Version 2.0

The Networked Data Lab

Topic 4: Intermediate Care Final Report

NDL [*Leeds Network Data Lab*]

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Glossary

IC- Intermediate Care

CCB – Community Care Beds

CSB – Community (Home) Based Services

ASCCOM – Adults Social Care Community (Reablement)

Contents

1. Introduction

Secondary health care providers are facing increased demand due to emergency hospital admissions. A key underpinning factor, exacerbating demand for services, is the increased complexity of care-needs for older people living with frailty and multimorbidity. In England, the National Audit Office (NAO) has reported that over half of the growth in emergency admissions is related to older people (National Audit Office, 2013) and 80% of this increase is caused by the patients who stay less than 24 hours. Over last 20 years, local authorities and health providers have developed services and put a care system in place to address the need of patients, who may be admitted to hospital for a short (less than 24h) stay, to avoid their admission. The same services also provide support for patients moving from hospital back to the place they call home and play a preventative role in reducing readmissions to hospital. Such services are called Intermediate Care (IC) services.

The primary goal of intermediate care is to facilitate individuals' rehabilitation efforts and expedite their return to a baseline level of independence whenever feasible (National Care Forum, 2023). Intermediate care encompasses services meeting specific criteria. These typically include a) providing assistance to individuals who would otherwise experience unnecessarily prolonged hospital stays, b) conducting comprehensive assessments leading to personalized care plans involving active and timely therapy, treatment, or opportunities for recovery, c) striving to maximize independence and typically facilitating the individual's return to their own residence within an agreed timeframe, typically ranging from 4 to 6 weeks, d) emphasizing interdisciplinary collaboration, with unified assessment frameworks, consolidated professional records, and shared protocols among healthcare professionals. There are two types of intermediate care: step up to prevent someone being admitted to hospital or moving to a care home and step-down to support someone's recovery after a hospital stay and help prevent readmission.

In recognition of a desire to improve the delivery of intermediate care in Leeds and the challenges faced at the time, the Leeds Health and Care Partnership agreed to undertake a detailed review of its intermediate care offer. In Autumn 2022, over 200 people across the Leeds system worked together with a delivery partner Newton Europe to complete a system-wide diagnostic reviewing outcomes from Leeds intermediate care offer and the interaction of acute, community and social care services. The diagnostic involved the detailed review of over 220 cases, data analysis of over 50,000 patient journeys, the views of over 600 patients, service users, families and carers, and input from 8 organizations across Leeds.

In Home First (LCH partnership) report ("Understand the Users of IC and their outcomes"), IC activity was summarised by demographic characteristics, and electronic frailty score, and compared with the overall Leeds population. Health outcomes were defined as the Length of Stay (LOS) in intermediate care and (re)admission rate for acute hospital care (A&E attendance or non-elective admission). Readmissions within 30 days of discharge from IC were identified by linking intermediate care data to acute (secondary) data at an individual level. The review showed there were approximately 41,371 total users of IC in Leeds between March 2020 and March 2023 with average age of 81. Neighbourhood Teams supported 87% of Intermediate Care users in Leeds.

The HomeFirst Diagnostic report highlighted that thousands of people receive excellent care and support each day from dedicated health and care staff, leading to outstanding outcomes. However, the report also identified several areas for improvement: too many individuals are spending more time in hospitals than necessary; short-term care is fragmented across numerous services; outcomes vary based on when, where, and how care is delivered; there is a high reliance on bed-based care; and many older adults could potentially avoid or lessen deconditioning with redesigned services. It

recognized several opportunities to enhance intermediate care services in Leeds, which could reduce hospital admissions and decrease the length of stay in community care beds.

These above findings have informed a significant programme of work to change how intermediate care is delivered in Leeds, the HomeFirst programme.[1] More details about the work done via HomeFirst Diagnostics are described at the end of this report.

The results presented by NDL team in this report are based on the analysis run independently to Home First Diagnostics on Leeds Data Model (integrated share care record). It is important to note that the data period for this study predates many of the changes introduced and rolled out through the HomeFirst Programme, which was designed to address many of the key themes discussed above.

The Leeds NDL team has access to the Pre-Diagnostics reports, and one of the goals of this study is to determine if the results for HomeFirst diagnostics and population inequality hold across different study periods. Additionally, this study aims to investigate patient outcomes following intermediate care. The HomeFirst Diagnostics analysis did not distinguish whether intermediate care (IC) was provided to prevent hospital admission or to support a patient upon hospital discharge. It also did not account for the nature of any hospital admissions, whether patients were receiving other types of care (such as GP, elective, or community services) in addition to intermediate care, or the potential association between that care and health outcomes.

NICE has defined several Discharge to Assess (D2A) pathways which provide increasing levels of support from home-based care to significant / complex bed-based care. In our study, Leeds examined health outcomes for intermediate care received on pathways 1 (home support provided by Leeds Community Care Services (CBS) and Reablement services (ASCCOM)) and pathway 2 (Community Care Beds (CCB)), following a hospital discharge.

The aim(s) of this study are to understand the characteristics of users of step-down intermediate care and to explore the role of the IC in effectiveness of reduction of hospital readmission. These outputs cover:

1. Definition of the users of step-down intermediate care in Leeds.
    a) What are the demographic characteristics of patients discharged who access intermediate care services?
    b) What is the health profile of the patient population offered step-down care after hospital discharge?
    c) What is a health outcome for people with step down intermediate care, continuity of IC?
2. Understanding health care provision and demand for users of step-down intermediate care:
    a) What is the type /intensity of health care prior hospital admission for the patient in step down IC?
3. Understanding relationship of step-down IC personal, health characteristics at the risk of hospital readmission:
    a) Which demographic and health characteristics are associated with the likelihood of hospital readmission after discharge from IC in the non-step-down care patient population?

[1] https://www.healthandcareleeds.org/about/homefirst/

b) Does step-down care reduce the risk of hospital readmission for 30, 60 and 90 days after hospital discharge?

2. Methods

2.1 PPIE and stakeholder engagement

Firstly, an insight report was created looking at what we already knew across the city about intermediate care. This information influenced and shortlisted the analysts' areas of interest together with the available data.

A task and finish group of diverse patients and carers with lived experience and interested stakeholders was set up to steer this topic with engagement at the heart. The group met four times during the life of the project and helped:

- Inform the design of the research study.
- Clarify the research questions and affirm their importance.
- Steer the project throughout the research process.
- Assist the research team in developing themes from data.
- Consult and check their understanding of the data interpretation in the same way as the research team.

We held a separate focus group in March with patients/carers who had lived experience around receiving home-based IC.

Healthwatch Leeds, one of our partners on this project, also spoke and surveyed a number of patients and carers in recovery hubs around the city and this data was fed into the analysts.

Involving PPIE within the project has created several positive benefits. We wanted to understand the stories of IC from patients and carers, including people who had not been offered IC and explore those stories. At every meeting we asked someone with lived experience to tell their story of a particular theme the analysts were working on to enrich the data sets. For example, the analysts were interested to hear more about the discharge process, hospital re-admission and outpatient services. The patient panel reflected many of the findings of the analytics and brought them to life with further discussion and recommendations which will be presented to local and national decision makers. The final report will be presented to the patient panel to ask their views on what they think are the key messages from the report.

Due to the complex picture of intermediate care services. We worked closely with senior stakeholders leading the redesign of intermediate care services in Leeds to define the services for inclusion in intermediate care. Several meetings to define intermediate care in Leeds accrued with the Leeds definition of the Intermediate Care Blueprint and the trial of the faster hospital discharges.

2.2 Data extraction & processing

The data source for these analyses is the Leeds Data Model. This data provides access to national data sets for NHS commissioned care in England, linked to local data sets on primary care data held in Leeds General Practices clinical systems, Leeds Community Healthcare Trust data, and Adult Social Care activity provided by Leeds City Council. These data are restricted to Leeds GP registered patients who have not opted out of data sharing for secondary use. Data linkage is by pseudonymised NHS number, as such where these data are not complete data is omitted.

The Leeds Data Model is composed of the following dataset:

- Primary care data (from EMIS & TPP), featuring patient demographics, appointments, events, and prescriptions. Key clinical data relating to patient conditions, as well as demographic information and patient carer status is recorded via both Read code (EMIS: v2, TPP: v3) and SNOMED codes.
- Leeds Community Health Care data, community health care nursing and therapy activity data provided by local NHS provider.
- Adult social care data extracts (from Leeds City Council – Adult Social Care Client Information System CIS), featuring referrals, reviews, assessments, and service provisions. This data set is externally linkable via pseudonymised NHS number, and internally linked through unique ASC ID.
- Secondary Uses Service (SUS), containing inpatient and outpatient attendances and A&E visits.

The above-mentioned systems were standardised into activity-based form that mainly report date, time, type, outcomes, and cost of the activity.

For this study we have focused on the inpatient hospital admissions that were linked to step down intermediate care activities (Community Beds (LCH), Reablement (CIS), and Community Home Based Services (LCH)). The care contacts, prior hospital admission, were aggregated into counts and last contact date before hospital admission and linked with hospital stays. The care contact included (GP, GP out of hours appointments (OoH), 111, 999 calls, Adult Social Care Reablement activities, Leeds Community Health Care activities, AE visits)

In addition, further reference data were required from the sources below:

- External open data sources and/or APIs including Index of Multiple Deprivation (IMD) linked to patient record at Lower Super Output Area (LSOA) level where patient record holds LSOA of residence: clinical coding (Read/SNOMED lookups); and population data (ONS census and mid-year estimates, to LSOA level).

2.3 Data analysis

The main aim of this study is understanding the characteristics of step-down intermediate care users and to explore the role of the IC in effectiveness of reduction of hospital readmission. Figure 1 presents the summary of three outputs produced to answer above presented research questions:

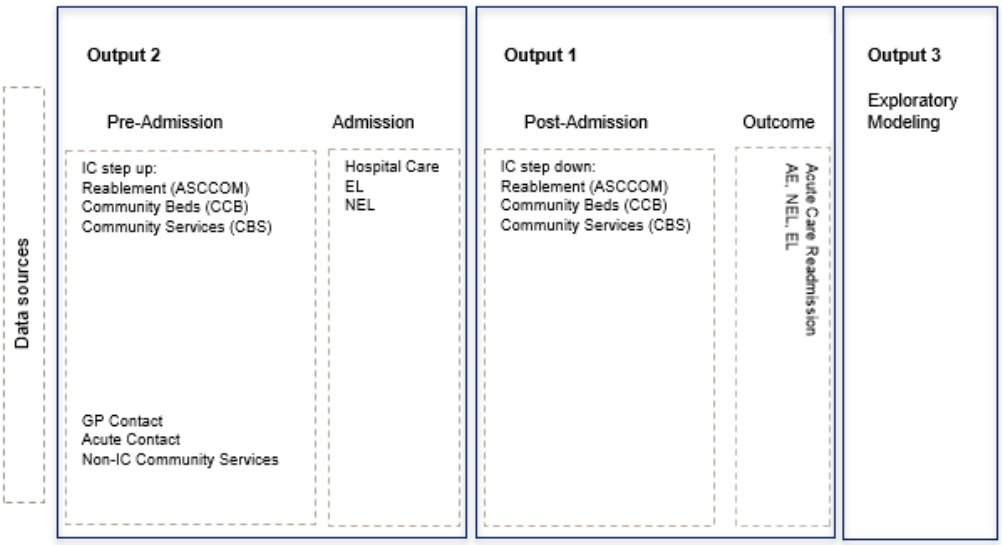
Output 1

Output 1 identify users of step-down IC in Leeds following a hospital discharge between 1st April 2022 and 31st March 2023. Demographics and health characteristics are used as exploratory variables and health outcomes defined as length of stay in Intermediate Care services and whether a service-user was re-admitted to Acute Care (hospital stay) within 30 days following discharge from IC services. To address question 1a-c descriptive statistics and visualisation of the study cohort were used, breakdown by demographic variables.

Output 2

Output 2 provides a wider picture of the Intermediate Care pathway and describe other services received 6 months prior to hospital admission. Intermediate care data were linked to other health care: acute care, primary care, and other community care data to determine number of GP appointments and other activity prior to Hospital Admission, through pseudoanonymised NHS number. Descriptive statistics and visualisation were used to address question 2a.

Figure 1 Research Outputs



Output 3

Output 3 investigates health inequalities in intermediate care and determine whether patients who receive health care services, or GP support, within 6 months prior to hospital admission have better health outcomes following intermediate care support. A logistic regression model was used to quantify the association between demographic, healthcare activity prior to hospital admission, intermediate care characteristics and the probability of Acute Care re-admission within 30 days following Intermediate Care support ending.

2.3.1 Study design

In this retrospective cohort analysis, we utilized data from existing data sources in LDM to describe users of step-down intermediate care and investigate relationship with patient characteristics.

2.3.2 Study period

The patients discharged from hospital between April 2022 and April 2023 were used in this study. The number of contacts with GP, OOH, 111, 999, AE, community care and intermediate care were collated for the six months prior to hospital admission. For hospital readmission and step-down intermediate care, we have used a period of 6 months after hospital discharge. In total, we were extracting care activity events between September 2021 and September 2023. These data included patients with multiple spells for hospital and intermediate care.

2.3.3 Study population

The study cohort is defined as Leeds GP registered patients in the Leeds Data Model with healthcare contact with Community Care Services, Community Care Bed, or Reablement Service. The variables (see **Section 2.3.4**) were obtained based on primary, secondary, and social care records between September 2021 and September 2023. The patient records examined include a) step-down intermediate care cohort, b) non-step-down intermediate care cohort.

Step-down Intermediate Care Cohort

The step-down care cohort consist of discharged patients who have accessed intermediate care after their hospital discharge. To identify this cohort the following criteria were implemented:

- Patient hospital discharge between April 2022 and April 2023

- Patients received Intermediate Care after hospital discharge. The IC service was defined if referral date to the service happened during hospital stay plus seven days after hospital discharge or if referral date is unknown and contact happened within seven days after hospital discharge.
- The length of stay within intermediate care was up to 6 weeks. Some of contact were coded as a day contact and some as spells. The end of the care was coded as last attendance day or maximum discharge day. This results in length of stay longer than 6 weeks for the spell type contacts.
- Patients with multiple admission within the study period have their community care contacts split between hospital spells. If the contact happens within 7 days after hospital discharge, it was treated as step down intermediate care. All patients with longer stay in IC service under the same referral with multiple hospital admission are treated as patients with continuing care.
- Patients who were readmitted to the hospital within the duration of their intermediate care had their IC stay shortened ending the stay on the date of readmission to the hospital.
- The services defined as Intermediate Care were:
    - Community (Home) Based Services (CBS): Community Intravenous Antibiotic Service, Community Neurology (Rehabilitation), Community Neurology (Rehabilitation), Community Stroke Team, District Nursing (inc. Palliative Care), LTCs Management – Respiratory, Integrated Neighbourhood Team – Nursing, Integrated Neighbourhood Team – Pharmacy, Mental Health, Virtual Respiratory Ward
    - Community Care Beds (CCB)
    - Reablement (ASCCOM)

Non-step-down Intermediate Care Cohort

The non-step-down intermediate care cohort consist of discharged patients who have accessed other community care services (identified as non-IC) or step down IC services with the first contact longer than 7 days with existing referral (continuity) or none after their hospital discharge. To identify this cohort the following criteria were implemented:

- Patient hospital discharge between April 2022 and April 2023
- Patients where discharge home with no care activities after discharge.
- Received community care support (other than IC) after hospital discharge.
- Received continuity of IC (defined as step down) more than 7 days after discharge.
- The other services included: adult domiciliary and dietetics, LTC Management, Specialist Nursing and Podiatry, Psychological support.

2.3.4 Definitions of outcomes and exposures

The variables are obtained from Leeds Data Model. Demographic, patient health, hospital stays, care contacts characteristics were selected (see Table1).

Table 1 Definition of Outcomes and Exposures Variables

Output	Type of variable (outcome or exposure)	Definition criteria	Dataset(s) from which the variable is derived
2,3	Outcome	AC readmittance	SUS
3	Outcome	Time to Readmission	SUS
List of demographic characteristics			
All	Exposure	Age	Multiple

All	Exposure	Age-band	Multiple
All	Exposure	Gender	Multiple
All	Exposure	Ethnicity (census ethnic group)	Multiple
1	Exposure	IMD 2019	Multiple
1	Exposure	PCN	Multiple
List of health characteristics			
All	Exposure	Frailty index (eFI)	GP
All	Exposure	Dementia status	GP
All	Exposure	Number of Comorbidities	LDM PHM cohort tables
List of hospital characteristics			
All	Exposure	Acute Care admissions	SUS
All	Exposure	Acute Care discharge	SUS
All	Exposure	Acute Care LOS	SUS
All	Exposure	Acute Care PoD (Point of Delivery)	SUS
List of care contact characteristics			
2	Exposure	GP Contact	GP
2	Exposure	OOH Contact	GP
2	Exposure	AE Contact	SUS
2	Exposure	999 Contact	SUS
2	Exposure	111 Contact	SUS
2,3	Exposure	LCH contacts (non-IC)	LCH
2,3	Exposure	IC contacts	LCH
List of Step-Down Intermediate Care characteristics			
all	Exposure	IC LOS	LCH / CSDS
all	Exposure	IC Time To First Contact	LCH / CSDS
all	Exposure	Type (P1, P2)	LCH / CSDS
all	Exposure	IC Group	LCH / CSDS
All	Misc	Pseudo-NHS-number	All

2.3.5 Statistical approaches

Descriptive Statistics and Visualisation

Descriptive statistics were used to explore the fundamental features of the data, and to describe the Leeds step down intermediate care users. Simple measures such as counts, means, medians, ranges and standard deviation were used to summary selected personal/health or service characteristics. Histograms, box plots, scatter plots, descriptive statistics were used to explore and elucidate the inherent properties of datasets. Descriptive statistics will be used in Output 1 and 2.

Statistical Tests

Where numerical and visual exploration indicated difference between groups the statistical test was performed to determine significance of that difference. The pairwise T-test and ANOVA were used to compare mean differences between groups (*ggbetweenstats*[2] package in R).

Multiple Logistic Regression

The multiple logistic regression was used to predict a binary outcome variable (hospital readmission) using a combination of the characteristics presented in Table 1. The model was used to determine the association between these characteristics and hospital readmission within 30 days from intermediate care service discharge. The deaths within 30 days from IC have been removed from the cohort. The records represent the hospital spells followed by IC. The patients with multiple readmissions were included in this dataset many times. The "*glmulti"* package in R (Vincent Calcagno, 2010) was used for automated model selection and model-averaging. The method, automatically generate all possible models (under constraints set by the user) with the specified outcome and explanatory variables and finding the best models in terms of some Information Criterion (AIC or BIC). In this study, the BIC was used to determine best variable selection for a model. This method can handle very large numbers of candidate models. A genetic algorithm is used (built within package) to find a set of the best models when an exhaustive screening of the candidates is not feasible. The final models will include a subset of variables with statistically significant coefficients according to alpha of 0.05.

After model generation, a given variables importance is determined based on the overall support for each variable across all models. The threshold of 0.8 is used to define the most important variables. The best performing model including these variables is selected as final best model to analyse the relationship between exposure variables and the outcome (hospital readmission).

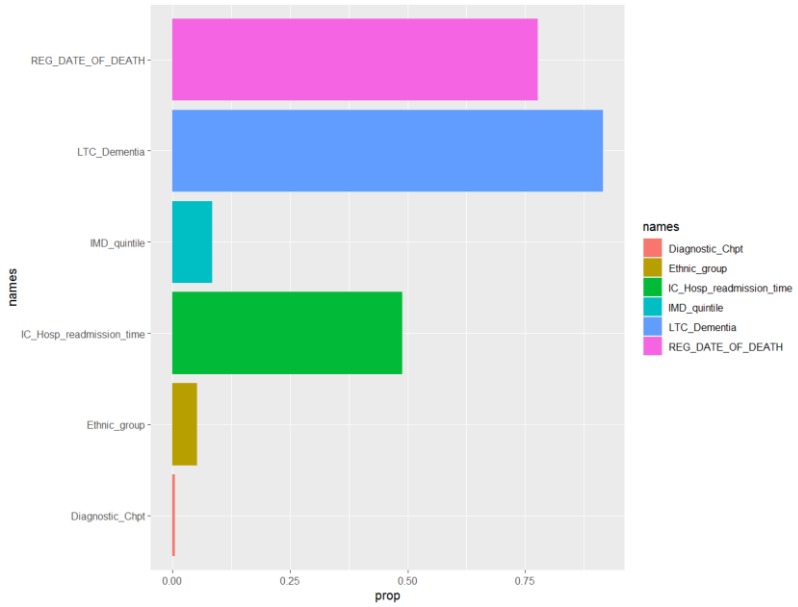
2.3.6 Methods for addressing missing data.

The variable missingness was calculated and presented in the image below. For categorical variables (LTC_Dementia, IMD_Quintile, Ethnic_ Group, Diagnostic Description (Chapter)) the missing value was coded as *unknown*. Variables with large number of missing values were Reg_Date_OF_Death, LTC_Dimentia and IC_hospital_readmission time.

For Logistic Regression the Ethnicity was one for main considered covariate thus it was imputed (*R mice*[3]) using Random Forest model. The others were coded as unknown.

[2] ggstatsplot: 'ggplot2' Based Plots with Statistical Details (r-project.org)

[3] mice: Multivariate Imputation by Chained Equations (r-project.org)



3. Results

3.1 Descriptive analysis of intermediate care cohort

In our study cohort, we examined 53,323 hospital admissions involving 38,970 patients. Patients from 80% hospital spells were discharged directly to their homes or places of residence (Pathway 0) without requiring additional support (see Figure 2), while 17% of hospital spells were followed by some form of community care services or reablement (Pathway 1). This category includes patients receiving intermediate care services, other community-based support, and those with ongoing care (continuing) arrangements. A small percentage (1%) of hospital spells were followed by admission to rehab centers/bed care facilities (Pathway 2). Around 2% were discharged to care homes/hospices (Pathway3)

Among the 38,970 patients analyzed, 7,320 (17%) received intermediate care services defined in Section 2.4, with 9740 hospital admissions. Figure 3 demonstrates that all Community (Home) Based Services are the most frequently utilized intermediate care services (85%). This includes a new referral to CBS service (57%) and continuation of CBS from before hospital admission (CBScon) (27%). There is 3.8% of hospital discharged followed with reablement (ASCCOM) and 6.4% with intermediate care beds (CCB). Additionally, "ASCCOM-CBS" indicates a combination of care activities with either continuity of services (CBScon), new service provided (CBS) or parallel reablement (ASCCOM) (4.3%).

In the cohort of hospital spells examined, it was found that 25% of admissions were classified as Elective (EL), while 75% were Non-Elective (NEL). Interestingly, when considering hospital spells followed by step-down intermediate care, a significant majority (90%) were Non-Elective (NEL), with only 10% being Elective (EL). This translates to 8% of all EL admissions and 21% of non-elective hospital admissions receiving step-down intermediate care services. The remaining patients, regardless of admission type, were discharged home with or without support to other community services or their continuity of care, which may include intermediate care services. Notably, the average length of stay for non-Elective admissions exceeded that of Elective admissions, with patients admitted for elective care experiencing shorter hospital stays (mean of 7 days compared to 15 days for non-Elective admissions).

Figure 2. Hospital Discharge Pathways Flow

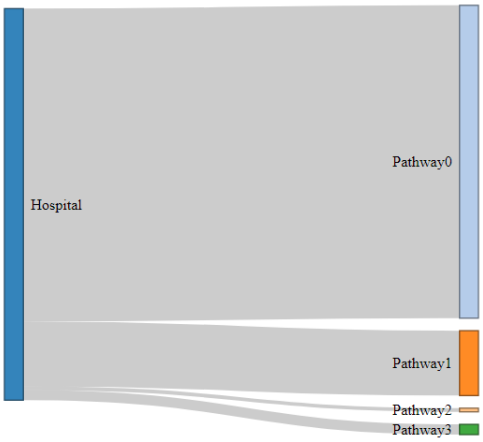


Figure 3 Step Down Intermediate Care Flow

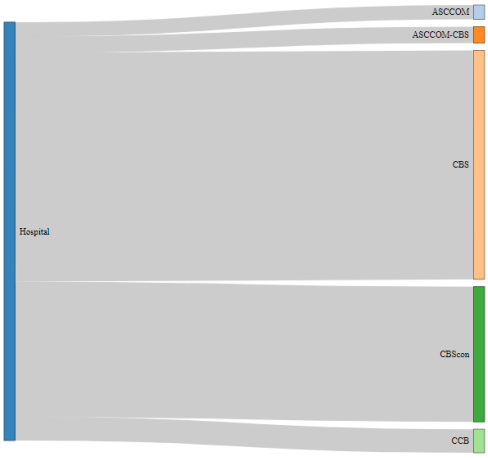


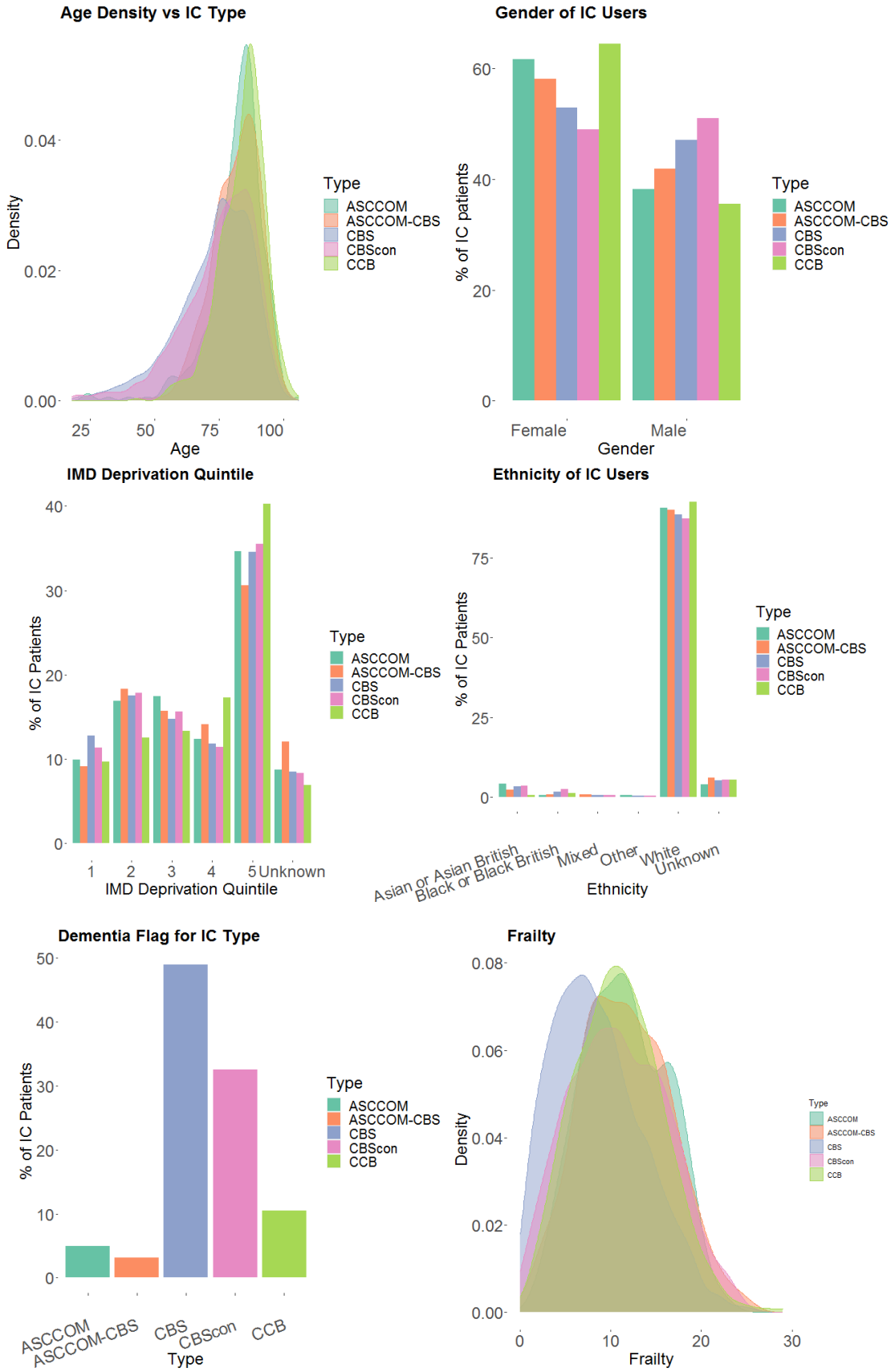
Table 2, along with Figure 4, offers an insightful overview of the personal and health characteristics observed among patients receiving step-down intermediate care. Descriptive statistics reveal that most step-down care patients are female, and there is a notable representation of individuals identifying as White ethnicity. Additionally, approximately 33% of patients receiving step-down care originate from deprived areas. Figure 4 further dissects these characteristics based on the type of intermediate care received. Figure 4 highlights a subgroup of patients, primarily aged 75-85, who are either undergoing reablement (ASCCOM) or residing in rehabilitation centers (CCB). Notably, the graphs illustrate a higher percentage of males in continuity of care (CBScon), although this difference is not statistically significant. Moreover, the distribution of patients across diverse types of intermediate care services appears to be evenly spread, with a significant proportion identifying as White ethnicity. Figure 4 provides insights into the higher frailty index observed among patients in rehabilitation centers (CCB), while community home-based services (CSB) are notably provided to a substantial percentage of individuals with dementia. The parentage was calculated over all patients with dementia in the intermediate care cohort.

Table 2: Overview of intermediate care cohort

	Cohort (n = 7320)	
	n	%
Sex		
Male	3390	46.3
Female	3930	53.7
Other		
Age group		
Under 50	443	6.05
50-54	212	2.90
55-59	348	4.75
60-64	434	5.93

65-69	626	8.55
70-74	794	10.8
75-79	1154	15.8
80-84	1118	15.3
85-89	1242	17.0
90+	949	13.0
Ethnic group		
Asian or Asian British	234	3.20
Black or Black British	129	1.75
Mixed	43	0.59
Other	27	0.37
White	6495	8876
Not Stated	392	5.36
IMD quintile		
1 – least deprived	923	12.6
2	1303	17.8
3	1128	15.4
4	879	12.0
5 – most deprived	2475	33.8
Unknown	612	8.36
Frailty		
Mean (SD)	9.64 (5.24)	-
Median (IQR)	9(7)	-
Dementia Flag		
1	665	9
Unknown	6655	91
Length of Stay in intermediate care setting		
Mean (SD)	31(25)	-
Median (IQR)	29(37)	-
Time to First Contact		
Mean (SD)	4(6.8)	-
Median (IQR)	2(4)	-

Figure 4 Step Down Care IC Personal Characteristics



The comparison involved analyzing patient age and frailty index across various discharge pathways, and these results were subsequently contrasted with both the hospital admission cohort and the step-down intermediate care cohort. Figure 5 illustrates the average age and frailty index for each pathway, compared to the mean (age, frailty) of patients discharged during the study period (represented by the blue dashed line) and the mean of the step-down intermediate care users (red dash line).

Figure 5 Age and Frailty Index vs Discharge Pathways

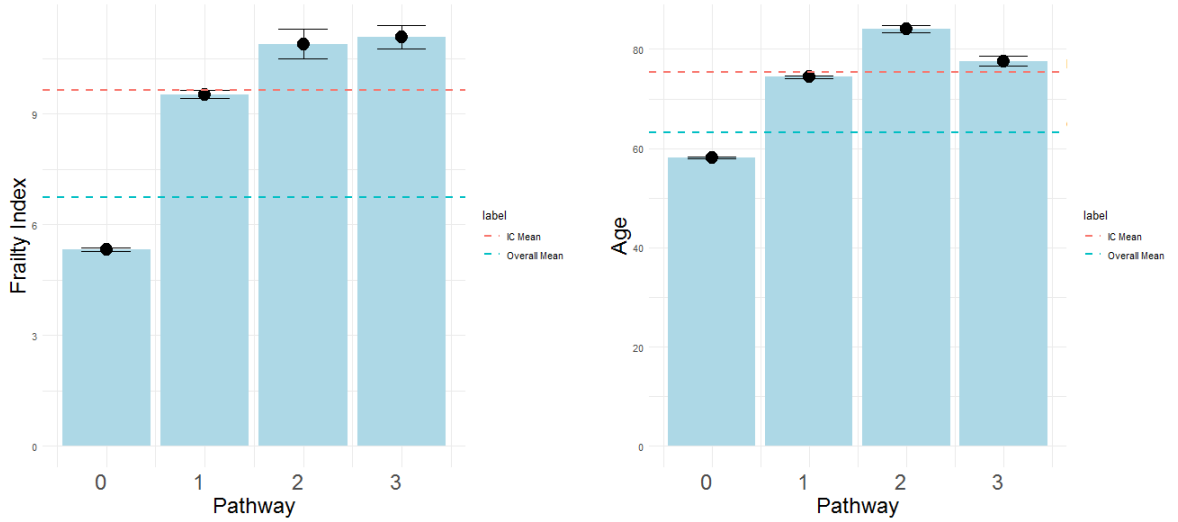
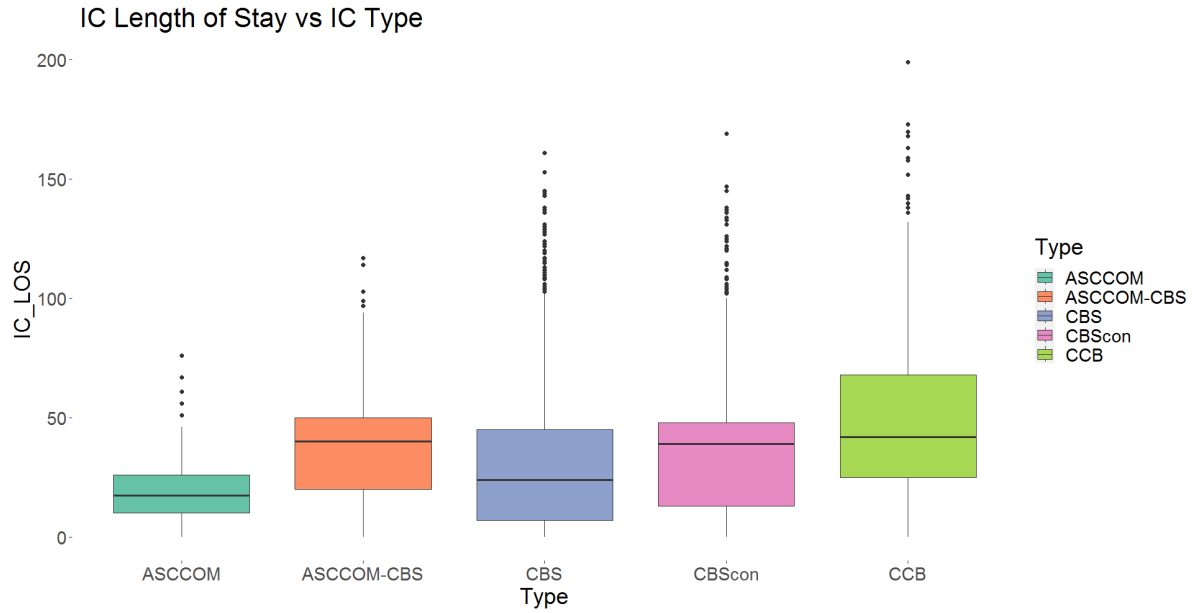


Figure 6 illustrates the distribution of length of stay in step-down IC, and ANOVA pairwise test showing differences between all types of intermediate care's length of stay. The p-values obtained from the Welch test with Holm-Bonferroni adjustments suggest a difference for the length of between s of type IC (showed as horizontal bars). The length of stay exceeded 6 weeks for some patients, this is related to the coding of attendance and discharge date in the LCH data. Some contacts were coded as spell and some as a day contact.

Figure 7 shows the difference between the time to first contact for each of the type of step-down intermediate care.

Figure 6 IC length of stay (top), statistical test for IC length of stay between groups of IC



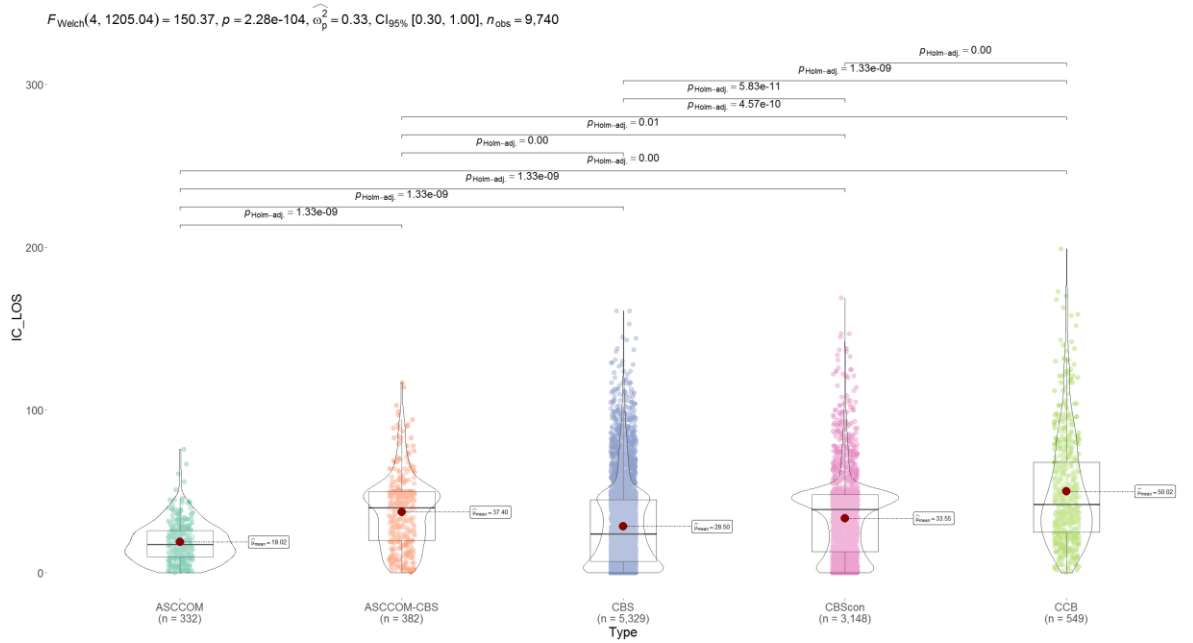


Figure 7 IC time to first contact Vs IC Type

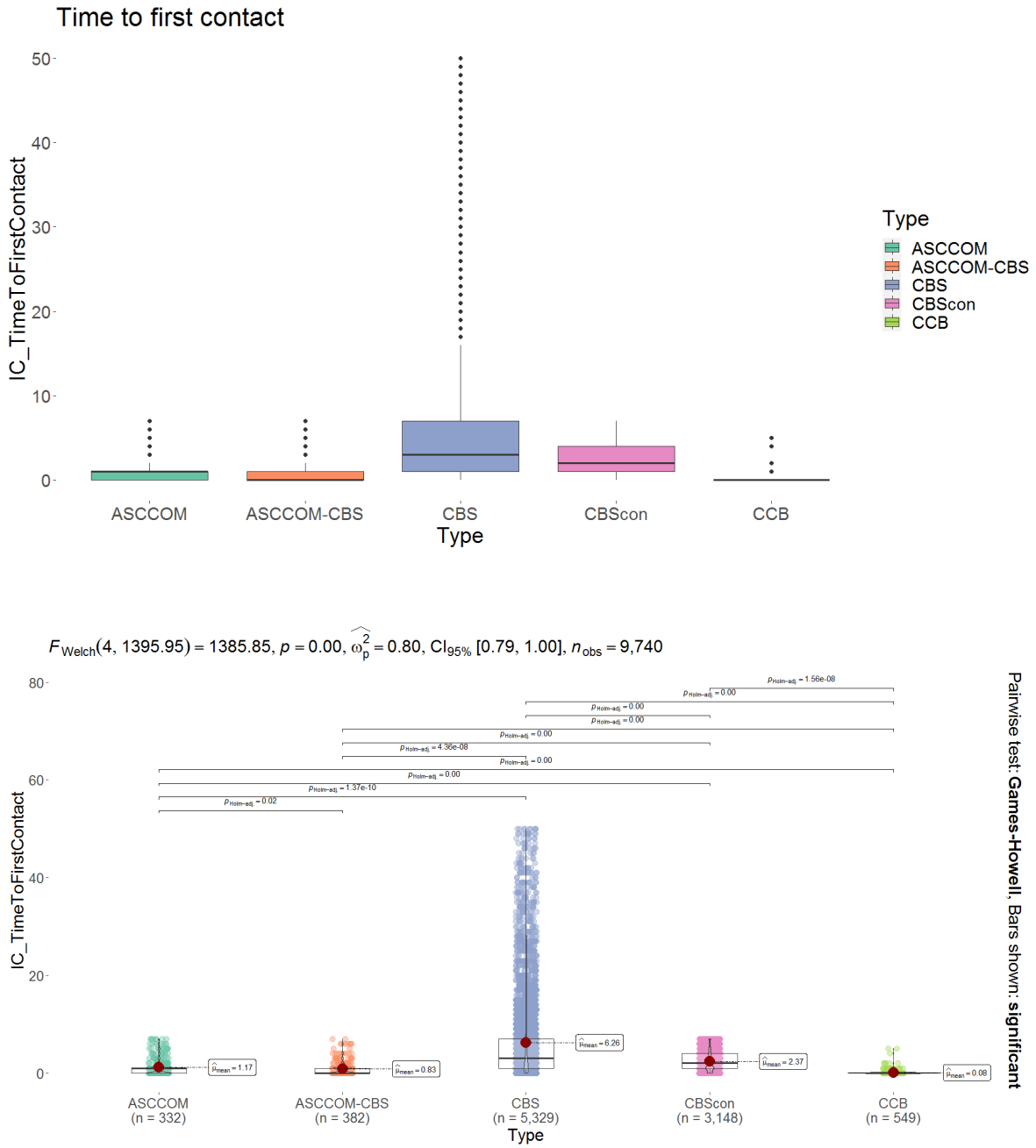


Figure 7 reveals that the average time to first contact for community home-based services (CBS) is notably higher compared to other services, standing at 6 days. This category included patients newly referred to Leeds Community Health, within time of hospital admission up to 7 days from hospital discharge, without ongoing intermediate care service types. Given the diverse methods of support offered by these services, there exists variance in their average first contact times. The ANOVA test shows significant difference on average days to the first contact across all types of IC. Horizontal bars show the significant difference with p-values. The lowest p-value (=0) was reported between CCB and three other services: CBS, ASCCOM-CBS, ASCCOM then between CBSCon and CBS, CCB-and ASCCOM-CBS.

Figure 8 further analyses the time to first contact for the five principal CBS services: Neighbourhood Team, Stroke Team, Respiratory Management Antibiotics, and Virtual Ward. Among these, the Neighbourhood Team emerges as the most frequently utilized service in Leeds, boasting a median time to first contact of three days. There is no significant difference between Antibiotic service and Virtual Word – first time contact.

Figure 8 Community Home Based Services

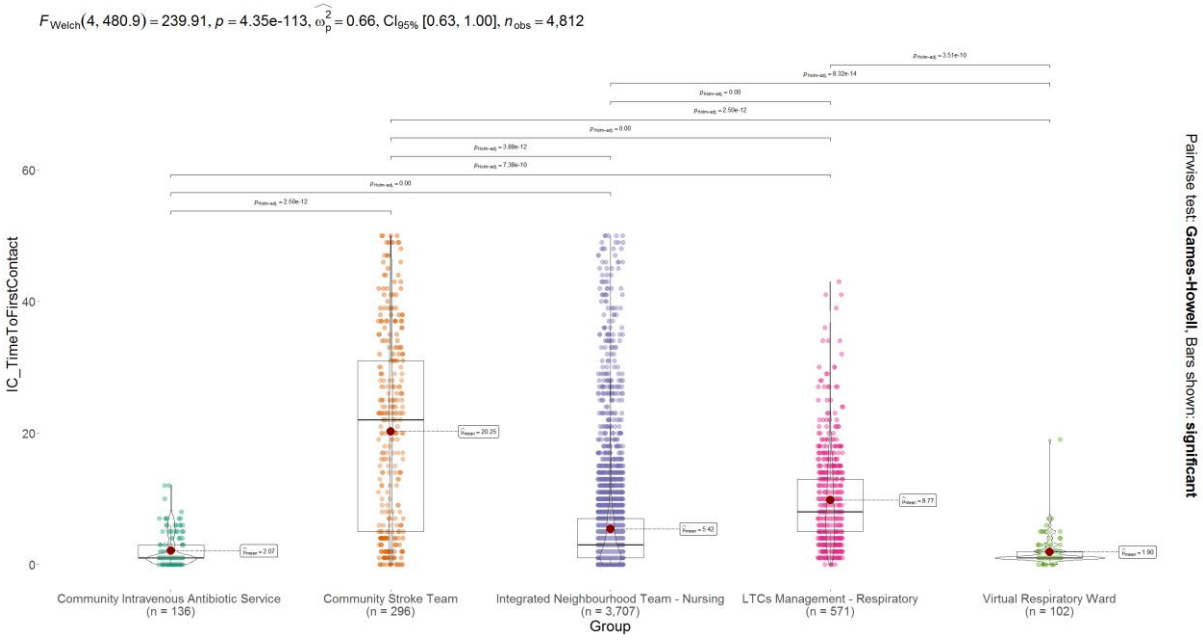


Table 3 shows a comparison of the personal characteristics between the intermediate group services. The count represents the number of hospital spells, as patients had multiple hospital admissions (spells) during the study period. There are 5 main types of intermediate care: ASCCOM-CBS include reablement with parallel CBS service (newly referred as well as continuation).

Table 3 Comparison of patient and IC stay characteristics among the main types of IC. Mean (standard deviation) for continuous characteristics, counts (%percentages) for categories.

Characteristic	**ASCCOM**, N = 332[1]	**ASCCOM-CBS**, N = 382[1]	**CBS**, N = 5,329[1]	**CBScon**, N = 3,148[1]	**CCB**, N = 549[1]
Age	81.77 (10.74)	81.56 (9.09)	73.31 (14.51)	75.05 (14.28)	83.96 (8.85)
Frailty_index	11.56 (4.53)	11.66 (4.89)	8.51 (4.98)	10.90 (5.39)	10.91 (4.76)
LTC_Dementia					
1	37 (11%)	24 (6.3%)	384 (7.2%)	307 (9.8%)	79 (14%)
Unknown	295 (89%)	358 (94%)	4,945 (93%)	2,841 (90%)	470 (86%)
Comorbidities	5.72 (2.67)	5.74 (2.66)	4.57 (2.71)	5.57 (2.93)	5.22 (2.65)
Ethnic_group					
Asian or Asian British	14 (4.2%)	9 (2.4%)	181 (3.4%)	113 (3.6%)	< 5
Black or Black British	< 5	< 5	91 (1.7%)	78 (2.5%)	7 (1.3%)
Mixed	< 5	< 5	35 (0.7%)	18 (0.6%)	< 5
Other	< 5	< 5	20 (0.4%)	15 (0.5%)	< 5
White	301 (91%)	344 (90%)	4,725 (89%)	2,755 (88%)	509 (93%)
Unknown	13 (3.9%)	23 (6.0%)	277 (5.2%)	169 (5.4%)	30 (5.5%)
IMD_quintile					
1	33 (9.9%)	35 (9.2%)	681 (13%)	357 (11%)	53 (9.7%)
2	56 (17%)	70 (18%)	934 (18%)	562 (18%)	69 (13%)
3	58 (17%)	60 (16%)	787 (15%)	491 (16%)	73 (13%)
4	41 (12%)	54 (14%)	631 (12%)	359 (11%)	95 (17%)
5	115 (35%)	117 (31%)	1,843 (35%)	1,117 (35%)	221 (40%)
Unknown	29 (8.7%)	46 (12%)	453 (8.5%)	262 (8.3%)	38 (6.9%)
IC_LOS	19.02 (12.19)	37.40 (21.86)	28.50 (24.96)	33.55 (22.96)	50.02 (33.60)
IC_TimeToFirstContact	1.17 (1.69)	0.83 (1.27)	6.26 (8.59)	2.37 (2.01)	0.08 (0.43)

[1]Mean (SD); n (%)

3.2 Re-admission

Hospital readmission was coded as any planned or unplanned hospital stay, excluding Accident and Emergency (AE) contacts. Among patients receiving step-down intermediate care (IC), 25% were readmitted within 30 days following discharge from intermediate care, while 6% experienced multiple hospital admissions during the study period. There were 0.5% patients who died within 30 days after discharge from IC among those readmitted to hospital and 6% of patients died within 30 days from IC discharge Table 4 presents the characteristics of intermediate care patients who were readmitted to acute care within 30 days from discharge from intermediate care. The n stands for number of patients that have been readmitted to the hospital.

Table 4 Characteristics of readmitted IC patients

	Cohort (n = 1862)	
	n	%
Sex		
Male	922	49.5
Female	940	50.5
Other		
Age group		
Under 50	105	5.64
50-54	65	3.49

55-59	88	4.73
60-64	109	5.85
65-69	164	8.81
70-74	206	11.1
75-79	293	15.7
80-84	301	16.2
85-89	310	16.6
90+	221	11.9
Ethnic group		
Asian or Asian British	61	3.28
Black or Black British	33	1.77
Mixed	11	0.59
Other	8	0.43
White	1646	88.4
Not Stated	103	5.53
IMD quintile		
1 – least deprived	208	11.2
2	302	16.2
3	281	15.1
4	220	11.8
5 – most deprived	677	36.4
Unknown	173	9.29
Length of Stay in intermediate care setting		
Mean (SD)	20.9(20.3)	-
Median (IQR)	14(30)	-

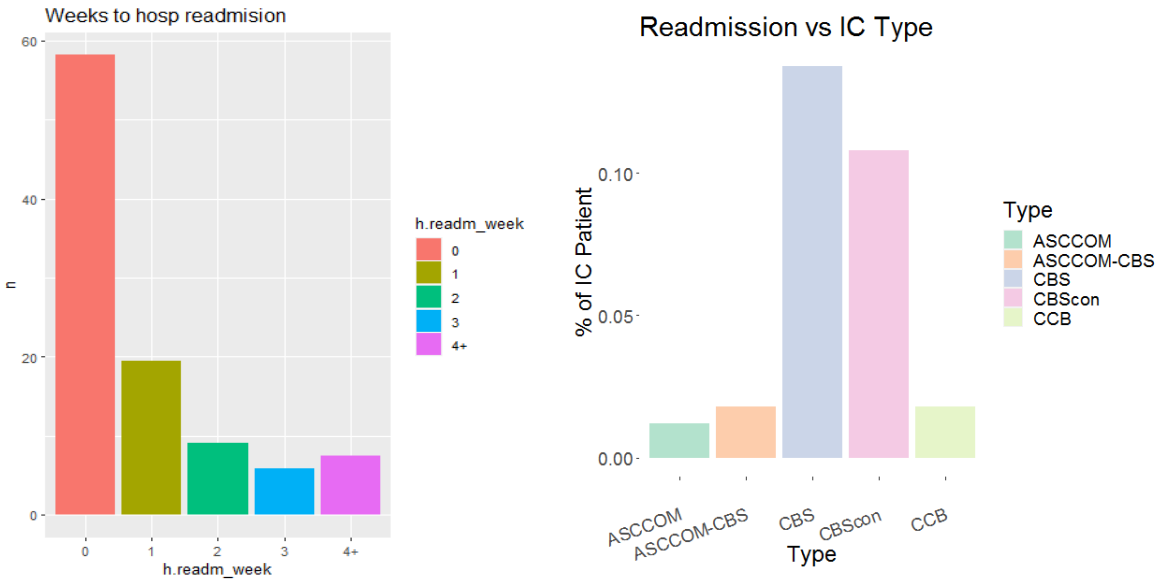
Table 5 shows the comparison of characteristics to the patients that were not readmitted to hospital after receiving IC, patients who died within 30 days were removed from the study cohort. The values present mean (standard deviation). Dementia count for patients that have long term dementia flag coded in the data. The numbers stand for count of patients and (percentage in cohort)

Table 5. Comparison of IC patients with single admission vs multiple admission

Characteristics	IC Single Hospital stay	IC Multiple Hospital stays
Age	75.09 (14.51)	74.45 (14.18)
Frailty_Index	8.59 (4.98)	10.65 (5.41)
Comorbidities	4.45 (2.71)	5.59 (2.83)
Dementia Flag	357 (<1%)	208 (<1%)
IC Length of Stay	34.93 (25.52)	20.92(20.37)
IC Time To First Contact	5.08 (8.08)	3.11 (4.71)

Figure 9 presents the percentage of patients readmitted to hospital within 0 - 6 weeks after they IC stay. Among these patients more than 50% were re-admitted to hospital during their initial IC duration, and an additional 20% readmitted within 1 week. The remaining 30% were readmitted between weeks 2 and 4 (Figure 9). Notably, 90% of patients re-admitted during IC were readmitted from community services (CBS).

Figure 9 Hospital readmission for IC



Base mortality and readmission are presented below. It was calculated based on all hospital admission in the cohort study including multiple patients' admission. It shows a difference on readmission and mortality rates between different discharge pathways.

Table. Based mortality and readmission rate for hospital admissions (including patients with multiple admission)

	Re-admission Rates				**Mortality Rates**			
No. of days	**Pathway 0** (non-SDC)	**Pathway 1** (Home SDC)	**Pathway 2** (Bedded SDC)	**Pathway 3** (non- SDC)	**Pathway 0** (non-SDC)	**Pathway 1** (Home SDC)	**Pathway 2** (Bedded SDC)	**Pathway 3** (non- SDC)
30	2.49%	7.11%	5.21%	3.38%	0.16%	0.58%	0.25%	0.64%
60	3.75%	9.52%	7.14%	4.74%	0.67%	1.87%	0.90%	2.35%
90	4.58%	11.10%	8.96%	6.11%	1.40%	3.90%	2.18%	4.60%
180	6.31%	14.42%	12.25%	9.27%	3.71%	8.91%	9.52%	10.54%
360	8.01%	17.50%	16.19%	11.76%	7.01%	15.42%	16.47%	18.29%

3.3 Analysis of Care Serviced 6 months Prior Hospital Admission

The GP, Out of Hours (OOH), adult social care (ASCCOM), Leeds Community Health contacts (ComServ) Intermediate Care (IC), AE contacts and 111, 999, calls were summarised as a number of contacts six

months prior hospital admission. There were 0.5% of hospital spell not proceeded by any of above-mentioned health contacts for intermediate care and 2.5% for non-intermediate care. The summary statistics in Table 6 compare these activities between intermediate care and non-intermediate care cohort. The class 1 represents step-down intermediate care (pathway 1 and 2) and the class 0 other patients (pathway 0 and pathway 3). The second group includes patients discharged home without support, those discharged home with other community services excluding intermediate care or discharge to hospice/care home. The values represent mean and standard deviation for continuous variables and counts and percentage for discrete and categorical.

Table 7 presents a comparison of health characteristics across different intermediate care packages. Interestingly, some patients receive additional services (Other.CBS) alongside intermediate care after hospital discharge, this include also patients being discharged into continuity of community service (Other.CBScon).

To comprehend the predominant pre-hospital admission service, we examined the service with the highest frequency of contacts in the six months and the latest contact preceding hospitalization. Figure 10 illustrates the percentage of patients with hospital stays within the study period across each cohort (intermediate care/non-intermediate care) with the highest contact rates in comparison to other care services. Furthermore, Figure 11 illustrates the percentage of patients with hospital spells who had their latest healthcare contact just before admission. Figure 12 illustrates the time between latest service contact and hospital admission.

Table 6 Comparison of IC and non-IC users (summary statistics)

Characteristic	**0**, N = 43,583[1]	**1**, N = 9,740[1]
GP_Count	6.40 (6.71)	8.70 (8.92)
UC111_Count	0.42 (1.50)	0.64 (1.57)
UC999_Count	0.82 (2.97)	1.77 (2.95)
UCOOH_Count	0.19 (0.68)	0.32 (0.78)
ASCCOM_Count		
0	43,271 (99%)	9,349 (96%)
1	269 (0.6%)	325 (3.3%)
2	38 (<0.1%)	57 (0.6%)
3	< 5	9 (<0.1%)
ComServ_Count	0.59 (2.29)	1.75 (3.84)
IC_Count	1.50 (10.14)	21.02 (51.92)
AE_Count	1.44 (2.56)	1.91 (2.09)
Age	58.55 (20.09)	75.19 (14.20)
Frailty_index	5.38 (4.56)	9.46 (5.18)
Comorbidities	3.01 (2.56)	4.86 (2.79)
LTC_Dementia		
1	1,616 (3.7%)	897 (9.2%)
Unknown	41,967 (96%)	8,843 (91%)

[1]Mean (SD); n (%)

Figure 10 Percentage of patients within hospital stays that have frequently contacted health care services: intermediate care cohort (left) non -intermediate care (right)

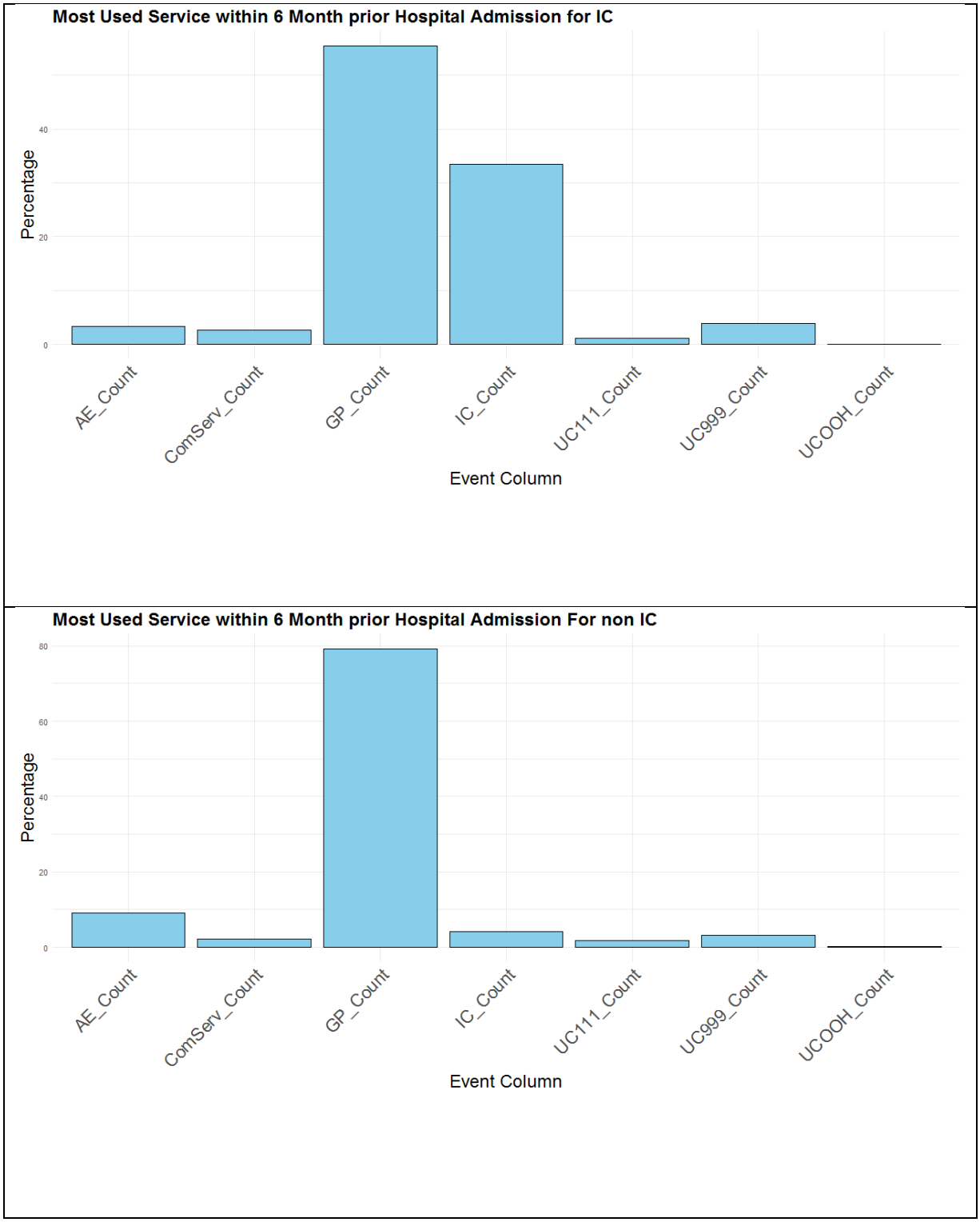


Figure 11 Percentage of patients whose last contact before hospital admission was with a health care service: intermediate care cohort (left) non-intermediate care (right)

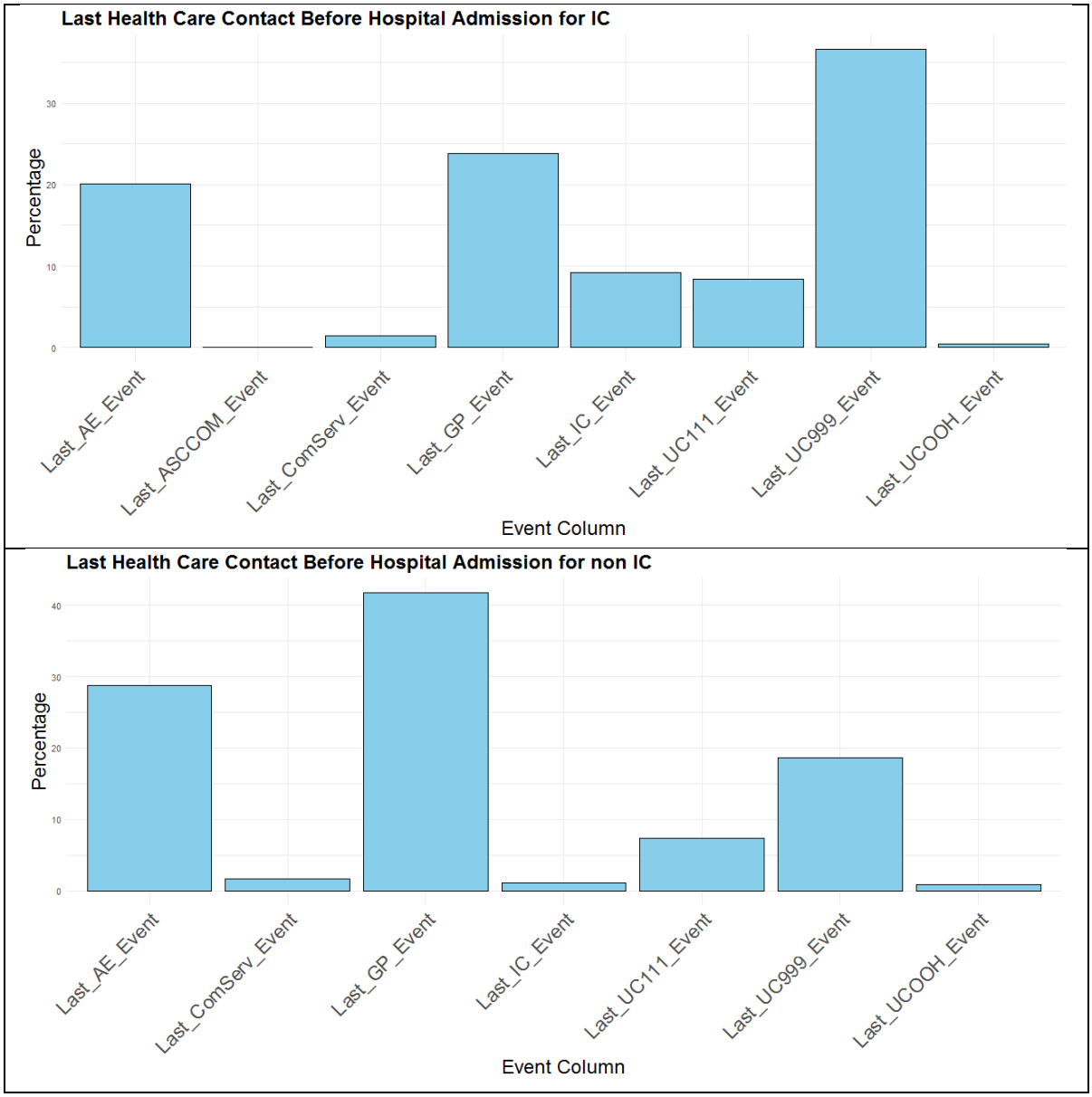
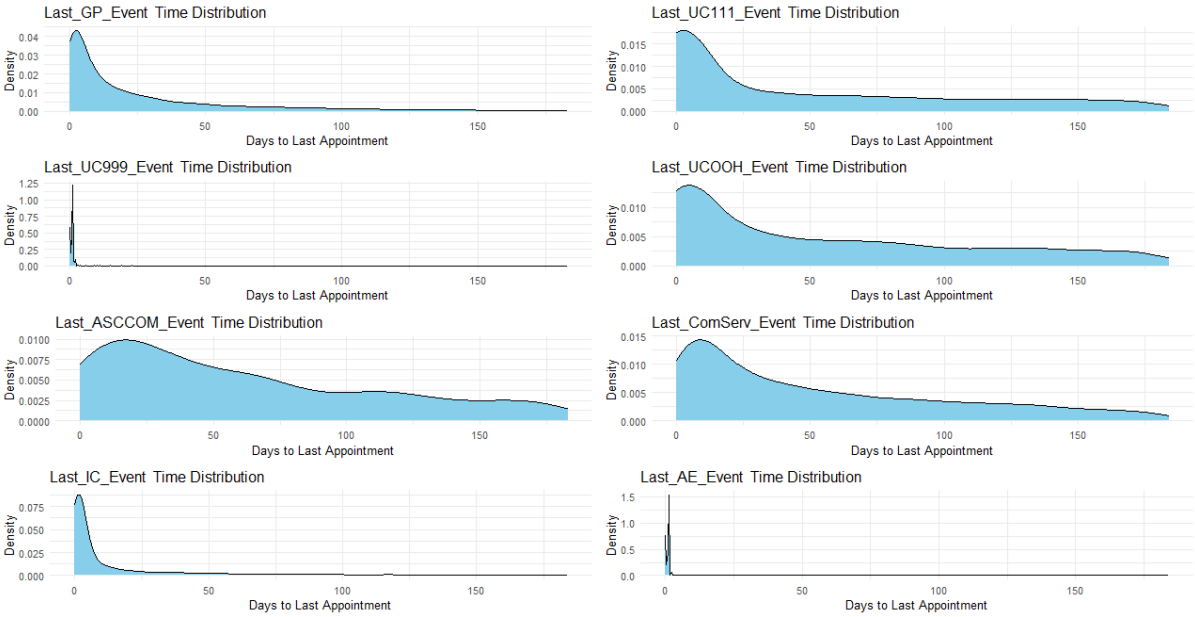


Table 7 Comparison of Health and Demographic Characteristics for IC

Characteristic	**ASCCOM**, N = 209[1]	**ASCCOM-CBS**, N = 468[1]	**ASCCOM-Other.CBS**, N = 37[1]	**CBS**, N = 4,516[1]	**CBS-Other.CBS**, N = 1,107[1]	**CBScon**, N = 1,869[1]	**CBScon-Other.CBS**, N = 985[1]	**CCB**, N = 549[1]
GP_Count	8.73 (8.33)	9.65 (9.98)	12.00 (10.46)	7.63 (7.96)	9.11 (9.10)	9.94 (9.53)	11.40 (10.78)	6.57 (7.32)
UC111_Count	0.53 (1.04)	0.77 (1.51)	0.54 (1.19)	0.54 (1.69)	0.46 (1.00)	0.79 (1.53)	1.00 (1.91)	0.51 (0.98)
UC999_Count	2.06 (2.48)	2.27 (2.71)	2.27 (1.69)	1.44 (3.07)	1.30 (1.59)	2.19 (2.69)	2.62 (4.15)	1.89 (1.92)
UCOOH_Count	0.32 (0.70)	0.35 (0.75)	0.24 (0.60)	0.24 (0.65)	0.24 (0.61)	0.44 (0.89)	0.62 (1.20)	0.21 (0.58)
ASCCOM_Count								
0	191 (91%)	392 (84%)	33 (89%)	4,437 (98%)	1,083 (98%)	1,774 (95%)	942 (96%)	497 (91%)
1	15 (7.2%)	61 (13%)	< 5	68 (1.5%)	20 (1.8%)	81 (4.3%)	38 (3.9%)	39 (7.1%)
2	< 5	13 (2.8%)	< 5	10 (0.2%)	< 5	13 (0.7%)	< 5	11 (2.0%)
3	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
ComServ_Count	0.66 (1.65)	1.67 (3.39)	3.54 (4.13)	1.06 (3.06)	2.56 (4.55)	1.46 (2.84)	5.13 (6.15)	1.16 (2.84)
IC_Count	5.10 (11.49)	21.04 (51.18)	10.24 (23.66)	8.66 (31.45)	9.60 (33.58)	40.93 (67.52)	61.96 (83.30)	11.28 (32.91)
AE_Count	2.29 (2.78)	2.26 (2.06)	2.30 (1.51)	1.70 (2.04)	1.65 (1.60)	2.19 (2.25)	2.42 (2.47)	1.77 (1.16)
Age	81.16 (10.97)	82.01 (9.43)	82.22 (8.94)	73.46 (14.68)	73.69 (13.82)	75.20 (14.64)	75.09 (13.46)	84.03 (8.85)
Frailty_index	10.59 (4.20)	11.41 (4.77)	14.54 (4.35)	8.32 (4.97)	9.21 (5.06)	10.09 (5.35)	11.72 (5.06)	10.68 (4.70)
Comorbidities	5.27 (2.52)	5.58 (2.70)	6.76 (2.70)	4.41 (2.67)	4.89 (2.80)	5.14 (2.83)	5.77 (2.96)	5.09 (2.64)
LTC_Dementia								
1	21 (10%)	46 (9.8%)	< 5	340 (7.5%)	97 (8.8%)	203 (11%)	103 (10%)	84 (15%)
Unknown	188 (90%)	422 (90%)	34 (92%)	4,176 (92%)	1,010 (91%)	1,666 (89%)	882 (90%)	465 (85%)

[1]Mean (SD); n (%)

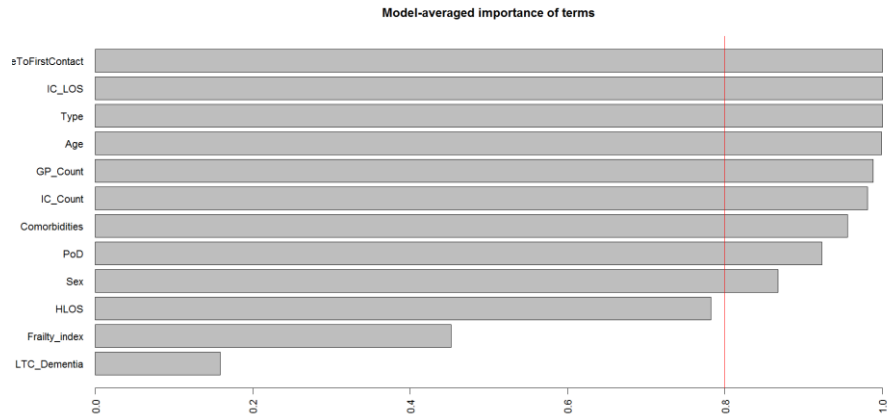
Figure 12 The distribution of time between latest appointment and hospital admission for IC cohort.



3.4. Likelihood of Hospital Readmission for Step Down Intermediate Care

To evaluate the likelihood of patients being readmitted to the hospital following step-down intermediate care, a multiple logistic regression approach was employed. The input dataset encompassed various characteristics including demographics (age, gender, ethnicity, IMD), health indicators (GP count, IC count, frailty index, LTC count, LTC dementia), hospital stay details (month of admission, point of delivery, hospital length of stay), and intermediate care specifics (length of stay, time to first contact, IC type (Home Based, Reablement or Bed)he logistic regression models were trained on a training dataset (70%), exploring all possible combinations of variables through exhaustive search to identify the top 100 models based on BIC critieria. The most frequently occurring variables were utilized to determine the final model, as illustrated in Figure 13. The plot presents a fraction of models where variables were utilized. Notably, age, IC type (CCB, CBS and ASCCOM), intermediate care length of stay (IC_LOS), and time to first contact (IC_TimeToFirstContact) were included in all 100 models. Subsequently, variables present in more than 80% of models were considered as important to be included in the final model. The importance value assigned to each predictor corresponds to the sum of weights or probabilities across models where the variable is present. Variables that consistently appear in models with substantial weights garner higher importance values.

Figure 13 Logistic Regression Variable Importance



Models that included all selected variables were tested in remaining 30% of data. The final model was selected based on the BIC criteria, accuracy and recall measures. The final model accuracy for testing dataset was (0.70) and recall (0.13). The model estimates are presented in Figure 14.

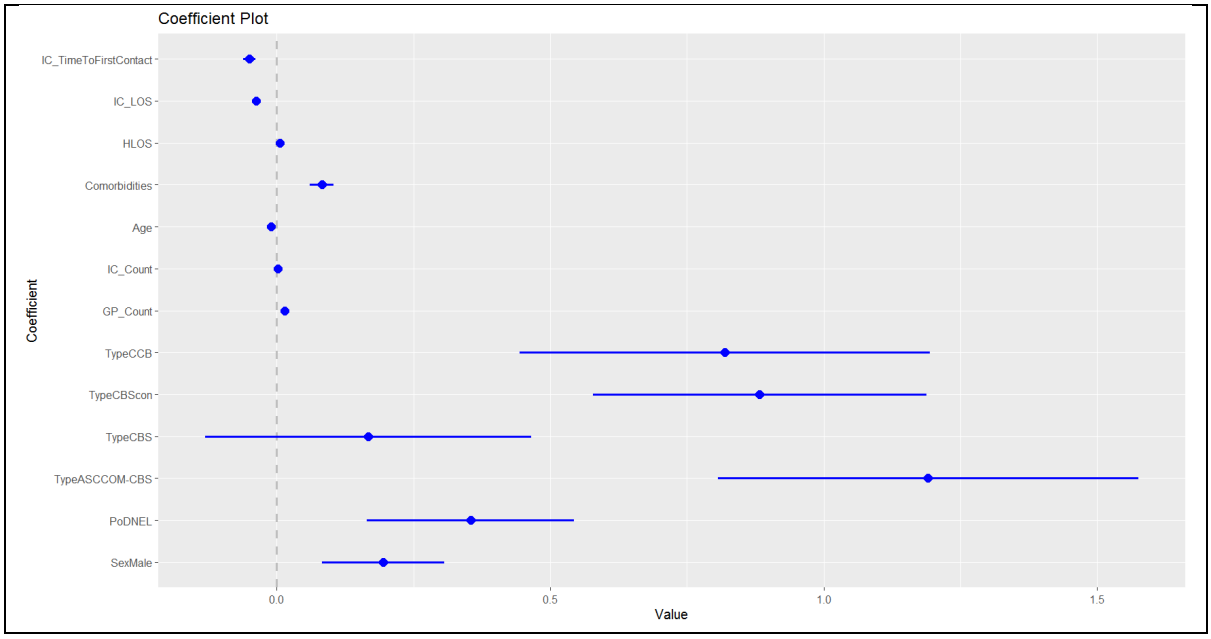
Figure 14 Logistic Regression Coefficients

```
Coefficients:
                          Estimate Std. Error z value Pr(>|z|)
(Intercept)             -0.5244131  0.2275504  -2.305 0.021189 *
SexMale                  0.1948747  0.0559744   3.481 0.000499 ***
PoDNEL                   0.3541125  0.0945575   3.745 0.000180 ***
TypeASCCOM-CBS           1.1909730  0.1923460   6.192 5.95e-10 ***
TypeCBS                  0.1668090  0.1490279   1.119 0.263006
TypeCBScon               0.8829465  0.1523781   5.794 6.85e-09 ***
TypeCCB                  0.8188741  0.1875593   4.366 1.27e-05 ***
GP_Count                 0.0143276  0.0030516   4.695 2.67e-06 ***
IC_Count                 0.0023547  0.0005485   4.293 1.76e-05 ***
Age                     -0.0101925  0.0021287  -4.788 1.68e-06 ***
Comorbidities            0.0820637  0.0109140   7.519 5.52e-14 ***
HLOS                     0.0051400  0.0014964   3.435 0.000593 ***
IC_LOS                  -0.0379909  0.0015547 -24.437  < 2e-16 ***
IC_TimeToFirstContact -0.0505458  0.0056527  -8.942  < 2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 8916.4  on 7443  degrees of freedom
Residual deviance: 7757.7  on 7430  degrees of freedom
AIC: 7785.7

Number of Fisher Scoring iterations: 5
```



4. Discussion

Output 1 included an analysis aimed at understanding characteristics of the step-down intermediate care cohort. Figure 1 illustrates the flow of patients from hospital discharge into intermediate care, revealing five distinct types of care: Reablement (ASCCOM), Community (Home) Based Services (CBS and CBScon), Community Care Beds (CCB), and a combination of services provided through mixed care delivered at home post-discharge. However, due to limitations in data availability (with the source of referral missing for 60% of the data), two conditions were employed to classify received services as step-down intermediate care: either a referral date within the hospital stay plus seven days after discharge, or the first contact occurring within seven days post-discharge. Notably, in Leeds, the largest service offered to individuals comprises Neighbourhood Teams, covering approximately 82% of post-hospital discharge activities. This was also reported in the diagnostics performed by HomeFirst Diagnostics.

Patients discharged from the hospital with an existing referral to the neighbourhood teams service are often returning to the service, making it challenging to ascertain whether the received service within seven days after discharge constitutes step-down intermediate care or whether the patient reverted to their standard long-term care. Roughly 20% of patients receive continuity of care in this manner. Further analysis of this group needs to be addressed.

Table 2 and Figure 4 depict the personal characteristics of patients admitted to the hospital in the study who received intermediate care. There were 5 groups of intermediate care service considered, showing that in some cases Reablement (ASCCOM) is delivered parallel to other home-based IC (CBS) including continuation of the service. The analysis reveals variations in average age across the main groups of intermediate care services, with an average age of 81 for reablement, 84 for community beds, and a slightly younger cohort for community home-based services, with an average age of 74. These findings align with the analysis by Home First Diagnostics, which indicates an average patient age of 81 for those accessing intermediate care services. Furthermore, our analysis is in line with Home First Diagnostics observation regarding the distribution of females and males within intermediate

care, with females being more prevalent. Additionally, the majority ethnic group in the cohort is White, followed by Asian and Black backgrounds, mirroring the demographic composition of the Leeds population in this age range, where individuals of white ethnicity comprise around 85%, followed by Asian individuals at 4%, and Black individuals 3%. From our analysis, we can see that the Asian background predominantly received home-based services, such as community care services and reablement, in comparison to other demographic groups. Additionally, there appears to be a relatively smaller representation of the Asian ethnicity within intermediate care bed settings when compared with the Black ethnicity. This fact has been confirmed with surveys, performed at bed settings done by Health Watch, reporting White and Black as main ethnicity groups.

Based on our analysis, which aligns with findings from HomeFirst Diagnostics, a considerable proportion of patients originate from the most deprived areas (33%). Notably, only 10% of step-down intermediate care patients had a dementia flag, highlighting a disparity compared to HomeFirst Diagnostic's report. HomeFirst Diagnostics reported a large percentage of patients within bed settings (CCB). The flag was delivered from GP records and / or primary and secondary diagnoses from secondary care record for both studies. Our analysis indicated that most patients with dementia were offered home-based services. This difference could be related to the study period (Home First Diagnostics included covid time) and the numbers of used beds that providers submitted at that time. There were only three providers who still were submitting data to that system during this study period compared to the main five providers (+ private sector) during covid.

The analysis of the Frailty Index reveals that individuals receiving home-based services tend to have a lower average Frailty Index (on average nine) compared to those receiving Reablement or beds, with an average Frailty Index of twelve. Figure 5 illustrates the comparison of the average age and Frailty Index across various discharge pathways for the entire study cohort, including patients both receiving and not receiving step-down intermediate care. When compared with the average age and Frailty Index of all patients, it becomes apparent that the step-down intermediate care cohort tends to have a higher average age and Frailty Index.

When analysing the length of stay in step-down intermediate care, we observe variations across different service types. On average, patients spend approximately 50 days in community home-based care, while reablement services have an average stay of around 20 days. However, this duration increases notably when reablement is combined with community home-based services, particularly with continuity care services, where the average stay extends to 34 days.

Figure 6 illustrates the distribution of stay durations for each step-down intermediate care group, highlighting significant differences between services. Specifically, there is a statistically significant distinction between community beds and other settings, as well as between reablement services and both home-based care and beds. However, no statistical difference is observed between community-based services and other types of care following discharge, compared to continuity of care under home based services. There is a difference in the length of stay for community-based services, as reported by HomeFirst Diagnostics (89 days). However, this disparity could be attributed to the requirement of step-down intermediate care duration, typically up to six weeks, used in our study and the inclusion of additional services such as stroke and respiratory teams as part of intermediate care services.

Analysing the time to first contact (depicted in Figure 7), we observe that community-based services for new referrals, without existing referrals, typically take longer to arrange the initial meeting. On

average, this process spans approximately six days. Notably, there is a considerable number of outliers, with some extending up to six weeks before the first contact. This anomaly may be attributed to referral conditions, where patients are referred during hospitalization but receive services later during intermediate care (6 weeks) period of time and the type of home base care service required e.g., Community Neurology (Rehabilitation) having on average 40 days to the first contact. The patients with existing referral and continuity of home-based care experienced quicker time to first contact. The average time to first contact community beds is approximately 0-1 days, often determined by a transfer setting. Interestingly, it has been observed that discharge dates from hospitals coincide with admission dates to community care settings. Reablement services exhibit a much faster response time for initial contact, with referrals typically organized within the hospital stay.

Tables 4 and 5 present summary characteristics of patients readmitted to the hospital within 30 days from discharge of step-down intermediate care. Table 4 highlights personal characteristics, revealing minimal differences in patient distribution across ethnicity and age IMD quintiles compared the step-down intermediate care cohort. In this study, the number of females exceeds the number of males for both whole IC cohort as well as within readmitted patients. Looking at the readmitted patient ratio there is more males that have been admitted to hospital several times during the study cohort.

Table 5 compares individuals with multiple admissions within the study period. Results indicate that, on average, patients with multiple hospital admissions exhibit higher frailty indices (10) and a greater prevalence of long-term conditions. Despite this, their stays in intermediate care are shorter compared to those with single hospital admissions. This trend is often observed because these patients are readmitted to the hospital during their step-down intermediate care duration. This can be observed on Figure 9 where 50% of patients are readmitted with 0 time to readmission, additional 20% are readmitted within first week, and next 10% within second week. The Figure 9 is showing percentage of patients readmitted within each service. This contradicts HomeFirst Diagnostics findings indicating larger percentage of bed setting users to be readmitted within 30 days. This report indicates that patients in community home based services have higher rates of readmission within 30 days.

Output 2 aimed to investigate the patterns of patient interactions preceding hospital admission, particularly focusing on daily visit frequencies and contacts with various healthcare services, comparing the intermediate care cohort to the non-intermediate care cohort. Table 6 provides a comparison of average contact counts for each health service type between these two cohorts. Notably, the intermediate care group exhibited higher average counts of GP contacts (GP_Counts) and IC contact (IC_counts) as well as contacts with other community-based services (ComServ_Counts) before hospitalization, indicating potentially different healthcare utilization patterns. Additionally, the intermediate care cohort appeared to be older, frailer, and more likely to present with dementia compared to the non-intermediate care group. Table 7 further explores contact counts, specifically focusing on the step-down intermediate care group combined with other community-based services (coded as "Other.CBS") received after hospital discharge. It can be noticed that reablement (ASCCOM) and intermediate care (CBS and CBSCon) are supported by a range of community services that are not considered intermediate care.

Furthermore, to identify the latest services received before hospital admission, the analysis examined the most frequent contacts and calculated the proportion of the intermediate care cohort receiving these services. Figure 10 illustrates the disparity in service utilization between the intermediate and non-intermediate care cohorts before hospitalization, with GP contact and intermediate care being prominent for the intermediate care group. Figure 11 provides insight into the types of services

received before hospital admission, highlighting differences between the two cohorts. We can notice that for intermediate care: 999 calls, GP appointment and AE attendance were the most utilised services, comparing to the non-intermediate care that the main contact prior hospital admission was GP contact followed by the 999 calls Finally, Figure 12 presents the time in days of the latest contacts before hospital admission, offering deeper insights into patient interactions with healthcare facilities preceding hospitalization, notably showcasing a significant proportion of patients having contact with AE and 999 services, followed by those engaging with intermediate care services.

Output 3 aimed to assess the likelihood of patients being readmitted to the hospital following discharge from step-down intermediate care. Our analysis revealed several noteworthy findings regarding factors influencing readmission probabilities.

We observed that a significant proportion of patients experienced readmission during their step-down intermediate care service. Coefficient analysis (see Figure 14) from logistic regression indicated that certain care settings, such as bed-based and community-home-based care with continuity, were associated with increased odds of readmission within 30 days post IC discharge. Additionally, we identified a higher proportion of spells for male patients among readmissions, with gender emerging as a significant factor contributing to readmission likelihood.

Furthermore, our analysis explored the impact of patient characteristics such as frailty index and age on readmission probabilities. Higher frailty index scores were positively correlated with increased readmission likelihood, suggesting that patients with greater frailty may result in higher likelihood of hospital readmission. Variables such as age, length of stay, and time to first contact exhibited negative associations with readmission probabilities, although their effects were inconclusive due to their proximity to zero values. The longer time to first contact can be explain that patients may not require urgent care after discharge, suggesting better health condition or family/community support contributing to their longer-term independence. We have seen that 60% of readmitted patients were admitted during their IC stay, shortening the suggested time to 20 days. Thus, the longer stay in IC settings can be associated with reduction of likelihood of readmission.

Overall, our regression analysis indicated that prolonged stays in intermediate care settings were associated with reduced readmission likelihood, suggesting the importance of comprehensive care provision during intermediate care. Additionally, the type of initial hospital admission emerged as a significant predictor of future readmissions, with non-elective care patients exhibiting higher readmission probabilities.

Our analysis highlighted disparities in the distribution of ethnicity within the step-down intermediate care cohort compared to the underlying population demographics. Notably, the cohort comprises individuals of White ethnicity, in line with the broader demographic composition of the Leeds population. However, there are notable differences observed, particularly regarding the representation of Asian and Black ethnicities within intermediate care settings. These findings suggest the need to consider ethnic diversity when evaluating healthcare access and service utilization patterns within the community. The low numbers of Asian background in bed settings could suggest that the local community/relatives take the care responsibilities, but this needs further investigation as it was observed from data and rehabilitation center visits by Health Watch.

The analysis reveals that a small percentage of intermediate care patients have a dementia flag overall, suggesting a lower prevalence compared to expectations based on existing literature.

However, among patients with dementia flag, there is a larger occurrence of patients having provided home-based intermediate care.

The regression analysis explored the characteristics associated with age, length of stay (LOS) in intermediate care (IC), and time to first contact with IC services. While age, LOS, and time to first contact demonstrate potential protective effects against hospital readmission, further investigation is required to ascertain their precise impact. For instance, prolonged LOS in IC settings appears to correlate with reduced readmission likelihood, suggesting the effectiveness of comprehensive IC care provision or the better health condition of the considered patient. A shorter time to first contact with IC services may indicate a higher acuity of service need, potentially affecting readmission outcomes. However, further analysis is needed to understand these relationships better and to develop targeted interventions that optimize patient outcomes.

The above analysis was aligned with several meetings of PPIE group and partially influenced by the outcome of the panel discussion. There were two types of activities: focus group (two groups of local Leeds residents one for discussing bed settings and other group discussing IC come based services) and Rehab center visits (conducted by Health Watch). The main outcomes for the first group were: lack of intermediate care provided after elective care, and this is what we could confirm from the data. Only 10% of planned hospital stays were followed by intermediate care type. In large percentage it was home based care (CBS). A large number of patients in the panel received planned care. The second aspect that was brought to our attention was the assessment of the after-hospital care. Some patients did not feel that they received the right care or did not receive anything resulting in hospital readmission. This was difficult to confirm with the data as we did not hold information about discharge and assessment criteria. The patients were able to confirm the average time of staying in intermediate care for different pathways, and from the discussion on the time to first contact we could observe the variety of that time. The analysis confirmed that and revealed surprisingly the time to main Intermediate Care service (Neighborhood teams) on average is longer for people that need to be introduced to the system compared to people that already used that service. An additional aspect for the patients in the panel was communication. Improving communication between hospital staff and patients and their family together with inclusion of relatives in discharge process were the key outcomes of that panel meetings. Also informing patients about the next steps related to their after-hospital care. The analysis was conducted using “carer flag” to understand the patients discharge pathways in relation to information about carer. Unfortunately, due to the lack of that information and challenge with identifying carers, we were not able to carry on the analysis. It was also confirmed by LTHT discharge coordinator that availability of unpaid carers has no influence of IC provision, but this was challenged strongly by PPIE group.

From the rehab center visits we were able to confirm by observation the ethnic background distribution. Health Watch visited three Intermediate Care settings and surveyed 49 service users and their families. They have observed large group of White ethnicity background and no Asian background, what confirmed our quantitative analysis of ethnicity. In contrast to the first group most of patients were transferred to bed setting after unplanned hospital stay. Also, it was discussed that patients did not feel adequately informed about the next steps of their post discharge care and they questioned the assessment as the offered care may not met, their personal needs.

5. Limitations

Data for this study will be primarily derived from commissioning data sets. Some of which are known to have limited data on protected characteristics, where possible and required, data linkage to general practice data in the Leeds Data Model was used to increase data completeness.

The most challenging aspect of our analysis was establishing the linkage between hospital stays and the services provided. We encountered numerous issues with the quality of the activity dates, particularly related to intermediate care services where information on referral dates was often missing. While community-based services generally had this information available, it was limited for bed settings and reablement, also the source of referral was not known, or such information has not been available within data.

Community home-based services provided a diverse number of services offered to the patients. Our focus was on essential intermediate care services, such as the neighbourhood team, stroke team, and long-term condition management respiratory services. However, there were additional services like antibiotic service pharmacy and virtual wards, which, while still considered intermediate care, were not as prominent in our analysis.

Around 20% of individuals experienced continuity of care, indicating repeated returns to the same service. However, assessing the intensity of this service proved challenging. Moreover, identifying step-down care necessitated classifying services where contact occurred within seven days post-discharge. Additionally, we encountered instances of individuals transitioning between different intermediate care services, resulting in removing such cases.

Finally, we were aware that we do not have full access data flow for community beds setting, the length of stay and time to first contact are in line with the internal report provided by HomeFirst Diagnostics and Newton Europe partner.

6. Impact and dissemination

The findings were presented to the broader Office of Data Analytics board in Leeds. The final report will be disseminated to the Home First and other teams involved in the evaluation of intermediate care. This report, along with the Home First Diagnostics's report, will serve as a foundation for transforming intermediate care service. Currently Leeds is a front runner in trialling new approaches for people to access step-down intermediate care.[4] The current goal is to define an intermediate care blueprint for service transformation that will impact hospital stays (faster discharges) and short-term admissions (prevention).

6.1 Home first program Transfotrmation

It is important to note that the data period for this report predates many of the changes introduced and rolled out through the HomeFirst Programme, which was designed to address many of the key themes identified in the introduction.

[4] Intermediate care framework for rehabilitation, reablement and recovery following hospital discharge (england.nhs.uk)

The overall vision for the HomeFirst programme is to achieve a person-centred, home-first model of intermediate care across Leeds that is joined up and promotes independence. To realise this ambition five core projects have been established within HomeFirst:

- **Active Recovery at Home**: redesigning our home-based intermediate care offer to maximise capacity and deliver the best outcomes for people accessing these services.
- **Enhanced Care at Home**: transforming preventive services to avoid escalations in need with a specific focus on avoidable acute admissions.
- **Rehab & Recovery Beds**: transforming bed-based intermediate care to improve outcomes and minimise length of stay in short-term beds.
- **System Visibility & Active Leadership**: Making use of the wealth of data in the system to produce system and service level dashboards, while establishing the right cross-partner governance to make effective decisions using these.
- **Transfers of Care**: redesigning our discharge model to minimise discharge delays and ensure we achieve the most independent outcomes for people leaving hospital.

Within each project, design groups of system experts have come together to shape the changes required. These range from progress changes, digital tools and new ways of working, through to entirely new models of service delivery. These changes have then been piloted and iterated with individual teams, using evidence gathered on performance of key measures, staff feedback and patient/service user feedback, before being scaled up across the system.
In the Transfers of care project, a new hospital discharge model has been developed tested on the pilot wards in Leeds during last quarter of 2023[5] and is being fully rolled out across in scope wards during autumn 2024.

Overall, the HomeFirst Programme is demonstrating positive impact in key target areas with

- fewer adults admitted to hospital each year
- more people going home from hospital rather than to a bedded setting
- people spending fewer days in hospital when they have completed their hospital care
- people spending fewer days in short-term beds when they have completed their bed-based care
- more people benefitting from a more rehabilitative home-based intermediate care off and
- fewer long term residential/nursing placements per year.

To date, the programme has seen a great deal of progress against these aims, with the majority of these targets being met by current system performance. There is still a good amount of work left to go:

- Further transformation work to achieve the full set of programme targets.
- Ensuring that current system performance is maintained and that the changes introduced to achieve this performance are fully sustainable without programme input.

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[5] Intermediate care framework for rehabilitation, reablement and recovery following hospital discharge (england.nhs.uk)

- Building an understanding of further opportunities that exist beyond the programme.

It would be useful to consider what aspects of this study/report analysis analysis might be repeated in future years to understand how patterns of delivery and people's experiences have changed for the implemented changes of HomeFirst Programme.

7. References

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8. Appendix

Section 3.1 describes the intermediate care cohort, but findings presented are sensitive to original inclusion criteria for both the acute care, step-down intermediate care and readmitted cohort. To establish if/how modifying the inclusion criteria would change the conclusions of this study the following descriptive analyses were conducted:

1) Including Day Cases (DC)
2) Excluding SDIC patients in receipt of continuing care (without Day Cases)

The sensitivity analyses presented below supplement findings above, highlight the largest effects, show biases in the intermediate care cohort and provide information on Day Case activity and patients receiving continuing care.

Inclusion of Day Care (DC) activity

Summary

- Inclusion of Day Cases increased total hospital admissions to 110,312 involving 70,950 unique patients (+107% and +60% respectively).
- Greatest increase in admissions (+45%) was for patients receiving continuing care (CBScon).
- Including Day Cases showed a +14% increase in male hospital admissions
- No significant difference in time to first contact, prior GP (or IC contacts) whether day cases were included or not.
- Inclusion of Day Cases in logistic regression model shifted statistically significant coefficients to more negative estimates, but overall conclusions described in section 4 remain unchanged.

Day patients (Day Cases) were given a hospital bed for tests or surgery, but do not stay overnight; this can include treatments such as minor surgery, dialysis or chemotherapy. Including Day Cases (DC) increased the total number of hospital admissions to 110,312 involving 70,950 unique patients (+107% and +60% respectively).

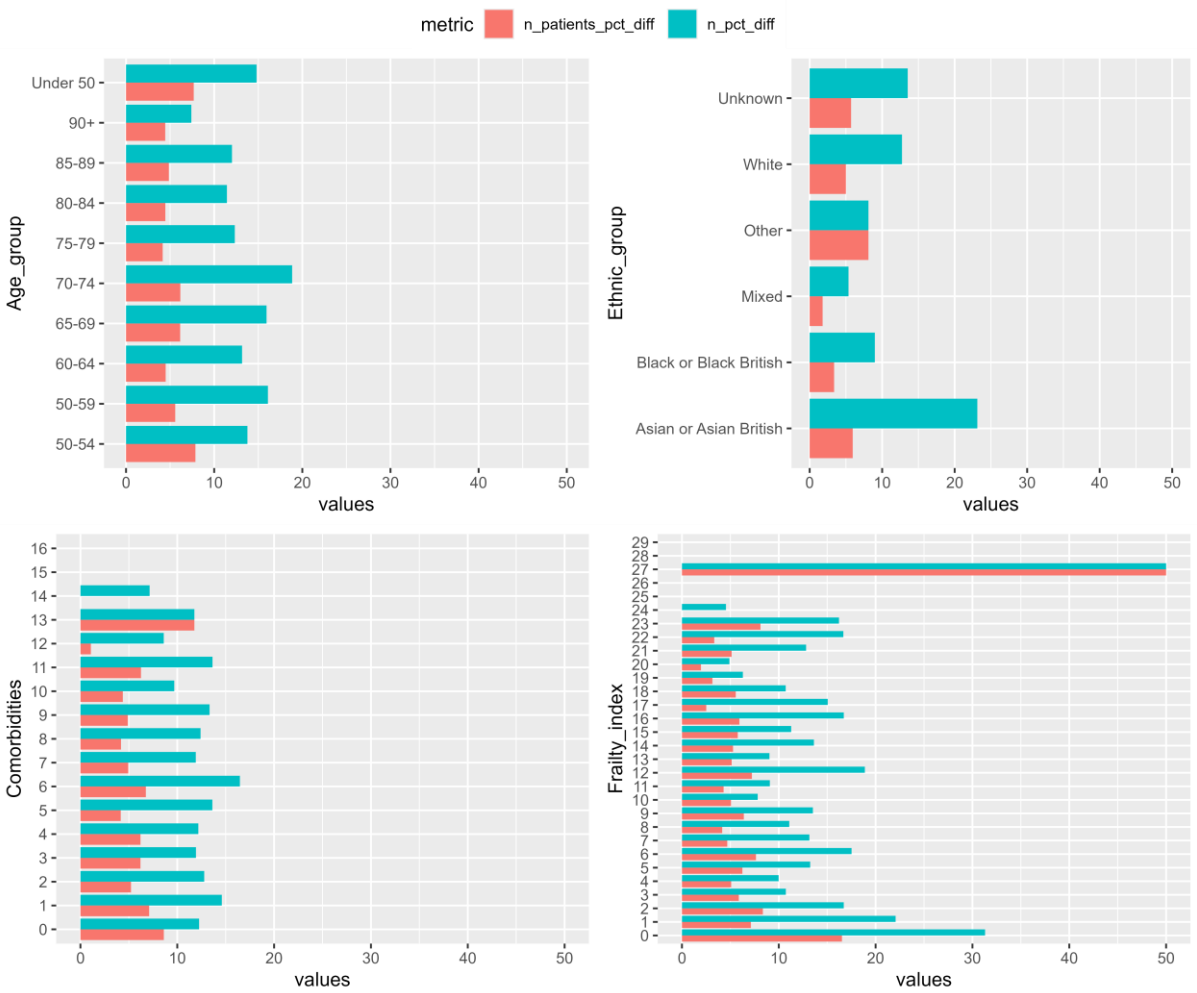
However, the number of admissions either followed by SDIC or receiving continuity of care increased from 9,740 to 11,005 (+13%) or 7,320 to 7,809 (+5%). The greatest increase in admissions was +45% for patients who received continuing care (CBScon). The largest increases were also with patients receiving various combinations of continuing care (ie ASCCOM-CBS or CBScon). The number of patients receiving step-down intermediate care along straightforward pathways (1,2,3) was relatively unaffected (+1-7%) by the inclusion of Day Cases.

The number of hospital spells from patients in continuity of care showed the greatest sensitivity (+33%), followed by discharge to pathway 0 (CBS) with +4% increase. Day Cases were coded separately from Elective (EL) and Non-Elective (NEL) and therefore the results presented above are unaffected.

Table 2, along with Figure 4, offers an insightful overview of the personal and health characteristics observed among patients receiving step-down intermediate care. Including Day Cases showed a +14% increase in male hospital admissions and an average +15% increase in patients from IMD quintile 1, 2, and 3 (the least deprived). It should be noted that admissions from patients without a recorded IMD also had a +15% increase. At +23%, the greatest increase in admissions was from Asian or Asian British patients. There was +10-20% increase in admissions across all age-groups with the greatest increase in 70–74-year-olds.

Table 3 showed difference in service indicators for the intermediate care cohort. For all intermediate care types, including day patients, the mean length of stay in intermediate care services reduced by 0-8%. The median for CCBs remained at 42 days and those in continuity of care reduced from 39 to 34 days. There was very little difference between time to first contact, prior GP (or IC contacts) whether day cases were included or not.

Including Day patients in the logistic regression model shifted statistically significant coefficients to more negative estimates. Therefore, overall conclusions described in section 4 are unchanged, although the Day patients receiving SDIC would benefit from being analyzed separately to determine whether they should be included in any further study cohort.



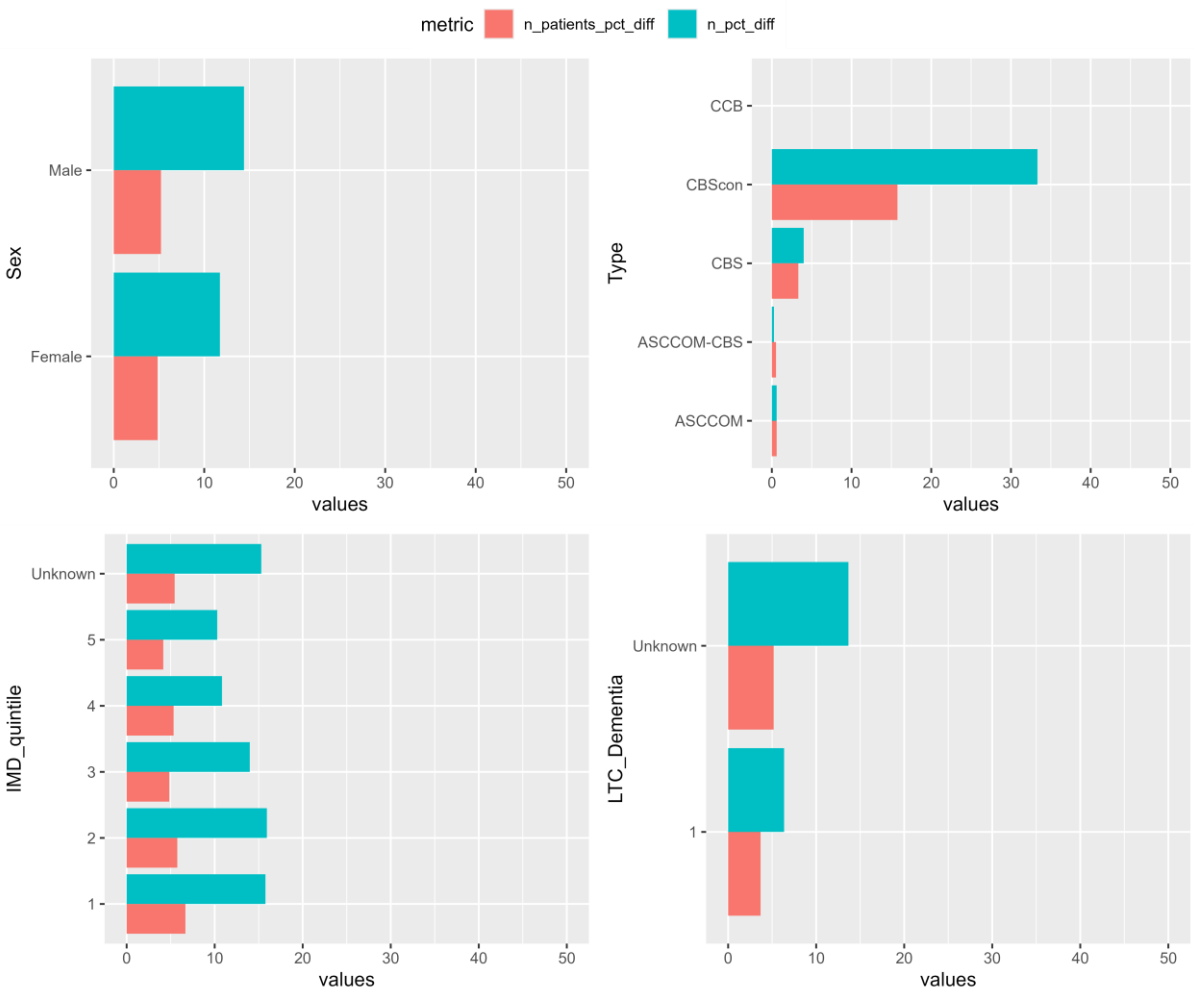


Figure A1: Percentage difference between the study cohort (without DC coded woDC) and the study cohort with Day Cases added (wDC) for each categorical characteristic used in the final logistic regression model. The red and blue bars are percentage differences in hospital admissions and unique patients respectively.

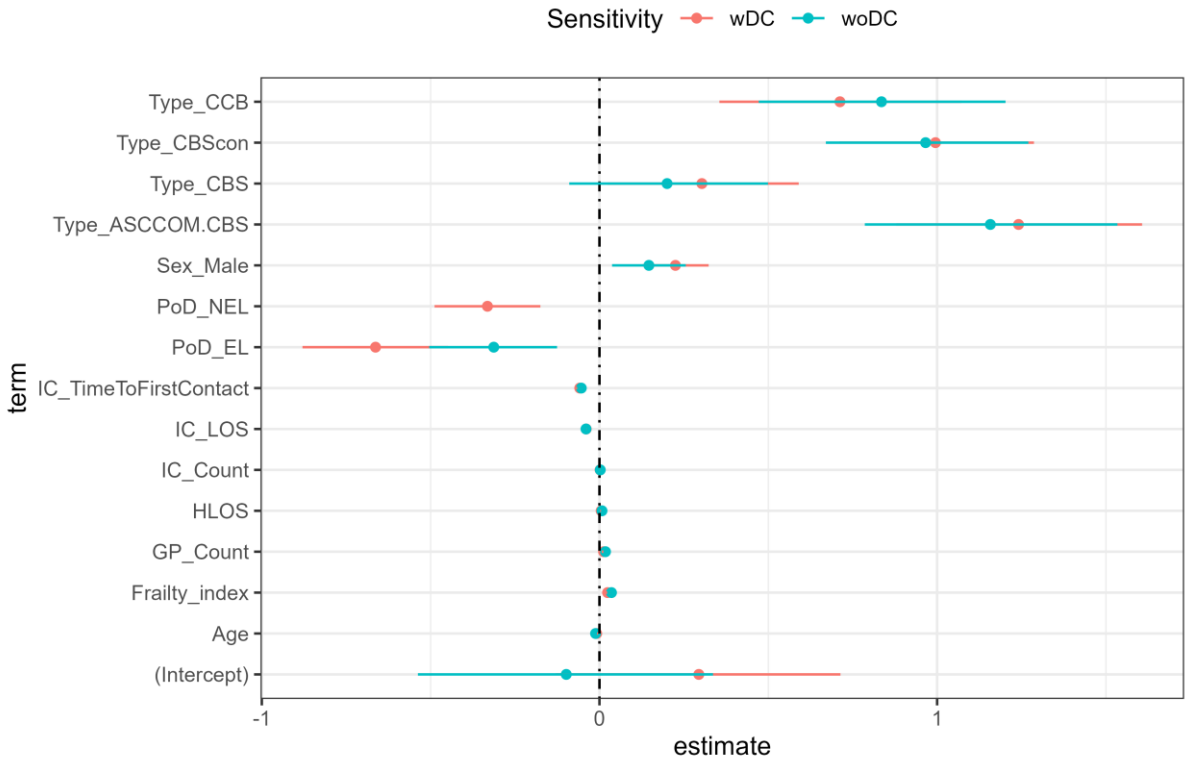


Figure A2: Comparison of the logistic regression coefficients for the likelihood of hospital readmission at 30 days (following a hospital discharge to intermediate care). Red and blue circles are the study cohort including Day Cases (wDC) and the study cohort with Day Cases excluded (woDC).

Exclusion of patients receiving continuing care

Summary

- Removing admissions preceded (and followed) by continuing care reduced the intermediate care cohort by 37% in admissions and 18% in unique patients.
- Largest reductions occurred in ASCCOM-CBS (-42%), CBS (-6%), and CCB (-3%) services.
- Removal of continuing care patients had the greatest impact on admissions from black or black British ethnic groups (-46%) and those with dementia (-44%).
- Omitting patients in continuity of care reduced median length of stay in intermediate care services by up to 5% and altered time to first contact with healthcare providers.

As discussed in Section 4 above, some patients discharged from the hospital with an existing referral to the neighbourhood teams service are often returning to the service, making it challenging to ascertain whether the received service within seven days after discharge constitutes step-down intermediate care or whether the patient reverted to their standard long-term care.

Removing all admissions preceded (and followed) by continuing care reduced the intermediate care cohort from 9,740 to 6,121 admissions (-37%) and 7,320 to 5,543 unique patients (-18%). The biggest reduction was in ASCCOM-CBS (-42%), CBS (-6%) and CCB (-3%) services received at discharge. This is caused by the coding of the main IC services and reducing the number of pathways of care. Wherever there was new referral to the service, but patients have also continued services it was wrapped under

that new referred service. So, the differences showed large number of patients that had added new rabblement service alongside they continue home based services

Removing patients with continuing care from the study cohort had the largest impact on admissions from the black or black british ethnic group (-46%) and those with dementia (-44%). Whilst the percentage change in admissions was approximately -38% across all age groups, the change in number of unique patients showed a systematic change from under-50s at -14% to 90+ at -24%. Why the number of spells per unique patient decreases with age when patients receiving continuity of care is unclear and requires further investigation. Removing the continuing care patients has a greater effect on admissions from people with a higher number of comorbidities, up until 12 comorbidities, and there are more admissions per person. This also applies to the frailty index of admitted patients, up until eFI of 23. However, the smaller cohorts with higher eFIs are also very sensitive to the inclusion/exclusion of single patients when changes are expressed as percentage differences.

Again, Table 3 showed differences in service indicators for the intermediate care cohort. Omitting patients in continuity of care reduced the median length of stay in intermediate care services by 0.5 days (-1%), 1 day (-4%) and 2 days (-5%) for CCBs, CBS and ASCCOM-CBS respectively. The mean time to first contact decreased for CCBs (-6%), whilst there was an increase of +4% and +12% for CBS and ASCCOM-CBS respectively. The median number of prior GP contacts was reduced by 14% for patients receiving ASCCOM-CBS services but was otherwise unchanged for other services.

Removing patients with continuity of care from the logistic regression model shifted statistically significant coefficients to more negative estimates. The percentage changes in IC cohort characteristics described above are not detectable when the cohort (excluding continuing care patients) is modelled separately. Therefore, overall conclusions described in section 4 are unchanged, although the cohort receiving continuity of care would benefit from being analyzed separately to determine whether it should be considered distinct from SUIC and SDIC in any further investigation.

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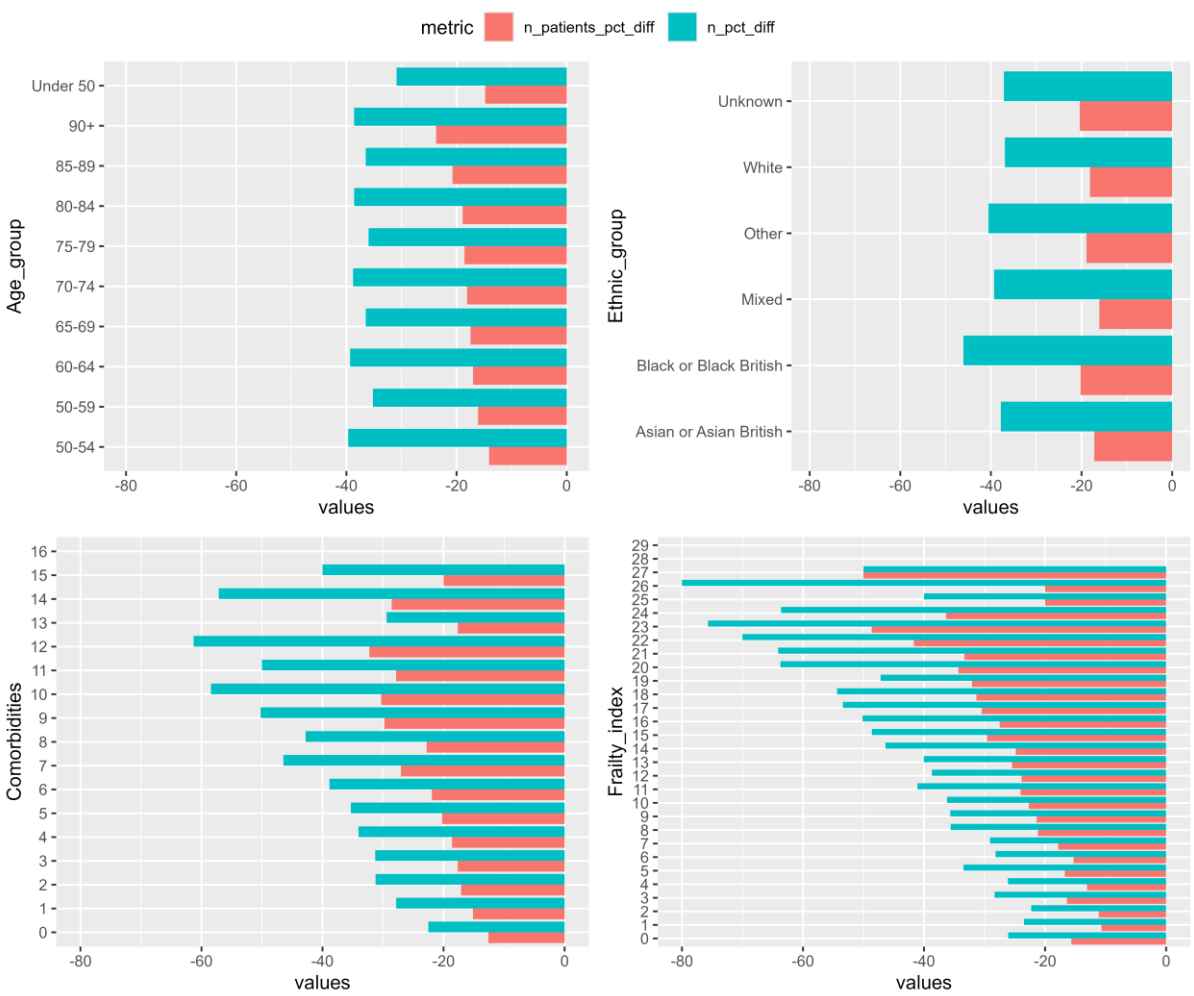
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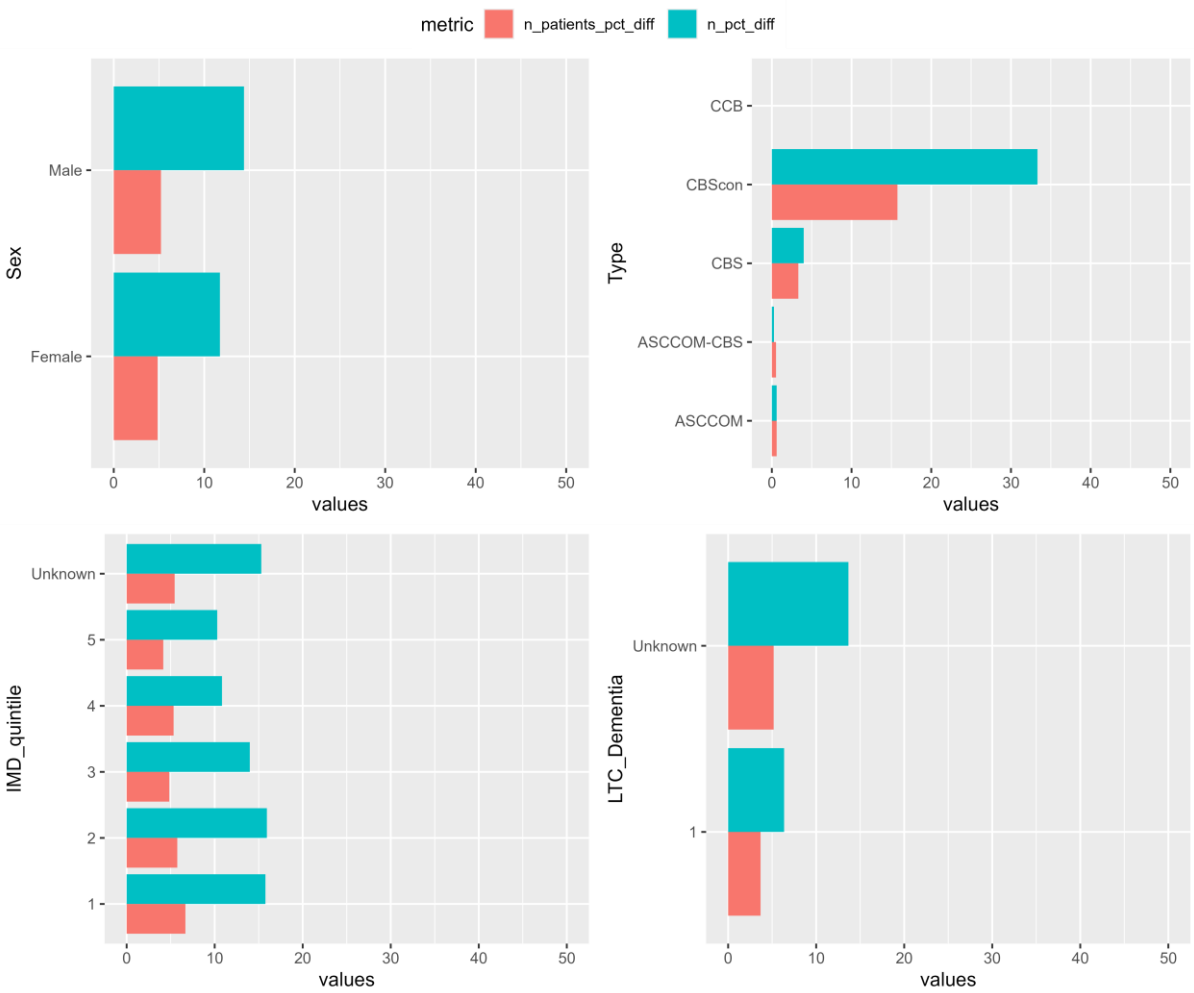

Figure A3: Percentage difference between the study cohort (including continuity or wContinuity) and the study cohort with patients receiving continuity of care excluded (woContinuity) for each categorical characteristic used in the final logistic regression model. The red and blue bars are percentage differences in hospital admissions and unique patients respectively.

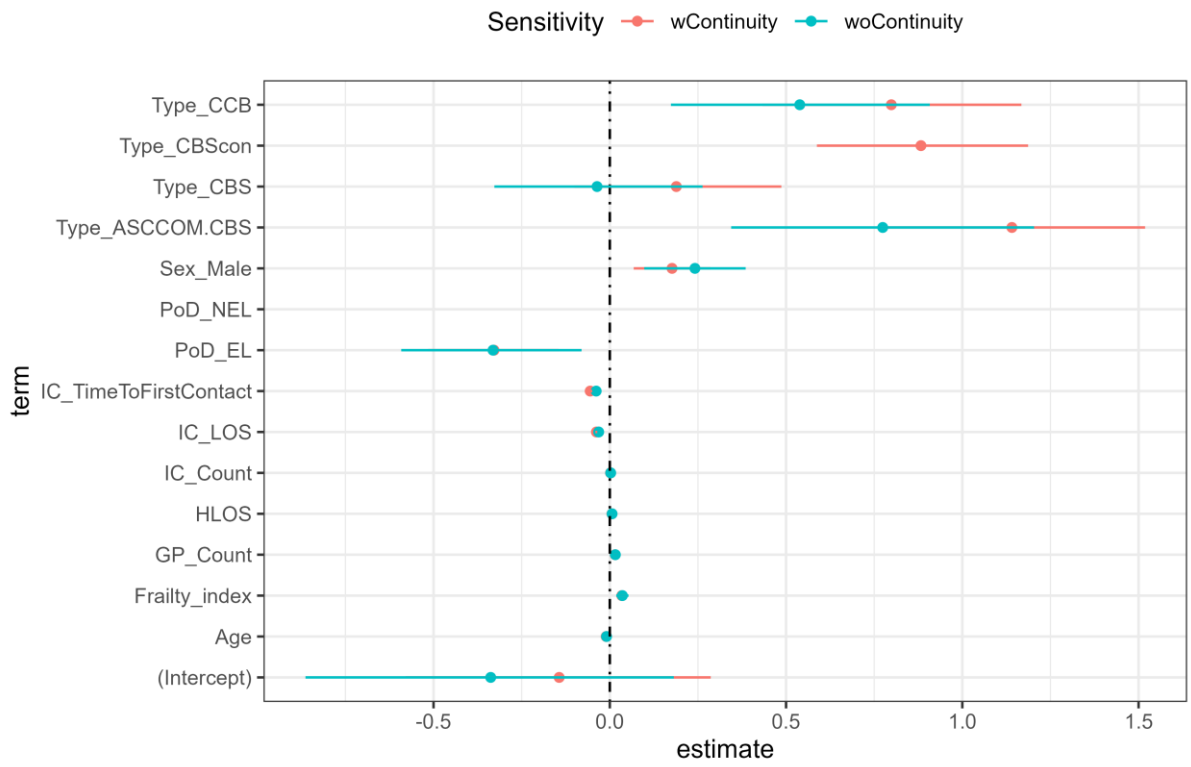

Figure A4: Comparison of the logistic regression coefficients for the likelihood of hospital readmission at 30 days (following a hospital discharge to intermediate care). Red and blue circles are the study cohort including continuity or (wContinuity) and the study cohort with patients in continuity of care excluded (woContinuity).

Appendix B

Section 3.4 describes the association between multiple variables characterized in output 1 and 2, and the likelihood of readmission to hospital at 30 days following the conclusion of step-down intermediate care. Survival analysis, more specifically Kaplin-Meier and Cox proportional hazards models are an alternative method to Logistic Regression, and due to time constraints, was used to inform CPH model design.

Unfortunately, using the same covariates violated the CPH assumption and invalidated these results. However, they can be used to design a valid model for future studies. Hospital readmissions were modelled using Kaplan-Meier curves and Cox proportional hazard models stratified by sex.

The aim was to discern the impact of:

- Sex
- Number of GP appointments 6 months prior to Acute Care Admission (GP_Count)
- Number of IC contacts 6 months prior to Acute Care Admission (IC_Count)
- Age
- Hospital length of stay (HLOS)
- Length of Stay in Intermediate Care (IC_LOS)
- Time (in days) between Hospital Discharge and 1st intermediate care contact
- Electronic Frailty Index
- Number of comorbidities

- Type of intermediate care services received.

To incorporate patients who died following discharge from intermediate care services, they were right censored in this analysis. This involved including patients in the study until the time of their death or the end of the study period (in this instance – 30 days), whichever occurred first.

There should have been further data preprocessing for CPH models which involved several steps to ensure that the data is appropriately formatted and prepared for analysis. Further work would involve removing or imputing missing values, checking for outliers, selecting relevant covariates or considering interactions and nonlinear effects, transforming variables and standardising / normalising variables.

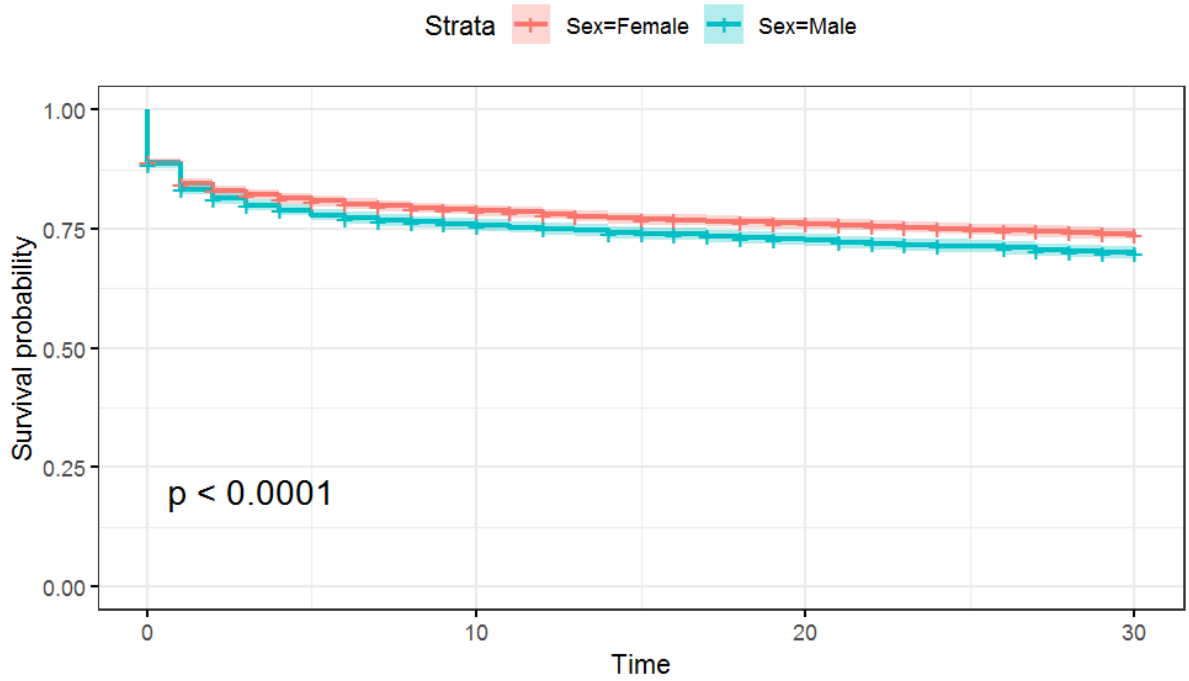

Figure B1: A Kaplan-Meier curve stratified by sex which shows the probability of readmission over time, following the completion of intermediate care.

The most prominent feature of the KM curve shown in Figure B1 is the step at time equals Zero (days) ie Scheduled intermediate care services end due to readmission and further readmissions within seven days. Figure B1 shows the survival probability stratified by Sex. There is a clear difference between the probability of readmission between males and females, which diverges within a week.

survX	statistic.log	statistic.wald	concordance	r.squared	AIC	BIC
surv30	1563.86	1415.80	0.72	0.15	42727.47	42798.12
surv60	1522.72	1405.23	0.70	0.14	50729.12	50801.82
surv90	1534.45	1430.31	0.69	0.15	56467.04	56541.03

Table B1: Metrics to determine goodness-of-fit and predictive accuracy. SurvX represents results from models which have hospital readmission at 30, 60 and 90 days respectively (X)

Table B1 was considered when selecting the best model, but the difference in metrics was negligible so readmission at 30 days stratified by Sex was selected as a comparator with LR model presented in section 3.4, despite the violation of CPH assumptions.

It is clear from both the concordance index and R-squared value that the predictive accuracy and explanatory power of the model is poor. Whether this analysis offers any useful insight given the violation of assumptions and low metrics is currently undetermined.

term	estimate	std.error	statistic	p.value	conf.low	conf.high
TypeASCCOM-CBS	2.617	0.133	7.247	0.000	2.017	3.394
TypeCBScon	1.817	0.110	5.440	0.000	1.465	2.254
TypeCCB	1.664	0.135	3.765	0.000	1.277	2.169
TypeCBS	1.057	0.110	0.509	0.611	0.853	1.311
Comorbidities	1.047	0.010	4.530	0.000	1.026	1.068
Frailty_index	1.020	0.006	3.303	0.001	1.008	1.032
GP_Count	1.008	0.002	4.012	0.000	1.004	1.012
HLOS	1.005	0.001	4.836	0.000	1.003	1.007
IC_Count	1.002	0.000	6.037	0.000	1.001	1.003
Age	0.991	0.002	-6.082	0.000	0.988	0.994
IC_LOS	0.968	0.001	-30.054	0.000	0.966	0.970
IC_TimeToFirstContact	0.952	0.005	-10.546	0.000	0.943	0.961
SexMale	-	-	-	-	-	-

Table B2: Coefficient estimates (exponentiated) from a Cox Proportional Hazard model with readmission at 30 days following discharge from step-down intermediate care.

In summary, the interpretation of these exponentiated estimates suggests that various factors (variables or terms) contribute to the risk of hospital readmission. Some variables are associated with increased risk (hazard ratio > 1), while others are associated with reduced risk (hazard ratio < 1). Factors with hazard ratios substantially greater than 1, such as Reablement and Community based services (ASCCOM-CBS ie ”cross-pathway-care”) and continuity of care (CBScon) have a particularly notable impact on the risk of hospital readmission. Understanding these factors could help healthcare professionals identify individuals at higher risk and implement targeted interventions to reduce hospital readmission rates.

Other counter-intuitive results should also be noted and require further explanation.

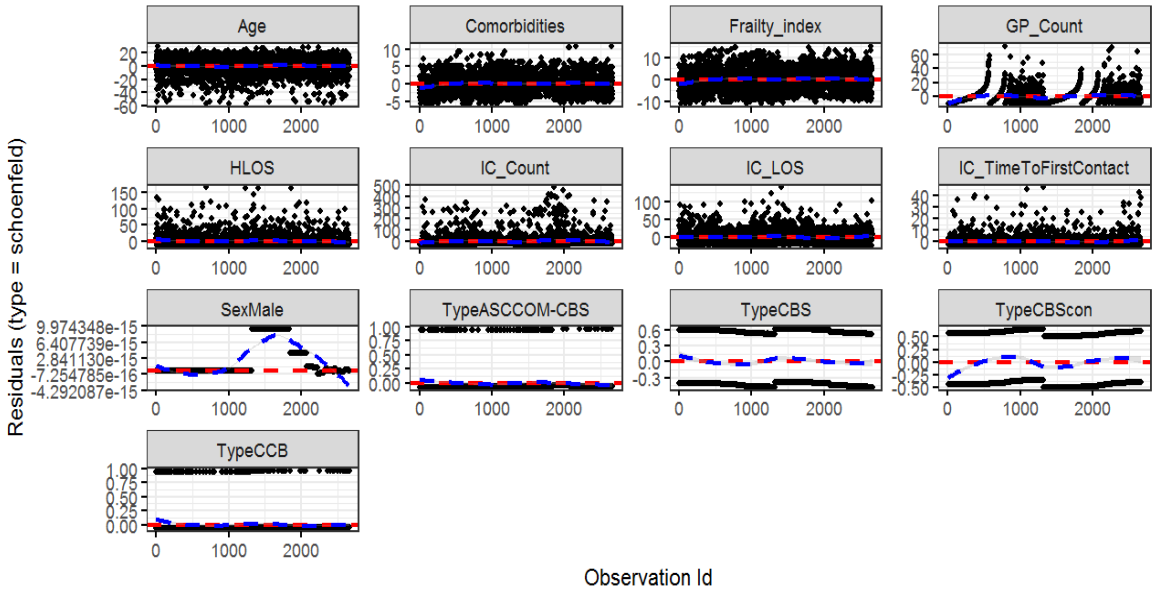

Figure B2: Schoenfeld residuals by observation for each covariate used in the Cox Proportionate Hazard model to predict readmission at 30 days following discharge from step-down intermediate care.

From Figure B2, several variables show systematic patterns or trends in Schoenfeld residuals across the observations, which may indicate violations of the proportional hazards assumption at the individual level. For example, if Schoenfeld residuals exhibit a consistent upward or downward trend across observations, it suggests that the effect of a covariate is changing over time for certain observations, violating the assumption of proportional hazards. To address these violations, potential interactions between covariates or time-dependent covariates could be introduced where appropriate.

In conclusion, analysis of hospital readmissions using Kaplan-Meier curves and Cox proportional hazard models attempted to provide insight into the factors influencing readmission rates 30 days after discharge from IC services. Unfortunately, by using Logistic Regression analysis as a guide and due to unreasonable time limitations, this analysis needs to be reviewed (redesigned) and SHOULD NOT be distributed without further validation of the robustness and accuracy of findings presented here.

Appendix C

Further analysis was conducted to understand how many patients died during the study period, who died within 30 days of hospital discharge, within 30 days of intermediate care discharge and who died whilst receiving intermediate care.

Overall, 1,537 (20%) of 7,320 patients from the intermediate-care cohort died during the study period with an average of 96 deaths per month between 1st May 2022 and 31st September 2023 (Figure C1). 430 (6%) died within 30 days of discharge from step-down intermediate care, 329 (5%) died whilst receiving intermediate care and 85 (1%) died within 30 days of Hospital discharge. There is an expected seasonal pattern with more deaths during the winter period, and unfortunately, there appears to be several data quality issues for deaths occurring in May 2022.

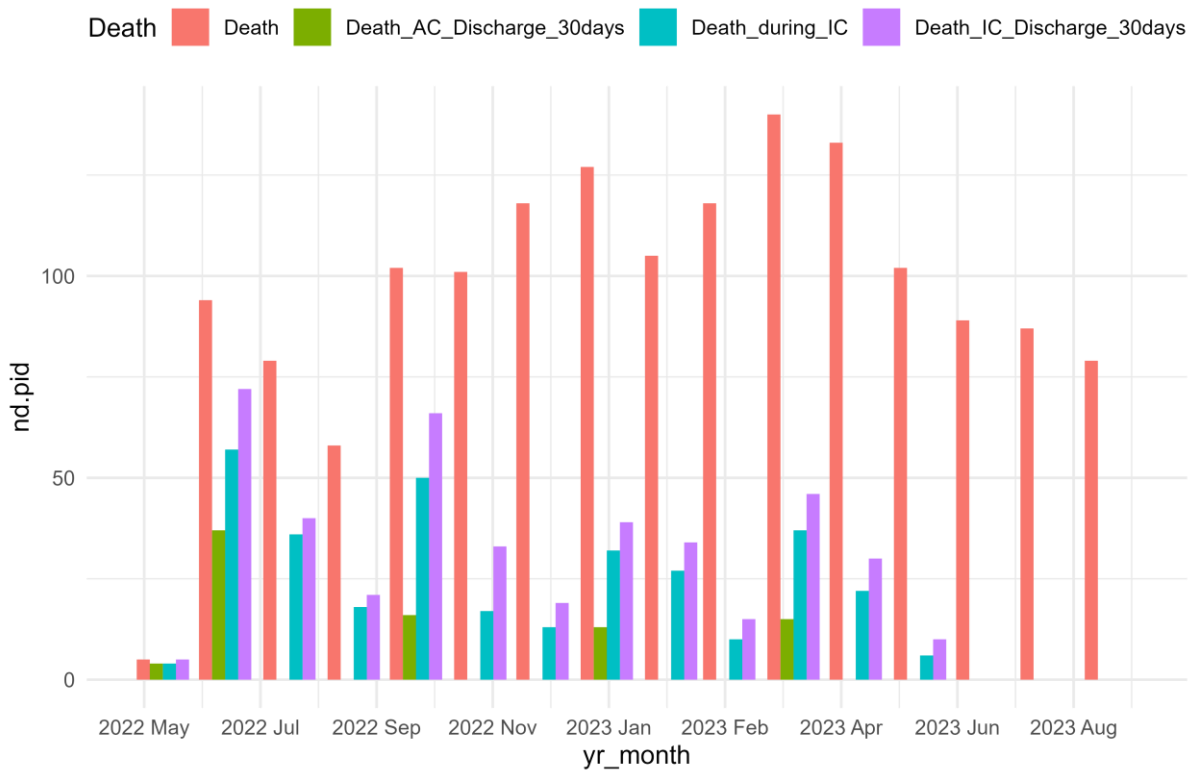

Figure C1: Number of distinct patients / pseudo-identifiers (nd.pid) included in the intermediate care cohort who died (per month) from May 2022 to September 2023. Legend indicates death during the study period (Death), death within 30 days of hospital discharge (Death_ACDis_30days), death within 30 days of intermediate care discharge (Death_ICDis_30days) and those who died whilst receiving intermediate care (Death_during_IC).

Variable	Status	Category	Death	Death_ACDis_30days	Death_ICDis_30days	Death_during_IC
T1_1_Overall	Died	overall	1537	85	430	329
T1_1_Overall	Survived	overall	5783	1476	1243	1308
T1_2_Sex	Died	Female	782	47	218	164
T1_2_Sex	Died	Male	755	38	212	165
T1_2_Sex	Survived	Female	3148	749	628	663
T1_2_Sex	Survived	Male	2635	727	615	645
T1_3_Age_group	Died	50-54	29	5	10	9
T1_3_Age_group	Died	50-59	36	-	13	10
T1_3_Age_group	Died	60-64	55	8	20	16
T1_3_Age_group	Died	65-69	107	9	27	23
T1_3_Age_group	Died	70-74	139	7	41	25
T1_3_Age_group	Died	75-79	263	13	77	62
T1_3_Age_group	Died	80-84	258	12	70	51
T1_3_Age_group	Died	85-89	311	15	81	65
T1_3_Age_group	Died	90+	303	11	75	54
T1_3_Age_group	Died	Under 50	36	-	16	14
T1_3_Age_group	Survived	50-54	183	26	22	23

T1_3_Age_group	Survived	50-59	312	35	28	31
T1_3_Age_group	Survived	60-64	379	49	43	44
T1_3_Age_group	Survived	65-69	519	102	91	93
T1_3_Age_group	Survived	70-74	655	134	112	122
T1_3_Age_group	Survived	75-79	891	254	217	226
T1_3_Age_group	Survived	80-84	860	247	207	217
T1_3_Age_group	Survived	85-89	931	301	252	263
T1_3_Age_group	Survived	90+	646	294	244	261
T1_3_Age_group	Survived	Under 50	407	34	27	28
T1_4_Ethnic_group	Died	Asian or Asian British	44	-	14	11
T1_4_Ethnic_group	Died	Black or Black British	28	-	7	6
T1_4_Ethnic_group	Died	Mixed	3	-	-	-
T1_4_Ethnic_group	Died	Other	5	-	-	-
T1_4_Ethnic_group	Died	White	1372	77	381	295
T1_4_Ethnic_group	Died	Unknown	85	5	26	16
T1_4_Ethnic_group	Survived	Asian or Asian British	190	43	36	38
T1_4_Ethnic_group	Survived	Black or Black British	101	27	22	22
T1_4_Ethnic_group	Survived	Mixed	40	-	-	-
T1_4_Ethnic_group	Survived	Other	22	5	-	-
T1_4_Ethnic_group	Survived	White	5123	1317	1112	1168
T1_4_Ethnic_group	Survived	Unknown	307	81	66	73
T1_5_IMD_quintile	Died	1	187	15	61	48
T1_5_IMD_quintile	Died	2	300	14	79	58
T1_5_IMD_quintile	Died	3	236	12	59	50
T1_5_IMD_quintile	Died	4	160	8	40	31
T1_5_IMD_quintile	Died	5	467	19	102	75
T1_5_IMD_quintile	Died	Unknown	187	17	89	67
T1_5_IMD_quintile	Survived	1	736	176	147	155
T1_5_IMD_quintile	Survived	2	1003	290	242	259
T1_5_IMD_quintile	Survived	3	892	228	188	196
T1_5_IMD_quintile	Survived	4	719	153	136	140
T1_5_IMD_quintile	Survived	5	2008	451	396	415
T1_5_IMD_quintile	Survived	Unknown	425	178	134	143
T1_8_Frailty_Level	Died	fit	244	23	88	67
T1_8_Frailty_Level	Died	mild	354	19	108	83
T1_8_Frailty_Level	Died	moderate	393	17	95	66

T1_8_Frailty_Level	Died	severe	546	26	139	113
T1_8_Frailty_Level	Survived	fit	1242	226	182	195
T1_8_Frailty_Level	Survived	mild	1710	345	279	297
T1_8_Frailty_Level	Survived	moderate	1466	382	327	344
T1_8_Frailty_Level	Survived	severe	1365	523	455	472
T1_9_LTC_Dementia	Died	1	190	8	60	44
T1_9_LTC_Dementia	Died	Unknown	1347	77	370	285
T1_9_LTC_Dementia	Survived	1	475	184	148	162
T1_9_LTC_Dementia	Survived	Unknown	5308	1292	1095	1146

Table C1: Demographic characteristics of patients from the intermediate care cohort who died during the study period. The status "Died" means a patient died in a particular time period (see text for further details) and "Survived" meant they lived during the period but died at some other time during the study. Note that statistical disclosure processes have been applied to values lower than 5.

Table C1 shows how many patients died in specific time periods:

1) during the study period (Death)
2) within 30 days of hospital discharge (Death_ACDis_30days)
3) within 30 days of intermediate care discharge (Death_ICDis_30days)
4) died whilst receiving intermediate care (Death_during_IC).

Further investigation is required to explain Table C1. Some variable categories may contain slight inaccuracies and require code corrections, but these results provide some valuable insight into deaths of patients who receive step-down intermediate care.