

# An Early Supported Discharge (ESD) Model of Care for Older Adults Admitted to Hospital: A Descriptive Cohort Study

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**Background:** Early supported discharge (ESD) facilitates early discharge from acute hospitals with continued rehabilitation in the home environment from a multi-disciplinary team at the same intensity as would be received in the inpatient setting. Emerging evidence suggests it can have a positive impact on the care of older adults on discharge from the acute hospital setting to home. This study aims to characterize an inreach model of ESD for older adults discharged from four hospitals in the Mid-West of Ireland and describe its impact on clinical and process outcomes at 30 and 180 days.

**Methods:** Consecutive older adults referred for ESD from four hospitals were recruited over six-months. Baseline assessments were carried out on initial review, and patients were followed up at 30 and 180 days by an independent outcome assessor. Outcomes measured include functional status, frailty, health related quality of life, mortality, and healthcare utilization.

**Results:** One hundred and thirty older adults (mean age 76.62 years, SD 9.81 years) were recruited, 44 for surgical complaints and 86 for medical complaints. The ESD service was provided over a median of 31 (medical) - 44 (surgical) days, primarily by physiotherapy and occupational therapy. The incidence of functional decline was 16.41% at 30 days and 27.5% at 180 days. There was a significant improvement in the self-reported function from index visit 72.94 (19.50) mean standard deviation (SD) to 30 days 84.05 (21.08) mean (SD) which was maintained at 180 days 80.53 (30.93) mean (SD). Frailty was independently associated with incidence of functional decline at 30 days (OR 2.06, 95% CI 1.39 to 3.06) and 180 days (OR 1.7, 95% CI 1.29 to 2.24).

**Conclusion:** An ESD model of care can have significant effects on patient outcomes for older adults admitted to hospital at 30 and 180 days, without increasing the risk of unscheduled Emergency Department re-presentation. Future research should explore the impact of an ESD model of care on specific older adult cohorts.

**Keywords:** early supported discharge, older adult, hospitalization, patient discharge, cohort studies

## Introduction

Global projections indicate that the number of older adults ( $\geq 65$  years) is set to rise from one billion in 2019, to 1.4 billion in 2030, and further increase to 2.1 billion by 2050.<sup>1</sup> Older adults are the largest consumers of health services, and it is recognized that older adults presenting to acute and emergency care settings are doing so with an increasing complexity.<sup>2</sup> Over half of older adults who present to the Emergency Department (ED) are subsequently admitted for inpatient care.<sup>3</sup> While an inpatient, older adults are more likely to experience a longer length of stay (LoS), as well as being at risk of functional decline with a reduced likelihood of recovering from the same.<sup>4,5</sup> A systematic review and meta-analysis of 15 studies found a prevalence of hospital associated disability of 30% (95% CI 24% to 36%) in older adults, however high levels of heterogeneity were observed.<sup>6</sup> This hospital associated deconditioning leads to an increased dependency at the time of discharge, along with increasing the risk of readmission.<sup>7</sup>

Early supported discharge (ESD) is a discharge intervention aimed at linking acute and community care, by providing patients with multi-disciplinary team (MDT) input in their own home, more than otherwise would be possible with community care.<sup>8</sup> ESD is well established in the stroke population, with a Cochrane review of 17 randomized controlled trials (RCTs) by Langhorne, Baylan, and Trialists<sup>8</sup> demonstrating a reduction of six days in a patient's LoS when compared to usual care (MD = -5.5, 95% CI -3 to -8 days,  $P < 0.0001$ ). In an older adult population admitted with undifferentiated medical complaints, a systematic review and meta-analysis of five RCTs by Williams, Morrissey, Steed, Leahy, Shanahan, Peters, O'Connor, Galvin, and O'Riordan<sup>9</sup> demonstrates statistically significant reductions in LoS in older adults who receive an ESD intervention ( $n = 533$ ) when compared to usual care ( $n = 490$ ) (REM, MD = -6.04, 95% CI -9.76 to -2.32,  $I^2 = 90\%$ ,  $P = 0.001$ ), with no associated increase in adverse outcomes. Similarly, there was a significant reduction in LoS among older adults who received ESD post-orthopedic surgery (REM, MD = -5.57, 95% CI -7.07 to -4.08,  $I^2 = 0\%$ ,  $P = 0.95$ ) in a recent evidence synthesis of five studies.<sup>10</sup> Across both systematic reviews, there was heterogeneity and inconsistency in terms of the reporting of MDT composition, duration, and intensity of the ESD interventions provided and in the outcomes that were measured. Nine RCTs provided an inreach service, five provided an outreach intervention and three studies provided a mixture of both inreach and outreach teams. To this end, the certainty of evidence for ESD as a model of care for older adults admitted to hospital remains moderate across clinical and process outcomes.

In a qualitative evidence synthesis carried out by Connor, Dolan, Horgan, Galvin, and Robinson<sup>11</sup> of 14 studies exploring stakeholders' experiences of an ESD intervention after stroke, ESD was seen as a method of optimizing rehabilitation due to the home environment creating a sense of empowerment for patients post stroke. ESD was identified as a collaborative and goal-orientated intervention between the patient and their team of healthcare professionals (HCPs), however the transition from ESD to further community services was seen as challenging due to the accessibility and availability of such resources. These findings mirror a recent qualitative study by Williams, O'Riordan, Steed, Leahy, Shanahan, Peters, O'Connor, Galvin, and Morrissey<sup>12</sup> that explored the views and perspectives of older adults, their carers, and HCPs involved in older adult care on the potential role of an ESD model of care for the older adult population. Similar to Connor, Dolan, Horgan, Galvin, and Robinson,<sup>11</sup> the proposed benefits of home-based rehabilitation were discussed, along with potential challenges including the lack of integration between acute and community services as well as the potential role of a key worker in the management of the transition between the acute and home setting.

Despite the emerging evidence suggesting the benefits of ESD for an older adult population, it is yet to be explored as a model of care in the Irish healthcare setting. Figure 1 demonstrates the relationships between the key concepts discussed and identifies where ESD may play a role in existing health services.

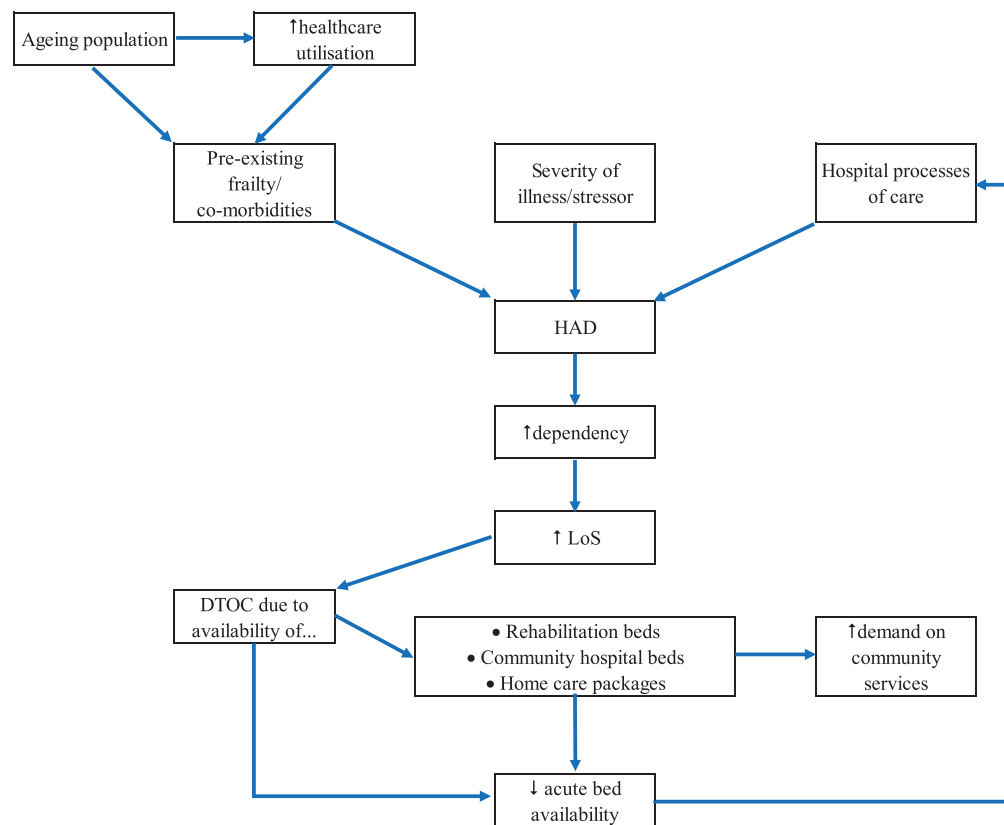
Taking the findings of existing quantitative and qualitative literature, this study aims to address the gaps discussed by characterizing an inreach community-based model of ESD care. Specifically, the objectives of this study are:

- To explore the components of an ESD model of care delivered by the Mid-West Multidisciplinary Community Intervention Teams (MDCITs) for older adults admitted to hospital.
- To examine the impact of an ESD model of care delivered by the MDCITs on patient outcomes, inclusive of functional ability, frailty, and quality of life and process outcomes including healthcare utilization, unscheduled hospital readmissions, and unscheduled ED attendances.

## Methods

### Study Design

This represents a descriptive cohort study. The STROBE standardized reporting guidelines for cohort studies were followed in the conduct and reporting of this study – see Appendix 1.<sup>13</sup> Participant data collection and follow-up took place from December 2022 to December 2023 (inclusive). See Appendix 2 for abbreviations.



**Figure 1** Relationships between key concepts.

## Ethical Approval

Ethical approval was granted by the HSE Mid-Western Area Regional Ethics Committee in November 2021 (REC Ref: 112/2022). The Declaration of Helsinki (2013) was adhered to in the context of participants receiving an intervention assessed to have greater benefits than risks and by providing written informed consent. Participants were able to withdraw from the study at any time without impacting their routine care.

## Setting

The study took place across University of Limerick Hospital Group (ULHG) sites. ULHG cares for a population of approximately 480,000 in the Mid-West of Ireland, across six hospital sites. University Hospital Limerick (UHL) is a university teaching hospital and only model 4 hospital in the region, supported by three model 2 hospitals: Ennis General Hospital (EGH), St. John's Hospital, Limerick (SJL), and Nenagh General Hospital (NGH). Croom Orthopedic Hospital (COH) is the region's main orthopedic hospital. There are over 750 hospital beds in the hospital group, excluding the region's maternity hospital. A total of 79,892 ED attendances were recorded in 2022, of which 15% were those aged over 75 years.<sup>14</sup>

## Population

Older adults aged  $\geq 65$  years who were discharged home from ULHG with a referral to MDCIT between December 2022 and June 2023 were deemed eligible for recruitment. Patients were excluded if they were deemed to not have decision making capacity to provide informed consent. While this criterion excluded a proportion of older adults from study recruitment, there was a pre-existing exclusion criterion for those referred to the MDCIT teams. Recruiting therapists excluded patients at their own discretion if they felt recruitment to the study was not appropriate at the time of recruitment.

Intervention

The MDCITs comprise specialist and healthcare teams that provide a rapid and integrated response to a patient with an acute episode of illness who requires enhanced services/acute intervention for a defined short period of time. This is provided in the patient’s home after an acute hospital admission, thereby facilitating early discharge. The MDCIT intervention is composed of Occupational Therapy (OT), Physiotherapy (PT), and healthcare assistants (HCA), with nursing support as required. Prior to the recruitment period beginning, the MDCIT service was in operation for a number of months, however a formal evaluation of the service was not conducted.

The service is provided across three counties: Clare, Limerick, and North Tipperary, with each county having its own MDCIT team. A patient’s home address determines which team will be providing their care. Patients are referred to the MDCIT service from the acute hospital setting by ED and ward-based therapy staff on a therapist–therapist (PT and/or OT) referral basis. The MDCIT therapists aim to make their first visit to patients within 24–48 hours of hospital discharge. Patients receive two-three visits per week, over a period of up to six weeks dependent on the patient’s ongoing rehabilitation needs and service capacity. Upon discharge from the MDCIT service, patients can be referred to community services as indicated by therapists.

Table 1 explores how this study aims to address key uncertainties identified in existing literature.

Recruitment and Data Collection

Index Visit

At index/initial attendance, a clinical member of the MDCIT provided prospective participants with an information leaflet and explained the objective of the study. If the participants agreed to take part, they were asked to read and sign a consent form. This MDCIT team member was then identified as the patient’s key worker. All participants had time prior to their initial assessment taking place to consider their participation and had the opportunity to ask any questions about the study.

After consenting to recruitment, each participant underwent a baseline assessment inclusive of a demographic questionnaire and a health assessment. Demographic information included participant’s sex, age, marital status, residential status (living alone, living with family, other), ethnicity, socioeconomic status (level of education, past/present occupation), and the site of referral within the five sites in the hospital group. The health assessment comprised the following measurements:

- A global measure of functional ability through the self-rated Barthel Index (BI) for activities of daily living.<sup>15</sup> BI is a widely used observational instrument for assessing physical function in older adults, composed of an ordinal scale measuring the performance of 10 ADLs. The BI has demonstrated sufficient internal consistency, structural validity, and inter-rater reliability in the older adult population.<sup>16</sup>
- HRQoL through the EuroQoL survey 5-dimension and 5-levels form (EQ-5D-5L).<sup>17</sup> The EQ-5D-5L measures HRQoL through five self-rated dimensions of health – mobility, usual activities, pain/self-comfort, anxiety/

Table 1 Key Uncertainties Addressed

Population	<ul style="list-style-type: none"><li>• An older adult population discharged from ULHG with medical or surgical complaints were included.</li></ul>
Intervention/ Exposure	<ul style="list-style-type: none"><li>• An inreach community-based model of ESD was provided.</li><li>• A key case worker was allocated to each participant.</li><li>• An MDT intervention was provided, led by Allied Health – PT and OT, with input available from nursing and HCA as required.</li><li>• Personalized case management underpinned by the principles of Comprehensive Geriatric Assessment (CGA).</li><li>• Intervention provided for approximately six weeks, with the participants being visited by team members 2–3 times/week – variable on a case-by-case basis.</li></ul>
Outcomes	<ul style="list-style-type: none"><li>• Patient and process outcomes were assessed inclusive of function, frailty, HRQoL, unscheduled hospital re-presentations, unscheduled hospital readmissions, mortality, and healthcare utilization.</li></ul>

depression, self-care – with five levels of answers to choose from. A visual analogue scale (VAS) ranging from 0–100 is used to indicate self-reported overall health. The EQ-5D-5L has demonstrated validity and responsiveness in the older adult population, as well as discriminant validity with the BI.<sup>18</sup>

- Frailty status through Rockwood's Clinical Frailty Scale (CFS).<sup>19</sup> The CFS is a clinical judgement-based frailty screening assessment tool, which evaluates dimensions such as function, cognition, and co-morbidities on a scale from 1 (very fit) - 9 (terminally ill). The CFS has been shown to have good predictive ability for adverse clinical outcomes in older adults.<sup>20</sup>

Following baseline assessment, participants underwent a multidisciplinary intervention across domains including, but not limited to functional, cognitive, and psychosocial abilities, as well as environmental modification as appropriate. Members of the team were guided by their clinical expertise and competencies, scope, and codes of professional practice. The number of encounters with each HCP was captured by the lead HCP in the patients care to characterize the tailored MDCIT service. To ensure accuracy, the patients notes documented by the MDCIT teams were cross-checked by a research nurse working on the project.

### Follow-up Assessments

An independent research nurse not involved in the person's routine care completed follow-up telephone interviews with participants at 30 days and 180 days. They completed the Patient Assessment of Integrated Elderly Care (PAIEC) at 30-day follow-up to explore participants' satisfaction with their care.<sup>21</sup> The BI, EQ-5D-5L, and CFS were repeated with patients at 30 days and 180 days. Data on objective measures such as unscheduled ED reattendance(s), hospital (re) admission(s), nursing home admission, and death were ascertained from routine hospital data. Withdrawals and participants lost to follow-up were also recorded.

### Outcome Variables

Functional ability was assessed using the BI. Secondary outcomes included HRQoL using the EQ-5D-5L, frailty score using the CFS, patient satisfaction, acute hospital LoS, unscheduled ED re-attendance(s), unscheduled hospital (re) admission(s), nursing home admission(s), healthcare utilization, and death.

### Sample Size

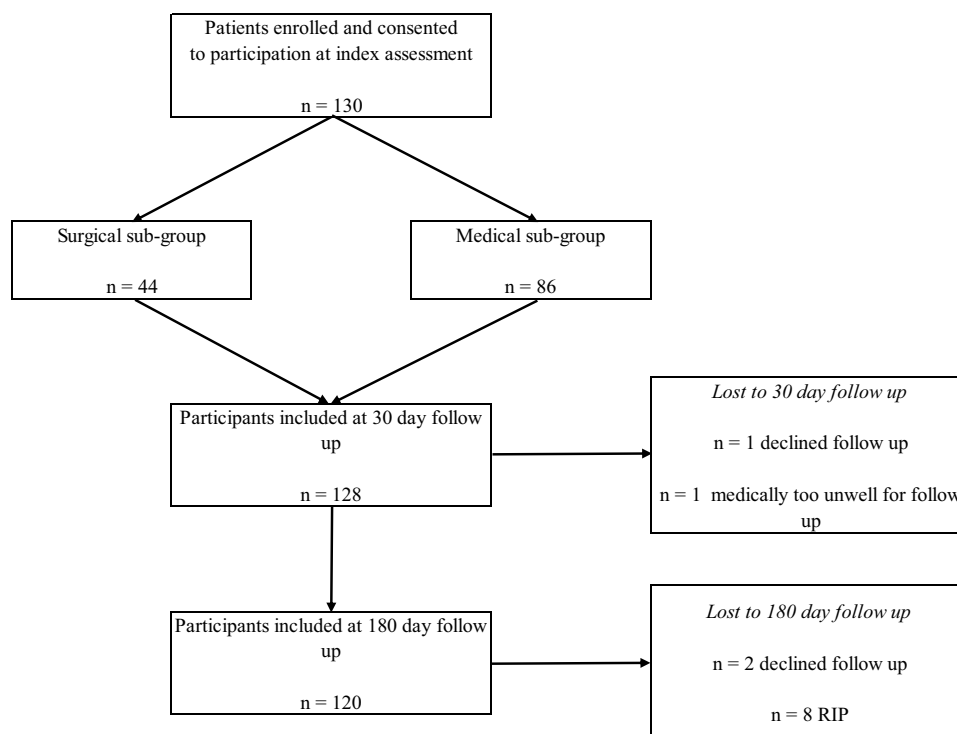
All prospective participants who met inclusion criteria during the study period were invited to participate. Our study was not hypothesis driven; therefore, formal power calculations are not applicable.

### Statistical Analysis

Descriptive statistics were used to profile the baseline characteristics of the total cohort split by the source of referral – medical or surgical. Categorical measures - eg, sex, were analyzed in terms of frequencies and percentages; continuous measures – eg, CFS, were analyzed in terms of means and standard deviations. Descriptive statistics were also used to profile the number of MDCIT interventions provided at index-30 days, 30–180 days, and index-180 days. Repeated measure ANOVAs were conducted to examine differences in functional decline (BI) and HRQoL (EQ-5D-5L) across all 3 time-points – index, 30 days, and 180 days. Moreover, a one-way ANOVA was conducted to examine differences in patient satisfaction (PAIEC) across the three MDCIT teams – Limerick, Clare, and Tipperary. A multivariate logistic regression was conducted to explore predictors (eg, frailty and number of MDCIT intervention) of functional decline at 30 days and 180 days. Regarding process outcomes, separate multivariate logistic regression models were conducted to explore predictors of ED re-attendance use at 30 and 180 days.

### Results

A total of 130 patients (mean age 76.623 years, SD 9.812 years) were recruited from December 2nd, 2022, to June 30th, 2023, across the three MDCIT teams, see [Figure 2](#) for an overview of recruitment and follow-up. [Table 2](#) describes the demographics of the patients included. The median (IQR) age of medical patients was 79 years ( $\pm 13.75$  years), and for



**Figure 2** Participant recruitment and follow-up.

surgical patients was 77 years (14.25 years), with females representing 62.308% of the total cohort. The median (IQR) hospital LoS pre-MDCIT input was 12 (15) days for medical patients and 12 (14.75) days for surgical patients. Slightly more of the surgical cohort lived with family at 65.909%, compared with 58.14% of those in the medical cohort. Across both groups, the most prevalent presenting complaint was falls (56.923%), followed by stroke (5.385%), increasing

**Table 2** Patient Demographics

		Medical		Surgical		Total	
		n = 86		n = 44		n = 130	
		n =	%	n =	%	n =	%
<b>Sex</b>	Female	53	61.63	28	63.64	81	62.31
	Male	33	38.37	16	36.36	49	37.69
<b>Ethnicity</b>	White Irish	84	97.67	44	100	128	98.46
	Unknown	2	2.33	0	0	2	1.54
<b>Marital status</b>	Married	44	51.16	31	70.46	75	57.69
	Widowed	26	30.23	6	13.64	32	24.62
	Single	10	11.63	4	9.09	14	10.77
	Separated/divorced	4	4.65	1	2.27	5	3.85
	In a relationship	2	2.33	1	2.27	3	2.31
	Missing data	0	0	1	2.27	1	0.77

(Continued)

Table 2 (Continued).

		Medical		Surgical		Total	
		n =	%	n =	%	n =	%
Residential status	Lives with family	50	58.14	29	65.91	79	60.77
	Lives alone	31	36.05	14	31.82	45	34.62
	Other	5	5.81	1	2.27	6	4.62
Socio-economic status	Very affluent	0	0	0	0	0	0
	Affluent	5	5.81	1	2.27	6	4.62
	Marginally above average	32	37.21	20	45.46	52	40
	Marginally below average	33	38.37	15	34.09	48	36.92
	Disadvantaged	2	2.33	5	11.36	7	5.39
	Very disadvantaged	7	8.14	3	6.82	10	7.69
	Extremely disadvantaged	7	8.14	0	0	7	5.39
Living circumstances	Bungalow	42	48.84	21	47.73	63	48.46
	Two story house	41	47.67	19	43.18	60	46.15
	Three story house	0	0	1	2.27	1	0.77
	Ground floor apartment	0	0	1	2.27	1	0.77
	Above ground floor apartment	1	1.16	0	0	1	0.77
	Sheltered housing	0	0	1	2.27	1	0.77
	Missing data	1	1.16	1	2.27	2	1.54
Smoking	Unknown	78	90.7	42	95.46	120	92.31
	Never	4	4.65	1	2.27	5	3.85
	Active	2	2.33	1	2.27	3	2.31
	Previous	2	2.33	0	0	2	1.54
Alcohol consumption	Unknown	78	90.7	43	100	121	93.08
	Never	3	3.49	0	0	3	2.31
	Active	2	2.33	1	2.27	3	2.31
	Previous	2	2.33	0	0	2	1.54
	Occasional	1	1.163	0	0	1	0.77
Falls in past 12 months	Yes	59	68.61	31	70.46	90	69.23
	No	27	31.4	13	29.55	40	30.77
Referral source	UHL					60	46.15
	COH					44	33.85
	ED					16	12.31
	NGH					8	6.15

(Continued)

**Table 2** (Continued).

	EGH	1	0.77
	SJL	0	0
<b>Reason for referral</b>	PT	126	96.92
	OT	116	89.23
	Nursing	29	22.31
	HCA	18	13.85
<b>Presenting complaint</b>	Falls	74	56.92
	Reduced mobility	7	5.39
	Post stroke	7	5.39
	Increased frailty	7	5.39
	Post total hip replacement	5	3.85
	Sepsis	4	3.08
	Liver failure	3	2.31
	COVID-19	3	2.31
	Confusion	3	2.31
	Urosepsis	2	1.54
	Post road traffic accident	2	1.54
	Twisting injury	2	1.54
	Pneumonia	2	1.54
	Breathlessness	1	0.77
	Pleural effusion	1	0.77
	Post total knee replacement	1	0.77
	Functional decline	1	0.77
	Syncope	1	0.77
	Dizziness	1	0.77
	Delirium	1	0.77
	Hip pain	1	0.77
	Lower respiratory tract infection	1	0.77
	Wound infection	1	0.77
	Congestive heart failure	1	0.77
	Deep vein thrombosis	1	0.77

frailty (5.385%) and reduced mobility (5.385%). Almost 70% had experienced a fall in the previous 12 months across both groups. While one patient was noted to have delirium, this was on initial presentation to the ED and had resolved at the point of discharge, hence allowing the patient to be included in the study.

Referrals were primarily made for PT input ( $n = 126$ ) and OT input ( $n = 116$ ), with 29 referrals being made for nursing and 18 for HCA support. The MDCITs were predominantly staffed with 2 WTE PT, 1 WTE OT, and 1 WTE PT/OT assistant per team. Nursing and HCA support for WTE varied depending on service demand, but there were no instances where services required were unable to be provided when requested.

## Outcomes at Index Assessment

Table 3 describes the baseline patient assessments. For the medical cohort, on initial assessment, the median (IQR) BI was 80 (23.75), the median (IQR) CFS was 5 (2), and the median (IQR) EQ-5D-5L was 13 (5), with a median (IQR) EQ-5D-5L VAS score of 50 (20). In the surgical group, on initial assessment, the median (IQR) BI was 70 (21.25), the median (IQR) CFS was 6 (2.25), and the median (IQR) EQ-5D-5L was 13 (3.25), with a median (IQR) EQ-5D-5L VAS score of 60 (20).

## Service Provision

In terms of number of days spent in the MDCIT service, the surgical patients had a higher median (IQR) at 44 (34) days when compared to the medical group 31 (23) days, see Table 4.

The number of interventions provided by the MDCIT teams can be seen in Table 5. Interventions were primarily provided between index assessment and 30 days, with almost 75% of interventions provided in this timeframe. PT was the intervention provided most, followed by OT.

## Patient Outcomes at 30 and 180 Days

The incidence of functional decline at 30 days was 16.41% and at 180 days was 27.5%. There was a significant improvement in self-reported function from index visit 72.939 (19.502) mean (SD) to 30 days 84.046 (21.078) mean (SD), see Table 6. This improvement was maintained at 180 days, 80.534 (30.930) mean (SD), see Figure 3. Frailty was independently associated with incidence of functional decline at 30 days (OR 2.061, 95% CI 1.386 to 3.062) and 180 days (OR 1. 95% CI 1.292 to 2.236), when controlling for the number of interventions provided.

There was a significant improvement in HRQoL measured by the EQ-5D-5L at 30 days. No significant differences were seen between 30 and 180 days, see Figure 4. Similar findings were noted in terms of the VAS portion of the EQ-5D-5L, see Figure 5. Figure 6 demonstrates the significant differences in frailty noted at 30 and 180 days. Overall, participants reported high levels of satisfaction with their care as measured by the PAIEC 83.591 (16.23) mean (SD). The breakdown of scores in the PAIEC can be seen in Table 7. Patients felt they were encouraged to take part in groups or activities only some of the time, while in most of the other outcomes patients felt they were addressed most of the time to always.

**Table 3** Index Assessments

	Medical			Surgical		
	n =	Median	IQR	n =	Median	IQR
BI	86	80	23.75	44	70	21.25
CFS	86	5	2	44	6	2.25
EQ-5D-5L	86	13	5	44	13	3.25
EQ-5D-5L VAS	85	50	20	42	60	20

**Table 4** Service Outcomes

	Medical			Surgical		
	n =	Median	IQR	n =	Median	IQR
Hospital LoS	86	12	15	44	12	14.75
No of days in MDCIT service	86	31	23	44	44	34

**Table 5** Number of MDCIT Interventions Provided

	Index-30 days	30-180 days	Index-180 days
Nurse	26	3	29
OT	172	26	198
PT	439	152	591
PT Assistant	59	57	116
OT Assistant	1	0	1
HCA	7	1	8
Total	704	239	943

**Table 6** Patient Outcomes at All Timepoints

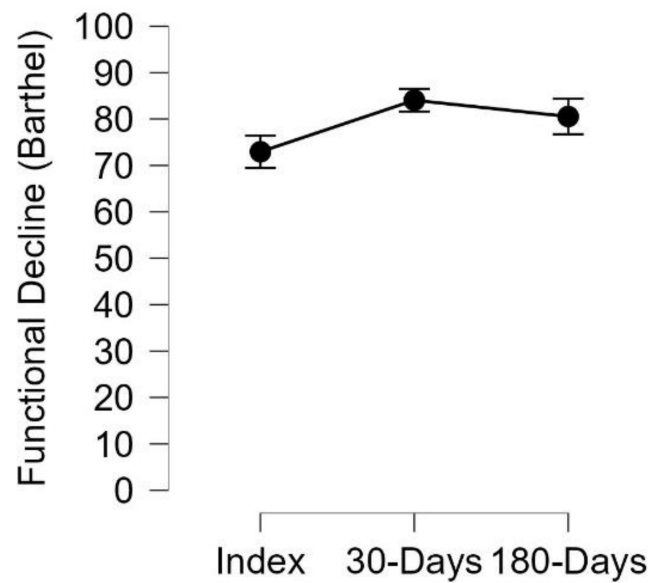
	Index		30 days		180 days	
	Mean	SD	Mean	SD	Mean	SD
BI	72.939	19.502	84.046	21.078	80.534	30.930
CFS	4.917	1.531	4.074	1.501	3.621	1.786
EQ-5D-5L	13.206	3.855	9.038	3.958	8.092	4.519
EQ-5D-5L VAS	57.521	18.425	68.846	18.953	66.709	21.347

## Process Outcomes

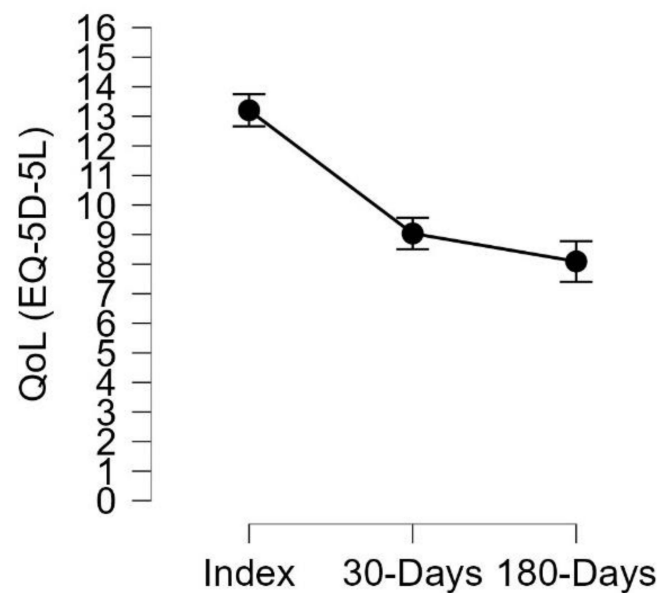
Data on process measures (unscheduled ED (re)attendance(s), unscheduled hospital admission(s), nursing home (NH) admission(s)) were available for 128 patients at 30-day follow-up. One patient declined follow-up at 30 days. 11.6% (n = 15) patients experienced an unscheduled ED attendance, 12.4% (n = 16) experienced an unscheduled hospital admission and no patients were admitted to a long-term care facility at 30 days.

Data on process measures were available for 120 patients at 180-day follow-up. Two patients declined follow-up and eight died from index to the 180-day timepoint. 28.9% (n = 35) patients experienced an unscheduled ED attendance, 27.2% (n = 33) experienced an unscheduled hospital admission and 2.5% (n = 3) were admitted to a long-term care facility at 180-day follow-up.

When controlled for the number of interventions provided, the CFS score at 30 days did not predict ED attendances at 30 days (OR 1.230, 95% CI 0.846 to 1.789) or 180 days (OR 1.199, 95% CI 0.95 to 1.514).



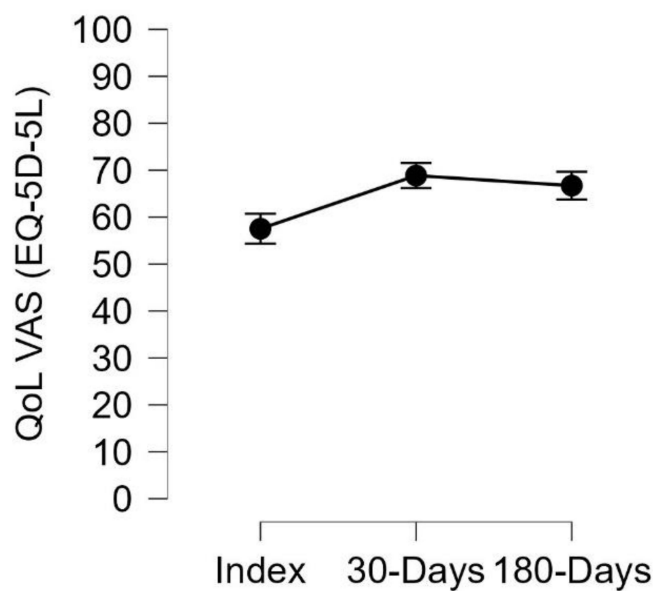
**Figure 3** Functional decline across all timepoints, as measured by the BI.



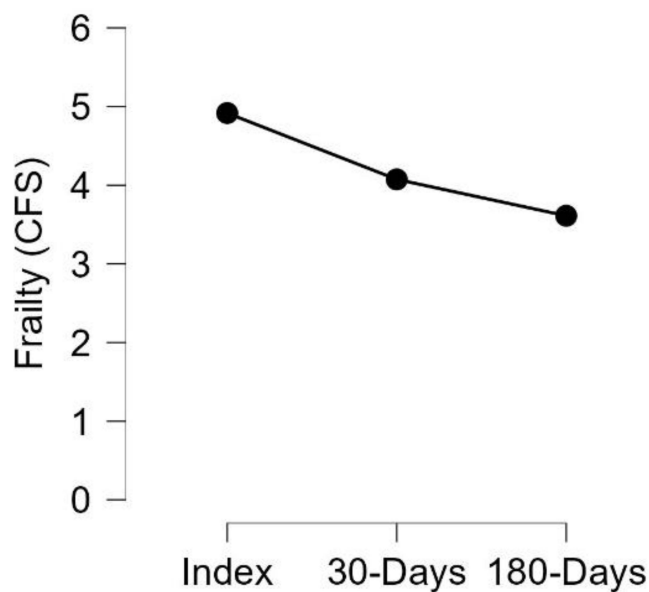
**Figure 4** HRQoL across all timepoints, as measured by the EQ-5D-5L.

## Community and Outpatient Services

In addition to the input received from the MDCIT teams, patients received input from existing community and outpatient services, see Table 8. At 30 days, 128 patients had received input from community and outpatient services, while 118 patients had received input between 30 days and 180 days. Almost a quarter of patients ( $n = 30$ ) was receiving home help (HH) at 30 days, which increased to 26.4% ( $n = 32$ ) at 180 days. GP visits were more prevalent after the 30-day timepoint, with patients receiving 309 consultations in total over the course of the study. Additional to this, patients attended 576 outpatient (OPD) appointments across medical and surgical specialties.



**Figure 5** HRQoL across all timepoints, as measured by the VAS component of the EQ-5D-5L.



**Figure 6** Frailty across all timepoints, as measured by the CFS.

## Integration of Healthcare

Onward referrals were sent for 78 patients across both groups. At 30 days, 16 PT referrals and 80 OPD clinic referrals had been sent. By 180 days, there were an additional 27 PT referrals and 189 OPD (medical and surgical) referrals sent, as well as 24 radiology and 1 speech and language therapy referral.

**Table 7** PAIEC at 30 Dayz

Over the past six months, when I received care and support for health issues related to ageing or my chronic condition(s), I was...	Mean	SD
Asked for my ideas and expectations when we made a care and support plan	4.378	0.796
Given choices about care and support to think about	4.480	0.844
Asked whether I had any problems with my medicines or their (side) effects	4.024	1.144
Asked whether I had any problems with my care and support or what my experiences with either had been	4.323	0.872
Given information on how to stay healthy or improve my health	4.378	1.076
Explained how my own actions or behavior influenced my health	4.346	1.178
Asked which goals I wished to achieve regarding my health	4.543	0.889
Helped to set specific goals in dealing with the consequences of ageing	4.622	4.706
Given a copy of my care and support plan	3.772	1.595
Encouraged to take a course, participate in a group, or undertake activities to help me cope with the consequences of ageing	2.118	2.284
Asked questions, either directly or on a survey, about my lifestyle (eg, smoking, exercise, diet, etc).	4.354	0.988
Sure that my healthcare professional had thought about my values, beliefs, and traditions, when they recommended care and support to me	4.669	0.713
Helped to make a care and support plan that I could carry out in my daily life	4.504	1.061
Helped to plan ahead so I could take care of myself in case my health declined, or my situation worsened	4.283	1.188
Asked how the consequences of ageing affected my life	3.835	1.572
Contacted after a visit or after participating in a (group) activity to see how things were going	3.953	1.694
Encouraged to attend programs in the community that could help me	3.016	2.243
Referred to a healthcare professional (such as a physical therapist or social worker) or to a (group) activity	4.803	0.679
Explained why a visit to a healthcare professional or participation in an individual or group activity was important for me	4.717	0.835
Asked how my visits to (or by) health-care professionals, or my participation in a (group) activity, were going	4.472	1.147
Total	83.591	16.232

**Notes:** Adapted from Uittenbroek RJ, Reijneveld SA, Stewart RE, Spoorenberg SL, Kremer HP, Wynia K. Development and psychometric evaluation of a measure to evaluate the quality of integrated care: the Patient Assessment of Integrated Elderly Care. *Health Expect.* 2016 Aug;19(4):962–72. © 2015 The Authors. *Health Expectations* Published by John Wiley & Sons Ltd. This is an open access article under the terms of the Creative Commons Attribution <https://creativecommons.org/licenses/by/4.0/>.<sup>21</sup>

**Table 8** Community and OPD Healthcare Utilization

	30 days	180 days
No of patients who had community encounters	128	118
No of patients who received HH	30	32
No of patients attending daycare	2	5
No of GP encounters	71	238
No of PT encounters	220	32
No of OT encounters	39	12

(Continued)

**Table 8** (Continued).

	30 days	180 days
No of SLT encounters	1	2
No of MSW encounters	0	11
No of OPD encounters	118	458

## Discussion

This descriptive cohort study explored the process and patient outcomes of older adults who received an ESD model of care after being discharged home from the acute care setting in Ireland over a period of six months. The incidence of functional decline at 30 days was 16.41% and at 180 days was 27.5%. Frailty was independently associated with incidence of functional decline at 30 days (OR 2.061, 95% CI 1.386 to 3.062) and 180 days (OR 1.7, 95% CI 1.292 to 2.236), when controlling for the number of interventions provided.

## Results in the Context of Current Literature

The findings for the primary outcome, functional decline, align with existing research identifying frailty as a predictor in functional decline in hospitalized older adults. Cunha, Veronese, de Melo Borges, and Ricci<sup>22</sup> carried out a systematic review and meta-analysis of 28 studies exploring adverse outcomes for older adults because of hospital admission and found that those identified as being frail (RR 1.32, 95% CI 1.04 to 1.67) and pre-frail (RR 1.51, 95% CI 1.05 to 2.17) were at a greater risk of experiencing functional decline at hospital discharge. A cohort study of 170 older adults in an acute general medical unit found that 45% of older adults had experienced functional decline at the time of discharge, with those identified as being frail more likely to experience functional decline (OR 1.8, 95% CI 1.13 to 2.87).<sup>23</sup> More recent research by Tavares, Sa-Couto, Reis, Boltz, and Capezuti<sup>24</sup> found that frailty predicts functional decline at hospital discharge (OR 1.07, 95% CI 1.02 to 1.14), but also at three months post discharge (OR 1.05, 95% CI 1.01 to 1.09). While existing research points strongly towards frailty predicting functional decline at hospital discharge, emerging evidence suggests that this predictor continues post discharge, in line with the findings of this cohort study.

In 2019, van Balen, Gordon, Schols, Drewes, and Achterberg<sup>25</sup> noted the variation in rehabilitation provided to older adults internationally in terms of patient selection, service organization, and content of the service provided. To address this, van Balen, Gordon, Schols, Drewes, and Achterberg<sup>25</sup> carried out a Delphi study across 18 European countries with a view to developing a consensus around quality criteria for geriatric rehabilitation. A consensus was reached on 61 (90%) of statements, which included the necessity of an early start of rehabilitation after an acute hospital admission and the preference for rehabilitation to occur within the patient's own home. Further to this, Grund, Gordon, van Balen, Bachmann, Cherubini, Landi, Stuck, Becker, Achterberg, and Bauer<sup>26</sup> carried out a European consensus on the core principles and future priorities for geriatric rehabilitation, also reporting the need to rehabilitate older adults in their home setting. Despite these recommendations for home-based rehabilitation for older adults, there is limited existing evidence in the area to address the needs of the older adult population.

Two previous systematic reviews and meta-analyses acknowledged the heterogeneity in the delivery of ESD interventions to older adults with both medical and orthopedic complaints.<sup>9,10</sup> The MDCIT service provided was an Allied Health led intervention, led by PT and/or OT as a key worker, with nursing and HCA support as required. Social work was not available in this study and was only available in our review of medical older adults, not in our review of orthopedic older adults. While nursing support was available in this study, its use was limited. In our previous systematic reviews, nursing support was more evident for those post-orthopedic surgery than the medical older adult population, which would align with the post-operative nursing needs of older adults for wound care. In line with the inreach model of care, medical support was provided by the patient's GP in this study which is opposite to the findings of our medical systematic review but in agreement with the management of orthopedic older adults as per our second review. Interventions were provided for a median of just over four weeks in the medical group, while our systematic review

would suggest a four-to-six-week period of intervention was provided. In the surgical group, this increased to a median of just over six weeks, which is in line with the systematic review on the orthopedic older adult population which suggests interventions are provided for six to ten weeks.

For older adults who present to the acute hospital setting, qualitative research emphasizes the value of a patient-centered approach to management of their health, with appreciation for not only their medical needs but also their holistic needs.<sup>27,28</sup> In accordance with this, existing research suggests that a better self-reported HRQoL is associated with lower mortality risk in adults and older adults in both the short and long term.<sup>29,30</sup> A higher self-reported HRQoL is furthermore associated with higher levels of mobility and independence in the home setting. In addition to this, increasing age is seen to have a converse relationship with self-reported HRQoL, in that HRQoL typically decreases with age.<sup>31</sup> Unlike the studies included in both systematic reviews previously carried out by the authors of this study, HRQoL was considered an important patient reported outcome measure (PROM) at all assessment timepoints, as assessed by the EQ-5D-5L. Despite the existing evidence suggesting that HRQoL decreases with age, with hospital admissions having a further detrimental impact on the outcome, our study demonstrates that interventions such as ESD can positively influence an older adult's HRQoL in the home setting.

## Implications for Practice

Research pertaining to the older person in more recent times has moved from looking at ageing as a biological process rather than a chronological process.<sup>32</sup> Research suggests that as ageing progresses, mortality increases as a result of aging-related events occurring rather than the passing of a specific period of time.<sup>32</sup> Frailty has been identified throughout research as a distinctive health state related to the ageing process and is seen as a clinical condition whereby patients have excessive vulnerability to stressors, increasing the risk of adverse health outcomes.<sup>33</sup> Therefore, frailty aligns itself with the biological view to ageing. In terms of identifying those who are frail and subsequently at greater risk of adverse outcomes, frailty screening tools, such as the CFS used in this study, can identify those that may benefit from targeted interventions.<sup>34–36</sup> In terms of establishing the cohort of older adults who would benefit from an ESD model of care, the findings from this study would suggest that those who are identified as frail at the point of hospital discharge are at greatest risk of functional decline at 30 days and 180 days.

This study used both clinical and PROMs across various timepoints. Given the complexity of older adult care and the heterogenous nature of the older adult population, clinical and target or service-based outcomes cannot fully capture the quality of care provided. PROMs traditionally play a role in measuring the quality of a service and in developing quality improvement initiatives, but their role in older adult care is valuable in delivering a patient centered approach to care co-ordination.<sup>37</sup> However, there is no PROM validated for use in older adults who are receiving acute inpatient care or community care.<sup>38</sup> Despite this, it is important for HCPs to consider the use of PROMs in providing quality older adult care, but also to consider the optimal timing of administration of such outcome measures in the patient care journey.

## Clinical and Policy Implications

Upon discharge from the acute care setting, older adults are at increased risk of re-presenting to the ED and subsequently being admitted to hospital again, with those discharged directly home at a greater risk of readmission.<sup>39</sup> Transitional care interventions aim to reduce the risk of readmission and improve patient outcomes in the community. A systematic review and meta-analysis of 11 studies synthesized existing evidence on transitional care interventions for older adults admitted to hospital with medical complaints.<sup>40</sup> The authors found that the majority of interventions provided pre-discharge and/or post-discharge reduced readmission rates, but overall study quality was predominately low. The authors were unable to identify which aspects of the interventions were most effective in reducing the risk of readmission. The post-hospitalization period for older adults has been recognized as a key timepoint in the management of older adult care as they transition through services, if implemented correctly demonstrating cost-effectiveness for health services and improved patient outcomes.<sup>41</sup> While this study did not directly explore the potential cost-effectiveness of the ESD intervention on the health service, it can be hypothesized that a reduced LoS resulted in reduced bed days in the acute care setting. A report carried out on ULHG found that 768 bed days were lost in 2022 due to delayed transfers of care of older adults to rehabilitation beds.<sup>42</sup> Interventions such as ESD may have a role in reducing these bed days that are lost by supporting

patient to return home for their rehabilitation, simultaneously reducing their risk of adverse outcomes that exist following a prolonged hospital LoS. Unscheduled ED re-presentation rates and hospital admissions in this study were marginally above expected ranges in the Irish setting, with minimal additional financial impact foreseen.<sup>43</sup> This is further supported by the European consensus study previously discussed by Grund, Gordon, van Balen, Bachmann, Cherubini, Landi, Stuck, Becker, Achterberg, and Bauer<sup>26</sup> with the focus of geriatric rehabilitation moving to a home-based model of care.

## Strengths and Limitations

This descriptive cohort study addresses key uncertainties in current models of ESD for older adults by demonstrating that an Allied Health led, inreach model of care can positively impact patient and process outcomes up to six months post intervention. This study is the first in the Irish setting which explores ESD as a model of care for older adults admitted to hospital, which used a comprehensive set of both patient and process outcomes over a six-month period. The use of PROMs further strengthens the results from this study. Low attrition rates at both 30- and 180-day follow-up add to the confidence in our findings. This study builds on the focus in research and policy of moving towards a community-based approach to the management of older adults, away from the acute care setting.

Limitations of this study include the observational design, with the lack of randomization to a control group not allowing for comparison of data.<sup>44</sup> In recruitment, those deemed not appropriate for inclusion were not accounted for. In their analysis, the authors controlled for confounding factors, however the true effect of exposures and subsequent outcomes cannot be ruled out. The study was conducted across one hospital group in the Mid-West of Ireland and included older adults with varying complaints, which may narrow the applicability of the results to international healthcare systems. Future research should continue to focus on domiciliary-based patient care, with high-quality RCTs across a variety of hospital sites.

## Conclusion

Health systems internationally are facing an increase in demand for the management of older adults in the acute care setting, who are presenting with increasing complexity and multimorbidity. Hospitalization for this cohort is linked with a high risk of functional decline, and an associated increase in dependency. Discharge interventions which reduce an older adult's LoS while maintaining or improving functional ability are key to managing their care in the community in the long term. This study is the first of its kind in the Irish setting which demonstrates that an ESD model of care can have significant effects on outcomes for older adults admitted to hospital at 30 and 180 days, without increasing the risk of unscheduled ED re-presentation. Future research should consider the impact of an ESD model of care on specific older adult cohorts, using the RCT methodology.

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## Disclosure

The authors report no conflicts of interest in this work.

## References

1. World Health Organization. Integrated care for older people: guidelines on community-level interventions to manage declines in intrinsic capacity. Available from: <https://www.who.int/publications/i/item/9789241550109>. Accessed February 21, 2021
2. Roe L, Normand C, Wren M-A, Browne J, O'Halloran AM. The impact of frailty on healthcare utilisation in Ireland: evidence from the Irish longitudinal study on ageing. *BMC Geriatr*. 2017;17(1):1–12. doi:10.1186/s12877-017-0579-0
3. Preston L, van Oppen JD, Conroy SP, et al. Improving outcomes for older people in the emergency department: a review of reviews. *Emer Med J*. 2021;38(12):882–888. doi:10.1136/emered-2020-209514

4. Resnick B, Boltz M. Optimizing function and physical activity in hospitalized older adults to prevent functional decline and falls. *Clinics in Geriatric Medicine*. 2019;35(2):237–251. doi:10.1016/j.cger.2019.01.003
5. O'Shaughnessy I, Robinson K, Whiston A, et al. Comprehensive Geriatric Assessment in the Emergency Department: a Prospective Cohort Study of Process, Clinical, and Patient-Reported Outcomes. *Clin Interventions Aging*. 2024; 189–201. doi: 10.2147/CIA.S434641
6. Loyd C, Markland AD, Zhang Y, et al. Prevalence of hospital-associated disability in older adults: a meta-analysis. *J Am Med Directors Assoc*. 2020;21(4):455–461. doi:10.1016/j.jamda.2019.09.015
7. Provencher V, Clemson L, Wales K, et al. Supporting at-risk older adults transitioning from hospital to home: who benefits from an evidence-based patient-centered discharge planning intervention? Post-hoc analysis from a randomized trial. *BMC Geriatr*. 2020;20(1):1–10. doi:10.1186/s12877-020-1494-3
8. Langhorne P, Baylan S, Trialists ESD. Early supported discharge services for people with acute stroke. *Cochrane Database Syst Rev*. 2017;2017. doi:10.1002/14651858.CD000443.pub4
9. Williams S, Morrissey A-M, Steed F, et al. Early supported discharge for older adults admitted to hospital with medical complaints: a systematic review and meta-analysis. *BMC Geriatr*. 2022;22(1):302. doi:10.1186/s12877-022-02967-y
10. Williams S, O'Riordan C, Morrissey AM, Galvin R, Griffin A. Early supported discharge for older adults admitted to hospital after orthopaedic surgery: a systematic review and meta-analysis. *BMC Geriatr*. 2024;24(1):143. doi:10.1186/s12877-024-04775-y
11. Connor EO, Dolan E, Horgan F, Galvin R, Robinson K, Kaunnil A. A qualitative evidence synthesis exploring people after stroke, family members, carers and healthcare professionals' experiences of early supported discharge (ESD) after stroke. *PLoS One*. 2023;18(2):e0281583. doi:10.1371/journal.pone.0281583
12. Williams S, O'Riordan C, Steed F, et al. Early Supported Discharge for Older Adults Admitted to Hospital with Medical Complaints: a Qualitative Study Exploring the Views of Stakeholders. *J Multidiscip Health*. 2022;Volume 15:2861–2870. doi:10.2147/JMDH.S380572
13. Von Elm E, Altman DG, Egger M, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Ann Internal Med*. 2007;147(8):573–577. doi:10.7326/0003-4819-147-8-200710160-00010
14. UL Hospitals Group. UL Hospitals Group Annual Review. 2022. Available From: <https://healthservice.hse.ie/healthcare-delivery/ul-hospitals-group/ul-hospitals-group-annual-review-2022.pdf>. Accessed November 18, 2024
15. Mahoney FI, BARTHEL DW. Functional evaluation: the Barthel index. *Maryland State Med j*. 1965;14(2):61–65.
16. Bouwstra H, Smit EB, Wattel EM, et al. Measurement properties of the Barthel Index in geriatric rehabilitation. *J Am Med Directors Assoc*. 2019;20(4):420–425. doi:10.1016/j.jamda.2018.09.033
17. Rabin R, Charro F. EQ-SD: a measure of health status from the EuroQol Group. *Annals of Medicine*. 2001;33(5):337–343. doi:10.3109/07853890109002087
18. Bhadhuri A, Kind P, Salari P, et al. Measurement properties of EQ-5D-3L and EQ-5D-5L in recording self-reported health status in older patients with substantial multimorbidity and polypharmacy. *Health Qual Life Outco*. 2020;18(1):1–17. doi:10.1186/s12955-020-01564-0
19. Rockwood K, Song X. A global clinical measure of fitness and frailty in elderly people. *Cmaj*. 2005;173(5):489–495. doi:10.1503/cmaj.050051
20. Church S, Rogers E, Rockwood K, Theou O. A scoping review of the Clinical Frailty Scale. *BMC Geriatr*. 2020;20(1):1–18. doi:10.1186/s12877-020-01801-7
21. Uittenbroek RJ, Reijneveld SA, Stewart RE, Spoorenberg SLW, Kremer HPH, Wynia K. Development and psychometric evaluation of a measure to evaluate the quality of integrated care: the Patient Assessment of Integrated Elderly Care. *Health Expectations*. 2016;19(4):962–972. doi:10.1111/hex.12391
22. Cunha AIL, Veronese N, de Melo Borges S, Ricci NA. Frailty as a predictor of adverse outcomes in hospitalized older adults: a systematic review and meta-analysis. *Ageing Res Rev*. 2019;56:100960. doi:10.1016/j.arr.2019.100960
23. Gregorevic KJ, Hubbard RE, Katz B, Lim WK. The clinical frailty scale predicts functional decline and mortality when used by junior medical staff: a prospective cohort study. *BMC Geriatr*. 2016;16(1):1–6. doi:10.1186/s12877-016-0292-4
24. Tavares J, Sa-Couto P, Reis JD, Boltz M, Capezuti E. The role of frailty in predicting 3 and 6 months functional decline in hospitalized older adults: findings from a secondary analysis. *Int J Environ Res Public Health*. 2021;18(13):7126. doi:10.3390/ijerph18137126
25. van Balen R, Gordon AL, JMGA S, Drewes YM, Achterberg WP. What is geriatric rehabilitation and how should it be organized? A Delphi study aimed at reaching European consensus. *Eur Geriatric Med*. 2019;10:977–987. doi:10.1007/s41999-019-00244-7
26. Grund S, Gordon AL, van Balen R, et al. European consensus on core principles and future priorities for geriatric rehabilitation: consensus statement. *Eur Geriatric Med*. 2020;11:233–238. doi:10.1007/s41999-019-00274-1
27. Herrler A, Kukla H, Vennedey V, Stock S. What matters to people aged 80 and over regarding ambulatory care? A systematic review and meta-synthesis of qualitative studies. *European J Agei*. 2022;19(3):325–339. doi:10.1007/s10433-021-00633-7
28. Phelps K, Regen E, Van Oppen JD, et al. What are the goals of care for older people living with frailty when they access urgent care? Are those goals attained? A qualitative view of patient and carer perspectives. *Int Emerg Nurs*. 2022;63:101189. doi:10.1016/j.ienj.2022.101189
29. Brown DS, Thompson WW, Zack MM, Arnold SE, Barile JP. Associations between health-related quality of life and mortality in older adults. *Prevent Sci*. 2015;16:21–30. doi:10.1007/s11121-013-0437-z
30. Phyto AZZ, Freak-Poli R, Craig H, et al. Quality of life and mortality in the general population: a systematic review and meta-analysis. *BMC Public Health*. 2020;20(1):1–20. doi:10.1186/s12889-020-09639-9
31. Krawczyk-Suszek M, Kleinrok A. Health-Related Quality of Life (HRQoL) of people over 65 years of age. *Int J Environ Res Public Health*. 2022;19(2):625. doi:10.3390/ijerph19020625
32. Ji L, Jazwinski SM, Kim S. Frailty and biological age. *Annal geri med rese*. 2021;25(3):141. doi:10.4235/agmr.21.0080
33. Hoogendijk EO, Afila J, Ensrud KE, Kowal P, Onder G, Fried LP. Frailty: implications for clinical practice and public health. *Lancet*. 2019;394(10206):1365–1375. doi:10.1016/S0140-6736(19)31786-6
34. Chua XY, Toh S, Wei K, Teo N, Tang T, Wee SL. Evaluation of clinical frailty screening in geriatric acute care. *J Evalu Clinical Prac*. 2020;26(1):35–41. doi:10.1111/jep.13096
35. Iuliano S, Fyfe JJ, Scott D, et al. Screening, diagnosis and management of sarcopenia and frailty in hospitalized older adults: recommendations from the Australian and New Zealand Society for Sarcopenia and Frailty Research (ANZSSFR) Expert Working Group. *J Nutr Health Aging*. 2022;26(6):637–651. doi:10.1007/s12603-022-1801-0

36. Knight T, Atkin C, Martin FC, et al. Frailty assessment and acute frailty service provision in the UK: results of a national 'day of care' survey. *BMC Geriatr.* 2022;22(1):1–9. doi:10.1186/s12877-021-02679-9
37. Rikkert MGMO, Van der wees PJ, Schoon Y, Westert GP. Using patient reported outcomes measures to promote integrated care. *Intern j Integrated Care.* 2018;18(2).
38. van Oppen JD, Coats TJ, Conroy SP, et al. Co-creation of a Patient-Reported Outcome Measure for Older People Living with Frailty Receiving Acute Care (PROM-OPAC). *J Patient Exper.* 2023;10:23743735231158941. doi:10.1177/23743735231158941
39. Glans M, Kragh Ekstam A, Jakobsson U, Å B, Midlöv P. Risk factors for hospital readmission in older adults within 30 days of discharge—a comparative retrospective study. *BMC Geriatr.* 2020;20(1):1–12. doi:10.1186/s12877-020-01867-3
40. Rasmussen LF, Grode LB, Lange J, Barat I, Gregersen M. Impact of transitional care interventions on hospital readmissions in older medical patients: a systematic review. *BMJ open.* 2021;11(1):e040057. doi:10.1136/bmjopen-2020-040057
41. Wang Y-C, Chou M-Y, Liang C-K, Peng L-N, Chen L-K, Loh C-H. Post-acute care as a key component in a healthcare system for older adults. *Ann Geriatric Med Res.* 2019;23(2):54. doi:10.4235/agmr.19.0009
42. UL Hospitals Group. Patient Flow Report. 2022.
43. Hospital Performance: an Analysis of HSE Performance Indicators (2023).
44. Rezigalla AA. Observational study designs: synopsis for selecting an appropriate study design. *Cureus.* 2020;12(1). doi:10.7759/cureus.6692

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