.0)	5897 (71.0)	1	1
Yes	411 (21.2)	1529 (78.8)	**1.22 (1.07-1.39)**	1.12 (0.95-1.33)
Highest educational qualification				
University or higher	939 (34.4)	1787 (65.6)	1	1
Trade/ diploma	796 (27.1)	2141 (72.9)	**1.41 (1.26-1.58)**	1.06 (0.94-1.20)
Year 12 or equivalent	286 (25.1)	853 (74.9)	**1.57 (1.34-1.83)**	1.12 (0.95-1.32)
Less than high school	793 (23.1)	2645 (76.9)	**1.75 (1.57-1.96)**	0.99 (0.87-1.13)
Household income at baseline				
$70,000 or more	944 (39.6)	1438 (60.4)	1	1
$40,000 to $69,999	470 (30.1)	1089 (69.9)	**1.52 (1.33-1.74)**	1.13 (0.97-1.31)
$20,000 to $39,999	384 (25.0)	1155 (75.0)	**1.98 (1.71-2.28)**	1.12 (0.95-1.33)
<$20,000	418 (18.5)	1841 (81.5)	**2.89 (2.53-3.31)**	**1.24 (1.03-1.49)**
Won't disclose	598 (23.9)	1903 (76.1)	**2.09 (1.85-2.36)**	**1.23 (1.06-1.44)**
Work status at baseline				
Full time	875 (37.0)	1492 (63.0)	1	1
Part time	567 (35.4)	1034 (64.6)	1.07 (0.94-1.22)	**0.85 (0.74-0.99)**
Not working	1372 (21.9)	4900 (78.1)	**2.10 (1.89-2.32)**	0.94 (0.81-1.09)
Having private health insurance				
No	576 (19.5)	2380 (80.5)	1	1
Yes	2238 (30.7)	5046 (69.3)	***0.55 (0.49-0.61)***	***0.78 (0.69-0.88)***
Having a health care concession card				
No	2244 (31.2)	4959 (68.8)	1	1
Yes	570 (18.8)	2467 (81.2)	**1.96 (1.77-2.17)**	1.06 (0.94-1.21)
Duke Social Support Index (social interaction) Mean and SD	8.9 (1.6)	8.9 (1.6)	1.01 (0.98-1.04)	**1.05 (1.02-1.08)**
Marital status				
No partner	910 (25.1)	2718 (74.9)	1	1
Partner	1904 (28.8)	4708 (71.2)	***0.83 (0.76-0.91)***	1.07 (0.96-1.19)
Smoking status at baseline				
Never smoke	1587 (28.1)	4062 (71.9)	1	1
Ex-smoker	1040 (27.1)	2797 (72.9)	1.05 (0.96-1.15)	1.01 (0.91-1.12)
Current smoker	187 (24.8)	567 (75.2)	1.19 (0.99-1.41)	**1.18 (0.98-1.43)**
Adequate physical activity at baseline				
Yes	939 (25.1)	2809 (74.9)	1	1
No	1875 (28.9)	4617 (71.1)	**1.22 (1.11-1.33)**	0.95 (0.86-1.06)

Patient factors	Saw a GP or Specialist within 2 weeks of discharge		Unadjusted	Model 1: Controlling for all other factors
	No	Yes	OR (95%CI)	OR (95%CI)
	N(%)	N (%)		
Adequate fruit and vegetable intake at baseline				
Yes	2262 (27.8)	5882 (72.2)	1	1
No	552 (26.3)	1544 (73.7)	0.93 (0.83-1.04)	0.96 (0.86-1.08)
Alcohol consumption at baseline				
Zero	848 (22.9)	2850 (77.1)	1	1
1-13 drinks	1418 (30.2)	3282 (69.8)	***0.69 (0.62-0.76)***	0.92 (0.82-1.02)
14+ drinks	548 (29.8)	1294 (70.2)	***0.70 (0.62-0.80)***	0.95 (0.82-1.09)
BMI category at baseline				
Normal weight	948 (28.7)	2359 (71.3)	1	1
Underweight	261 (23.5)	848 (76.5)	**1.31 (1.12-1.53)**	1.15 (0.97-1.36)
Overweight	1039 (27.9)	2687 (72.1)	1.04 (0.94-1.15)	1.03 (0.92-1.15)
Obese	566 (27.0)	1532 (73.0)	1.09 (0.96-1.23)	1.07 (0.93-1.22)
Being treated for high blood pressure at baseline				
No	2116 (29.2)	5126 (70.8)	1	1
Yes	698 (23.3)	2300 (76.7)	**1.36 (1.23-1.50)**	1.05 (0.94-1.18)
Being treated for high cholesterol at baseline				
No	2344 (28.1)	5991 (71.9)	1	1
Yes	470 (24.7)	1435 (75.3)	**1.20 (1.07-1.34)**	0.93 (0.82-1.07)
Physical functioning at baseline				
No limitations	781 (35.7)	1408 (64.3)	1	1
Minor limitations	681 (30.8)	1527 (69.2)	**1.24 (1.10-1.41)**	1.04 (0.91-1.19)
Moderate limitations	630 (24.7)	1925 (75.3)	**1.70 (1.50-1.92)**	1.07 (0.93-1.24)
Severe limitations	394 (19.7)	1602 (80.3)	**2.26 (1.96-2.60)**	1.10 (0.91-1.33)
Not available	328 (25.4)	964 (74.6)	**1.63 (1.40-1.90)**	0.96 (0.80-1.14)
Psychological distress at baseline				
Low psychological distress	1917 (29.3)	4631 (70.7)	1	1
Moderate psychological distress	398 (29.0)	975 (71.0)	1.01 (0.89-1.15)	0.96 (0.84-1.11)
High psychological distress	128 (24.2)	401 (75.8)	**1.30 (1.06-1.59)**	1.16 (0.92-1.46)
Very high psychological distress	76 (23.3)	250 (76.7)	**1.36 (1.05-1.77)**	1.06 (0.79-1.42)
Not available	295 (20.2)	1169 (79.8)	**1.64 (1.43-1.88)**	1.02 (0.87-1.20)
Self-rated good/v good/ excellent health at baseline				
Yes	542 (21.9)	1934 (78.1)	1	1
No	2272 (29.3)	5492 (70.7)	**1.48 (1.33-1.64)**	0.97 (0.84-1.13)
Self-rated good/v good/ excellent QoL at baseline				
Yes	476 (22.1)	1680 (77.9)	1	1
No	2338 (28.9)	5746 (71.1)	**1.44 (1.28-1.61)**	1.01 (0.86-1.17)
Reported needing help with daily activities at baseline				
No	2654 (28.2)	6753 (71.8)	1	1
Yes	160 (19.2)	673 (80.8)	**1.65 (1.38-1.98)**	1.01 (0.81-1.24)

Patient factors	Saw a GP or Specialist within 2 weeks of discharge		Unadjusted	Model 1: Controlling for all other factors
	No	Yes	OR (95%CI)	OR (95%CI)
	N(%)	N (%)		
Reported at least one fall in 12 months prior to baseline				
No	2280 (28.2)	5818 (71.8)	1	1
Yes	534 (24.9)	1608 (75.1)	**1.18 (1.06-1.32)**	0.93 (0.82-1.05)
Length of stay for index admission (Mean days and SD)	5 (5.4)	6.3 (6.8)	**1.04 (1.03-1.05)**	**1.03 (1.02-1.04)**
Number of GP visits in 12 months prior to index hospitalisation				
3 or fewer visits	663 (46.6)	760 (53.4)	1	1
4-7 visits	929 (34.5)	1765 (65.5)	**1.66 (1.45-1.89)**	**1.67 (1.45-1.91)**
8-12 visits	731 (25.6)	2124 (74.4)	**2.54 (2.22-2.90)**	**2.26 (1.95-2.62)**
13+ visits	491 (15.0)	2777 (85.0)	**4.93 (4.28-5.69)**	**3.85 (3.27-4.54)**
Number of Specialist visits in 12 months prior to Index hospitalisation				
None	402 (28.3)	1021 (71.7)	1	1
One-four	1242 (30.3)	2853 (69.7)	0.90 (0.79-1.03)	***0.81 (0.70-0.94)***
More than four	1170 (24.8)	3552 (75.2)	**1.20 (1.05-1.37)**	***0.79 (0.68-0.93)***
Number of hospitalisations in 12 months prior to Index hospitalisation				
None	1495 (27.3)	3983 (72.7)	1	1
One	816 (30.0)	1904 (70.0)	***0.88 (0.79-0.97)***	***0.82 (0.73-0.91)***
Multiple	503 (24.6)	1539 (75.4)	**1.15 (1.02-1.29)**	0.90 (0.79-1.02)
Self-reported diabetes diagnosis at baseline				
No	2566 (28.3)	6487 (71.7)	1	1
Yes	248 (20.9)	939 (79.1)	**1.50 (1.29-1.74)**	1.08 (0.92-1.27)
Self-reported osteoarthritis/osteoporosis diagnosis at baseline				
No	2426 (28.7)	6037 (71.3)	1	1
Yes	388 (21.8)	1389 (78.2)	**1.44 (1.27-1.63)**	1.08 (0.94-1.24)
Self-reported cardiovascular disease diagnosis at baseline				
No	2372 (29.7)	5612 (70.3)	1	1
Yes	442 (19.6)	1814 (80.4)	**1.74 (1.55-1.95)**	**1.21 (1.06-1.37)**
Self-reported asthma diagnosis at baseline				
No	2450 (27.6)	6434 (72.4)	1	1
Yes	364 (26.8)	992 (73.2)	1.04 (0.91-1.18)	1.02 (0.89-1.18)
Self-reported depression/anxiety diagnosis at baseline				
No	2306 (27.4)	6113 (72.6)	1	1
Yes	508 (27.9)	1313 (72.1)	0.98 (0.87-1.09)	0.93 (0.82-1.06)
Self-reported cancer diagnosis at baseline				
No	2300 (27.9)	5948 (72.1)	1	1
Yes	514 (25.8)	1478 (74.2)	1.11 (1.00-1.24)	0.94 (0.84-1.06)
TOTAL	2814 (27.5)	7426 (72.5)		

NOTE: Significantly higher associations in bold and significantly lower associations in italics and bold.

Supplementary Table S6: Time from index hospitalisation to first subsequent hospitalisation

	Time from Index hospitalisation to first subsequent hospitalisation								
	Week 3	Week 4	Weeks 5-6	Weeks 7-8	Weeks 9-13	Weeks 14-26	6-12 months	No subsequent hosp	Died before being hosp
	n (%)	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)
Saw a GP within 2 weeks									
No	47 (1.3)	59 (1.6)	75 (2.1)	75 (2.1)	130 (3.6)	199 (5.5)	281 (7.7)	2760 (75.6)	27 (0.7)
Yes	147 (2.2)	123 (1.9)	165 (2.5)	175 (2.7)	267 (4.1)	465 (7.1)	675 (10.3)	4509 (68.5)	61 (0.9)
Saw a GP or Specialist within 2 weeks									
No	24 (0.9)	32 (1.1)	42 (1.5)	50 (1.8)	93 (3.3)	137 (4.9)	210 (7.5)	2211 (78.6)	15 (0.5)
Yes	170 (2.3)	150 (2.0)	198 (2.7)	200 (2.7)	304 (4.1)	527 (7.1)	746 (10.1)	5058 (68.1)	73 (1.0)

Note: excludes those who were re-hospitalised within 2 weeks of the index hospitalisation

Supplementary Table S7: Number and percent of first subsequent admissions for LOW GP users by 3-digit principal diagnosis (ICD-10-AM) – Top 9 diagnosis codes

3-digit Principal diagnosis ICD-10-AM Code	Description	Number of Low GP users with subsequent admission	% Low GP user admissions	Rank Low GP user admissions
I50	Heart failure	23	2.6	1
J44	Other COPD	19	2.1	2
C18	Malignant neoplasm of colon	16	1.8	3
N39	Other disorders of urinary system	15	1.7	4
I21	Acute myocardial infarction	14	1.6	5
J18	Pneumonia organism unspecified	13	1.5	6
S72	Fracture of femur	13	1.5	6
Z43	Attention to artificial openings	13	1.5	6
I48	Atrial fibrillation and flutter	12	1.3	9
T81	Complications of procedures NEC	12	1.3	9
M48	Other spondylopathies	12	1.3	9
Sum of top 9 codes		**162**	**18.1**	

Supplementary Table S8: Number and percent of first subsequent admissions for HIGH GP users by 3-digit principal diagnosis (ICD-10-AM) – Top 10 diagnosis codes

3-digit Principal diagnosis ICD-10_AM Code	Description	Number of High GP users with subsequent admission	% High GP user admissions	Rank High GP user admissions
I50	Heart failure	67	3.4	1
I48	Atrial fibrillation and flutter	54	2.7	2
J18	Pneumonia organism unspecified	51	2.6	3
J44	Other COPD	39	2.0	4
N39	Other disorders of urinary system	35	1.8	5
K80	Cholelithiasis	31	1.6	6
N40	Hyperplasia of prostate	30	1.5	7
C79	Secondary malignant neoplasm of other and unspecified sites	29	1.5	8
L03	Cellulitis	29	1.5	8
T81	Complications of procedures NEC	28	1.4	10
Sum of top 10 codes		**393**	**19.8**	

Supplementary Table S9: Sensitivity Analysis - Association between seeing a GP and/or Specialist within 7 days of the index hospitalisation and subsequent hospitalisations

Patient factors	Subsequent hospitalisation within 12 months from index hospitalisation			Likelihood of a subsequent hospitalisation within 12 months after seeing a GP/Specialist within 7 days			
				Unadjusted	controlling for all other factors		
	ALL	LOW GP	HIGH GP users	ALL	Model 1: ALL	Model 2: LOW GP users	Model 3: HIGH GP users
	Yes N (%)	Yes N (%)	Yes N (%)	HR (95%CI)	HR (95%CI)	HR (95%CI)	HR (95%CI)
Age at time of Index hospitalisation (Mean and SD)	75.0 (11.8)	70.8 (12.5)	76.9 (10.9)	**1.04 (1.03-1.04)**	**1.02 (1.01-1.02)**	**1.02 (1.01-1.03)**	**1.02 (1.01-1.02)**
Gender							
Male	1592 (30.5)	520 (23.9)	1072 (35.4)	1	1	1	1
Female	1291 (25.7)	374 (19.3)	917 (29.7)	***0.81 (0.76-0.88)***	***0.79 (0.72-0.86)***	0.87 (0.75-1.01)	***0.75 (0.67-0.83)***
Speaks a language other than English at home							
No	2336 (28.1)	743 (21.3)	1593 (33.1)	1	1	1	1
Yes	547 (28.2)	151 (23.9)	396 (30.3)	1.01 (0.92-1.11)	***0.87 (0.79-0.96)***	0.98 (0.81-1.18)	***0.82 (0.73-0.92)***
Household income at baseline							
<$20,000	814 (36.0)	176 (30.8)	638 (37.8)	**1.94 (1.74-2.17)**	0.90 (0.78-1.05)	0.81 (0.62-1.06)	0.91 (0.75-1.09)
$20,000 to $39,999	443 (28.8)	117 (23.3)	326 (31.5)	**1.48 (1.30-1.68)**	0.89 (0.77-1.03)	0.85 (0.67-1.10)	0.87 (0.72-1.05)
$40,000 to $69,999	365 (23.4)	136 (19.3)	229 (26.8)	**1.16 (1.01-1.33)**	0.89 (0.77-1.02)	0.89 (0.71-1.10)	0.84 (0.70-1.01)
$70,000 or more	489 (20.5)	258 (17.3)	231 (26.0)	1	1	1	1
Won't disclose	772 (30.9)	207 (24.5)	565 (34.1)	**1.61 (1.44-1.80)**	0.93 (0.81-1.06)	0.91 (0.73-1.14)	0.90 (0.76-1.08)
Highest educational qualification							
Less than high school	1143 (33.2)	274 (27.2)	869 (35.7)	**1.52 (1.38-1.68)**	1.07 (0.96-1.20)	1.04 (0.86-1.26)	1.08 (0.94-1.23)
Year 12 or equivalent	327 (28.7)	82 (19.3)	245 (34.3)	**1.28 (1.12-1.46)**	1.03 (0.90-1.18)	0.83 (0.64-1.07)	1.11 (0.94-1.32)
Trade/ diploma	777 (26.5)	251 (20.9)	526 (30.3)	**1.15 (1.04-1.28)**	0.98 (0.88-1.09)	1.01 (0.84-1.20)	0.96 (0.83-1.11)
University or higher	636 (23.3)	287 (19.3)	349 (28.2)	**1**	**1**	**1**	**1**
Work status at baseline							
Not working	2128 (33.9)	528 (29.0)	1600 (35.9)	**2.01 (1.81-2.22)**	1.06 (0.93-1.22)	1.20 (0.97-1.49)	0.93 (0.78-1.12)
Part time	314 (19.6)	138 (16.6)	176 (22.9)	1.05 (0.91-1.22)	0.90 (0.77-1.05)	0.97 (0.78-1.22)	***0.80 (0.65-0.98)***
Full time	441 (18.6)	228 (15.5)	213 (23.7)	**1**	**1**	**1**	**1**
Having private health insurance							
No	1001 (33.9)	281 (30.2)	720 (35.5)	1	1	1	1
Yes	1882 (25.8)	613 (19.2)	1269 (31.0)	***0.72 (0.67-0.78)***	***0.89 (0.81-0.97)***	***0.68 (0.57-0.82)***	0.97 (0.87-1.08)
Having a health care concession card							
No	1808 (25.1)	667 (19.7)	1141 (29.9)	1	1	1	1
Yes	1075 (35.4)	227 (31.2)	848 (36.7)	**1.52 (1.41-1.64)**	1.00 (0.91-1.09)	0.96 (0.80-1.16)	1.02 (0.92-1.12)
Duke Social Support Index (social interaction) Mean and SD	8.85 (1.6)	8.81 (1.6)	8.87 (1.6)	***0.96 (0.94-0.98)***	0.98 (0.96-1.01)	0.97 (0.93-1.01)	0.99 (0.96-1.02)
Marital status							
No partner	1178 (32.5)	334 (26.0)	844 (36.0)	1	1	1	1
Partner	1705 (25.8)	560 (19.8)	1145 (30.3)	***0.75 (0.70-0.81)***	***0.86 (0.79-0.93)***	0.89 (0.77-1.04)	0.85 (0.77-0.93)
Smoking status at baseline							
Never smoke	1521 (26.9)	460 (20)	1061 (31.6)	1	1	1	1
Ex-smoker	1147 (29.9)	342 (22.9)	805 (34.4)	**1.13 (1.05-1.22)**	1.07 (0.99-1.16)	1.11 (0.96-1.28)	1.04 (0.94-1.15)
Current smoker	215 (28.5)	92 (28.0)	123 (28.9)	**1.09 (0.94-1.25)**	**1.17 (1.00-1.36)**	**1.43 (1.12-1.83)**	1.01 (0.83-1.24)
Adequate physical activity at baseline							
Yes	1607 (24.8)	550 (19.5)	1057 (28.8)	1	1	1	1
No	1276 (34.0)	344 (26.4)	932 (38.1)	**1.48 (1.38-1.59)**	**1.15 (1.06-1.25)**	1.09 (0.94-1.26)	**1.18 (1.07-1.29)**

Patient factors	Subsequent hospitalisation within 12 months from index hospitalisation			Likelihood of a subsequent hospitalisation within 12 months after seeing a GP/Specialist within 7 days			
				Unadjusted	controlling for all other factors		
	ALL	LOW GP	HIGH GP users	ALL	Model 1: ALL	Model 2: LOW GP users	Model 3: HIGH GP users
	Yes N (%)	Yes N (%)	Yes N (%)	HR (95%CI)	HR (95%CI)	HR (95%CI)	HR (95%CI)
Adequate fruit and vegetable intake at baseline							
Yes	579 (27.6)	162 (21.1)	417 (31.4)	1	1	1	1
No	2304 (28.3)	732 (21.9)	1572 (32.8)	1.03 (0.94-1.13)	0.99 (0.90-1.09)	0.98 (0.82-1.17)	0.99 (0.88-1.10)
Alcohol consumption at baseline							
Zero	1162 (31.4)	273 (23.5)	889 (35.0)	1	1	1	1
1-13 drinks	1251 (26.6)	437 (20.9)	814 (31.2)	***0.82 (0.76-0.89)***	0.98 (0.90-1.07)	1.09 (0.93-1.28)	0.96 (0.86-1.06)
14+ drinks	470 (25.5)	184 (21.3)	286 (29.2)	***0.78 (0.70-0.87)***	0.90 (0.80-1.01)	1.01 (0.82-1.24)	***0.85 (0.74-0.99)***
BMI category at baseline							
Underweight	362 (32.6)	109 (27.0)	253 (35.9)	**1.21 (1.07-1.36)**	1.06 (0.94-1.20)	1.14 (0.91-1.43)	1.02 (0.88-1.19)
Normal weight	936 (28.3)	296 (21.3)	640 (33.4)	**1**	**1**	**1**	**1**
Overweight	1037 (27.8)	338 (22.4)	699 (31.6)	0.98 (0.90-1.07)	1.00 (0.91-1.09)	1.12 (0.95-1.32)	0.95 (0.86-1.07)
Obese	548 (26.1)	151 (18.6)	397 (30.8)	0.91 (0.82-1.01)	0.89 (0.80-0.99)	0.85 (0.69-1.04)	0.92 (0.80-1.05)
Being treated for high BP at baseline							
No	1940 (26.8)	674 (21.0)	1266 (31.4)	1	1	1	1
Yes	943 (31.5)	220 (24.4)	723 (34.5)	**1.20 (1.11-1.3)**	0.98 (0.90-1.07)	0.96 (0.80-1.14)	0.99 (0.89-1.10)
Being treated for high cholesterol at baseline							
No	2307 (27.7)	746 (21.2)	1561 (32.4)	1	1	1	1
Yes	576 (30.2)	148 (24.9)	428 (32.6)	**1.11 (1.01-1.22)**	0.99 (0.89-1.09)	1.10 (0.9-1.34)	0.96 (0.85-1.08)
Physical functioning at baseline							
No limitations	408 (18.6)	196 (15.4)	212 (23.2)	1	1	1	1
Minor limitations	486 (22.0)	198 (18.8)	288 (25.0)	**1.19 (1.05-1.36)**	1.00 (0.87-1.14)	1.09 (0.89-1.33)	0.93 (0.77-1.11)
Moderate limitations	743 (29.1)	207 (24.3)	536 (31.5)	**1.66 (1.47-1.87)**	1.13 (0.99-1.29)	1.19 (0.96-1.47)	1.07 (0.91-1.27)
Severe limitations	839 (42.0)	182 (36.7)	657 (43.8)	**2.63 (2.34-2.96)**	**1.39 (1.20-1.62)**	**1.41 (1.08-1.84)**	**1.35 (1.12-1.63)**
Not available	407 (31.5)	111 (25.2)	296 (34.7)	**1.83 (1.60-2.10)**	1.20 (1.03-1.40)	1.16 (0.89-1.52)	1.17 (0.96-1.41)
Psychological distress at baseline							
Low psychological distress	1697 (25.9)	605 (20.4)	1092 (30.4)	1	1	1	1
Moderate psychological distress	375 (27.3)	94 (18.9)	281 (32.1)	1.06 (0.95-1.19)	1.00 (0.89-1.12)	0.88 (0.70-1.11)	1.03 (0.90-1.18)
High psychological distress	166 (31.4)	46 (23.5)	120 (36)	**1.26 (1.08-1.48)**	1.07 (0.90-1.28)	0.95 (0.69-1.31)	1.12 (0.91-1.37)
Very high psychological distress	104 (31.9)	27 (27.8)	77 (33.6)	**1.28 (1.05-1.56)**	1.05 (0.85-1.30)	1.05 (0.68-1.62)	1.02 (0.80-1.31)
Not available	541 (37.0)	122 (33.4)	419 (38.1)	**1.53 (1.39-1.68)**	0.98 (0.88-1.09)	1.12 (0.90-1.39)	0.95 (0.84-1.08)
Self-rated good/v good/ excellent health at baseline							
Yes	1938 (25.0)	666 (19.5)	1272 (29.3)	1	1	1	1
No	945 (38.2)	228 (32.5)	717 (40.4)	**1.68 (1.55-1.81)**	**1.15 (1.03-1.27)**	1.22 (0.99-1.50)	1.12 (0.99-1.27)
Self-rated good/v good/ excellent QoL at baseline							
Yes	2092 (25.9)	704 (20.3)	1388 (30.1)	1	1	1	1
No	791 (36.7)	190 (29.4)	601 (39.8)	**1.53 (1.41-1.66)**	0.98 (0.88-1.10)	0.96 (0.78-1.19)	1.00 (0.88-1.14)
Reported needing help with daily activities at baseline							
No	2508 (26.7)	807 (20.6)	1701 (31.0)	1	1	1	1
Yes	375 (45.0)	87 (43.7)	288 (45.4)	**1.94 (1.74-2.16)**	1.14 (1.00-1.29)	1.31 (1.00-1.71)	1.08 (0.93-1.25)
Reported at least one fall in 12 months prior to baseline							
No	2164 (26.7)	717 (20.9)	1447 (31.1)	1	1	1	1
Yes	719 (33.6)	177 (26.1)	542 (37.0)	**1.31 (1.20-1.43)**	1.01 (0.92-1.11)	1.03 (0.87-1.23)	1.00 (0.90-1.11)

Patient factors	Subsequent hospitalisation within 12 months from index hospitalisation			Likelihood of a subsequent hospitalisation within 12 months after seeing a GP/Specialist within 7 days			
				Unadjusted	controlling for all other factors		
	ALL	LOW GP	HIGH GP users	ALL	Model 1: ALL	Model 2: LOW GP users	Model 3: HIGH GP users
	Yes N (%)	Yes N (%)	Yes N (%)	HR (95%CI)	HR (95%CI)	HR (95%CI)	HR (95%CI)
Length of Stay for Index Admission (Mean days and SD)	7.2 (7.7)	6.9 (7.1)	7.4 (7.9)	**1.03 (1.02-1.03)**	**1.02 (1.01-1.02)**	**1.02 (1.01-1.02)**	**1.02 (1.01-1.02)**
Self-reported diabetes diagnosis at baseline							
No	2456 (27.1)	803 (21.1)	1653 (31.5)	1	1	1	1
Yes	427 (36.0)	91 (28.8)	336 (38.6)	**1.4 (1.27-1.55)**	1.09 (0.98-1.22)	1.02 (0.81-1.28)	1.11 (0.98-1.25)
Self-reported osteoarthritis/osteoporosis diagnosis at baseline							
No	2281 (27)	771 (21.3)	1510 (31.2)	**1**	**1**	**1**	**1**
Yes	602 (33.9)	123 (25.1)	479 (37.2)	**1.30 (1.19-1.43)**	0.97 (0.88-1.07)	0.84 (0.68-1.03)	1.02 (0.91-1.14)
Self-reported cardiovascular disease diagnosis at baseline							
No	2029 (25.4)	698 (19.8)	1331 (29.8)	1	1	1	1
Yes	854 (37.9)	196 (32.9)	658 (39.6)	**1.61 (1.49-1.75)**	**1.10 (1.01-1.20)**	1.19 (1.00-1.42)	1.08 (0.98-1.19)
Self-reported asthma diagnosis at baseline							
No	2490 (28)	802 (21.9)	1688 (32.3)	1	1	1	1
Yes	393 (29.0)	92 (20.0)	301 (33.6)	1.04 (0.94-1.16)	1.03 (0.92-1.14)	0.92 (0.74-1.15)	1.07 (0.94-1.21)
Self-reported depression/anxiety diagnosis at baseline							
No	2379 (28.3)	773 (22.0)	1606 (32.8)	1	1	1	1
Yes	504 (27.7)	121 (20.3)	383 (31.3)	0.97 (0.88-1.07)	0.95 (0.85-1.05)	0.97 (0.79-1.19)	0.94 (0.83-1.06)
Self-reported cancer diagnosis at baseline							
No	2150 (26.1)	693 (20.0)	1457 (30.4)	1	1	1	1
Yes	733 (36.8)	201 (30.5)	532 (39.9)	**1.51 (1.39-1.64)**	**1.24 (1.14-1.35)**	**1.33 (1.13-1.57)**	**1.22 (1.1-1.35)**
Number of GP visits in 12 months prior to Index hospitalisation							
3 or fewer visits	300 (21.1)	300 (21.1)	-	1	1	1	-
4-7 visits	594 (22.0)	594 (22.0)	-	1.05 (0.92-1.21)	0.94 (0.82-1.09)	0.95 (0.82-1.10)	-
8-12 visits	775 (27.1)		775 (27.1)	**1.33 (1.17-1.52)**	0.98 (0.85-1.14)	-	1
13+ visits	1214 (37.1)		1214 (37.1)	**1.95 (1.72-2.21)**	1.10 (0.96-1.27)	-	**1.13 (1.03-1.25)**
Number of Specialist visits in 12 months prior to Index hospitalisation							
None	346 (24.3)	209 (22.7)	137 (27.3)	1	1	1	1
One-four	939 (22.9)	346 (17.8)	593 (27.6)	0.93 (0.82-1.05)	0.92 (0.81-1.05)	0.85 (0.71-1.02)	1.01 (0.84-1.22)
More than four	1598 (33.8)	339 (27.1)	1259 (36.3)	**1.46 (1.30-1.64)**	1.12 (0.98-1.28)	1.15 (0.94-1.40)	1.17 (0.97-1.41)
Number of hospitalisations in 12 months prior to Index hospitalisation							
None	1357 (24.8)	508 (20.2)	849 (28.6)	1	1	1	1
One	728 (26.8)	205 (20.1)	523 (30.8)	1.09 (0.99-1.19)	1.04 (0.95-1.14)	1.01 (0.86-1.20)	1.06 (0.95-1.19)
Multiple	798 (39.1)	181 (31)	617 (42.3)	**1.73 (1.59-1.89)**	**1.36 (1.24-1.50)**	**1.30 (1.08-1.56)**	**1.38 (1.24-1.54)**
Saw a GP within 7 days, but did not see a Specialist within 7 days							
No	588 (20.9)	288 (18.1)	300 (24.5)	1	1	1	1
Yes	1358 (28.7)	341 (21.6)	1017 (32.2)	**1.36 (1.27-1.47)**	**1.17 (1.07-1.27)**	1.07 (0.92-1.24)	**1.22 (1.10-1.35)**
Saw a GP within 7 days and saw a Specialist within 7 days							
No	278 (33.1)	130 (32.1)	1641 (31.3)	1	1	1	1
Yes	659 (35.6)	135 (25)	524 (40.0)	**1.46 (1.32-1.60)**	1.00 (0.84-1.20)	0.84 (0.6-1.20)	1.07 (0.87-1.33)
TOTAL	**2883 (28.2)**	**894 (21.7)**	**1989 (32.5)**				

NOTE: Significantly higher associations in bold and significantly lower associations in italics and bold.