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Community Specialist Teams for Older Persons (CST-OP) at risk of, or living with frailty in Ireland: a prospective cohort study of a new model of integrated care for community dwelling older adults

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Abstract

Background This study explored the clinical and process outcomes of older adults at risk of or living with frailty who received an interdisciplinary Comprehensive Geriatric Assessment (CGA) in the community.

Methods This prospective cohort study recruited older adults aged ≥ 75 who were screened for frailty and referred to one of three CST-OP hubs in the Mid-West of Ireland by their GP. Follow-up assessments were conducted via telephone by an independent assessor at 30- and 180-days. The primary outcome was functional status. Secondary outcomes included primary healthcare use, secondary healthcare use, nursing home admission, health-related quality of life (HRQoL), patient satisfaction and mortality.

Results A total of 303 participants (mean age = 83.2 years) were recruited. Incidence of 30- and 180-day functional decline was 26.4% and 33.7% respectively. The majority of older adults who availed of community-based CGA maintained functional independence up to 6-months post index visit. At 30-days, the mortality rate was 1.0%, Emergency Department (ED) presentation 6.9%, hospitalisation 6.6% and nursing home admission 4.0%. HRQoL significantly improved at 30- and 180-days. There was a significant improvement in HRQoL, F(2,542) = 13.8, p < 0.001, $\eta^2 = 0.5$. The presence of frailty was a significant predictor of adverse outcomes.

Conclusion Community-based CGA results in favorable health outcomes including HRQoL among communitydwelling older adults. Community-based CGA may also mitigate against potentially avoidable ED presentations and hospitalisations. Use of the Clinical Frailty Scale is recommended to predict the risk of functional decline, increased rates of mortality, NH admission, hospitalisation or ED presentation at 30- and 180-days among communitydwelling older adults.

Trial registration The study protocol was prospectively registered on Clinicaltrials.gov (NCT05527223). Registered January 09, 2022. https://clinicaltrials.gov.

Keywords Comprehensive geriatric assessment, Community, Out-patient, Older adults, Community-dwelling, Frailty

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Background

The proportion of older adults is increasing rapidly worldwide [1]. There is a particularly fast growth in the oldest old, with the number of adults aged over 85 years expected to increase by 95.5% by 2031 [2]. As people age, they experience a decline in their intrinsic capacity, ultimately leading to more chronic and complex health issues [3], increased care dependency and increased susceptibility to frailty [4, 5]. Frailty, a consequence of age related decline in multiple physiological systems commonly resulting in heightened vulnerability to sudden health changes, places older adults at increased risk of poor health outcomes [5, 6]. Community-dwelling older adults living with frailty are additionally at increased risk of reduced health-related quality of life (HRQoL) [7], functional decline [8], increased rate of hospitalisation [8], nursing home (NH) admission [9] and mortality [10] compared to their non-frail community-dwelling older adults. With a quarter of adults aged over 75 years, and over half of adults aged 85 years living with frailty [4, 5, 11], intervening at an early stage of developing frailty is a priority across health systems internationally [1]. However, realigning health and social care systems to deliver care to older adults is challenging in the context of an ageing population globally [3]. As such, integrated care strategies targeting enhanced health outcomes and HRQoL for older adults are an increasing focus of health policy and service delivery [3].

Integrated care is a person centred model of care whereby services that span across the different levels and sites of care are co-ordinated and integrated according to an individual's needs [3]. Varied models of integrated care exist, underpinning the complexity of its implementation [12]. The World Health Organization (WHO) guidelines for integrated care for older people do however, recommend a holistic assessment, a common goal and a care plan for older adults with particular focus on early intervention within the community setting [1, 3]. Integrated care strategies for older adults have demonstrated reduced rates of hospitalisations, length of hospital stay and improved patient satisfaction [13]. Two of the challenges of integrating healthcare, according to older adults receiving community services, are fragmented communication strategies by healthcare professionals and a discontinuity of care while transitioning across care settings [14]. This is further highlighted in the output of a recent Priority Setting Partnership with the James Lind Alliance, whereby improving the exchange of information between specialist/acute and primary care services within the Irish setting was reported as the top research priority in managing chronic conditions in primary care [15].

In order to facilitate integrated healthcare reform in Ireland, the national Integrated Care Programme for Older People has implemented a number of initiatives to facilitate a shift away from acute episodic care to longitudinal coordinated and integrated care for older adults that allows them to access care closer to home [16]. One such approach is the establishment of community specialist teams for older people (CST-OP) whereby experienced multidisciplinary team (MDT) individuals from medical, nursing, pharmacy and health and social care professions offer prompt comprehensive geriatric assessment (CGA) in the community to older adults [16, 17]. CGA is defined as a multidimensional approach to assessment of an older adults medical, psychological, functional ability and social circumstances in order to develop a personalised coordinated and integrated plan for treatment and follow-up [18].

The research evidence base reports mixed results to support the effectiveness of CGA in the community setting [19]. A recent Cochrane review and meta-analysis of 21 randomised controlled trials (RCT) examining the effectiveness of community-based CGA (including within the participant's home, general practice, or communitybased clinic) for community-dwelling frail older adults found no improvement in functional status (standardised mean difference (SMD): -0.09; 95% CI: -0.24-0.05) and little change in the health related quality of life (HRQoL) (SMD: 0.10; 95% CI: 0.00-0.21) among this cohort [19]. However, there was heterogeneity across studies with regards to the description of 'CGA' interventions delivered. Given the uncertainty of community-based CGA and the variations in its operation, this review called for future research to examine its effectiveness [19]. Furthermore, the World Health Organization (WHO) called for future longitudinal research to investigate profiles of older adult's functional abilities and healthcare needs in order to realise the goal of Healthy Ageing [20]. The heterogeneity of person-centred outcomes and lack of a core outcome set incorporating patient-reported outcome measures (PROMs) across community-based CGA research [19, 21, 22] has led to a lack of robust evidence to support its effectiveness. Implementation of PROMs that enable collaborative person-centred interventions ensure more effective healthcare [23].

This prospective cohort study is the first study nationally to explore the process, clinical and patient-reported outcomes of older adults over a six-month period, who are referred to one of the three CST-OP hubs in the Mid-West of Ireland by their GP.

Methods

Study design

This prospective cohort study was conducted in line with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Guidelines (Additional File 1) [24]. Data collection and follow-up took place during the period of February 2022 to December 2023 (inclusive). The study protocol was registered on Clinicaltrials.gov (NCT05527223). Registered January 09, 2022. https://clinicaltrials.gov.

Ethics

Ethical approval for the study was granted by the Research Ethics Committee, University of Limerick Hospitals Group, Mid-West Region (Ref. 116/2021).

Setting

This multi-site study took place at three CST-OP hubs across the Mid-West region. Each of these hubs serve an approximate population of 150,000 people and has a population of approximately 34,000 people living with a chronic disease [25].

The CST-OP multidisciplinary team comprised of a specialist geriatrician, and nursing and allied health disciplines. This team was operational from 8:00–17:00 Monday-Friday. A typical detailed description of the referral, assessment and closure process at the CST-OP is available in appendix 5 of the "Practice Guidance for Older-Person Multidisciplinary Teams" [26]. Referrals were sent by GPs directly to the CST-OP. All referrals received by the CST-OP were triaged by a member of the MDT and geriatrician. All participants who were assessed in-person by their GP and referred to the CST-OP were considered eligible.

A detailed description of the MDT composition across the three sites is outlined in Table 1.

Population of interest and recruitment

All older adults aged \geq 75 years who were referred to the CST-OP hub by their GP during recruitment periods were considered eligible for participation in the study, if they met the following inclusion/exclusion criteria:

• Inclusion criteria

Patients aged \geq 75 years who were referred to the CST-OP hub by their GP, scored between 4 and 6 on the Rockwood Clinical Frailty Scale (CFS) [27] (pre-frail, mildly frail or moderately frail), resided within the catchment area of the relevant CST-OP hub, had been assessed inperson by the referrer, did not have community MDT input within the last three months.

And any one of the following criteria:

Fall within the last month unrelated to acute cardiac or neurological cause and no previous falls assessment, increased dependency or increased carer burden in the last month, a deterioration in swallow in the previous month including symptoms of recurrent chest infections, weight loss, coughing when eating/drinking, selfmodifying diet secondary to difficulties or experienced an adverse drug reaction within the last month excluding allergic reaction.

Exclusion criteria

	CST-OP site 1	CST-OP site 2	CST-OP site 3
Data collection period	February 2022- January 2023	June 2022- April 2023	May 2022- June 2023
Geriatrician (FTE)	0.5	0.5 FTE June-Dec 2022	0.5 FTE May—Dec 2022
		1 FTE from June 2023 onwards	Varied locum medical agency cover December 2022 onwards
CNS (FTE)	1	1	1
ANP (FTE)	2	2	1
Senior Physiotherapist (FTE)	1	1	1 (Maternity leave from July 22- March 23; agency cover for small period of this time)
Physiotherapy assistant (FTE)	1	1 August 2023 onwards	1
Senior Occupational Therapist (FTE)	1	1	0
Senior Speech and Language Therapist (FTE)	0.5	1 May 2023 onwards	
Senior Dietician (FTE)	1 (Was on leave for part of study)	0.5	0.5
Other		0	
Registrar			1
GP	1		
Case Manager	1		
OTA	1		

Table 1 Multidisciplinary team composition at each CST-OP

Abbreviations: FTE full-time equivalent, CNS clinical nurse specialist, ANP advanced nurse practitioner, GP General Practitioner, OTA occupational therapist assistant

Patients were excluded if they presented with an acute neurological or cardiovascular event, were more appropriate to an alternative care pathway or service e.g. primary care or geriatric medicine clinic, presented with injuries, unless the injury had already been appropriately managed, were experiencing an acute medical illness requiring treatment in an acute hospital setting, if care was being provided by other health care professionals at the time of referral and it was apparent that they are working to meet goals aligned with that current service, they required investigation or treatment not available in the relevant CST-OP hub (unless these investigations are already being arranged elsewhere), they have had MDT input in the previous three months, had confirmed or suspected Covid-19 infection or other exclusions at the discretion of the CST-OP based on clinical expertise and available resource.

Consecutive participants were identified by a member of the MDT. It was assumed that participants had the ability to consent or decline participation unless the research nurse determined they lacked capacity. The research nurse explained the study to the potential participant. If an older adult was able to understand, retain, and articulate the details of the study to the research nurse, and could assess the information to make an informed decision, their capacity was considered intact. If a participant could not demonstrate these abilities, they were regarded as lacking the capacity to consent, and proxy consent was obtained from the next of kin/ person with a longstanding relationship with the patient who was aware of their wills and preferences, with the patient's assent. The next of kin was given time to review the study and ask questions on the patient's behalf. Hard copies of signed participant consent forms were stored in a locked filing cabinet in a locked office on-site.

Exposure

All participants underwent a CGA which was initiated at their index visit to the CST-OP hub. A medical assessment including medication review, blood pressure and physical assessment was led by the geriatrician. A falls assessment, assessment of mobility and stairs, transfers, personal care, activities of daily living (ADLs), social supports and environmental, cognition, and nutritional assessments were conducted by a member of the MDT. Personalised goals were discussed with patients to inform the care plan. The geriatrician oversaw the medical management of all participants. The MDT then created a clinical problem list based on the patient's presentation and created a recommended plan of care which was discussed at a weekly MDT meeting. Diagnostic procedures (e.g. DXA scan, Tilt Table testing, ECG, 24-h ambulatory blood pressure monitoring) were carried out at the hub or relevant hospital where required. Patients received out-patient medical, allied health professional or nursing input over a period of up to six weeks or dependent on the patient's ongoing needs. Patients were also referred to other community-based services including public health nurse, home healthcare or specialist out-patient/ in-patient care etc. where appropriate. Referrals to voluntary social support services for older adults were also initiated where relevant. Patients were discharged when their duration of care concluded, as determined by the geriatrician and were discharged back to their GP. Consistent with the components of CGA reported by Ellis and colleagues [18], the fundamental components of CGA adopted are outlined in Additional File 2.

Baseline data collection

Baseline consent and assessments were completed by members of the CST-OP. The baseline assessment comprised of demographic variables and validated health measures. Demographic information included participant's age, sex, ethnicity, marital status, residential status, socioeconomic status, education level and living circumstances were recorded. The health assessment included: presenting problem, smoking status, alcohol consumption, mobility status, 12-month self-report falls history, co-morbidities (Charlson Co-morbidity index), global measure of function (Barthel Index), frailty status (CFS) and quality of life (EuroQoL-5D-5L).

Follow-up data collection

Participants were followed-up via telephone call at 30-days and 180-days post index visit by an independent member of the research team (CH or CD) who were not involved in the patients routine care. Data on objective and health measures including: ED presentation, Acute Medical Assessment Unit attendance, hospitalisation, NH admission, incidence of falls, functional status (Barthel Index), mortality, use of geriatric services, use of other primary care services during this timeframe, participant satisfaction with care (Patient Assessment of Integrated Elderly Care) and quality of life (EQ5D5L) were recorded.

Outcomes

Primary outcome- functional status at baseline, 30-days and 180-days, as measured by the Barthel Index [28].

Primary healthcare use (within and outside of CST-OP healthcare utilisation). This included the number of services that participants were in receipt of following index visit at the CST-OP hub including; GP visits, Public Health Nurse visits, Health and Social Care Professional use, formal homecare support at 30-days and 180-days. Secondary healthcare utilisation. This included the number of secondary healthcare services that participants were in receipt of including; Outpatient services, ED presentation and unplanned hospital admission at 30-days and 180-days.

Patient satisfaction. Participants evaluated the quality of integrated care across a number of domains using the Patient Assessment of Integrated Elderly Care (PAIEC) Questionnaire at 30-days.

Quality of life: Participants rated their HRQoL using the EuroQoL-5D-5L [29] at 30-days and 180-days.

Mortality: The number of participants who died following their index visit at the CST-OP hub 30-days and 180-days.

Nursing home admission: Number of participants who were admitted to a nursing home or residential care facility following their index visit to the CST-OP hub 30-days and 180-days.

Sample size

Our study was not hypothesis driven; therefore, formal power calculations were not applicable. All prospective older adults that met inclusion criteria were invited to participate during the study recruitment period (January 2022–2023 inclusive).

Statistical analysis

Descriptive statistics were used to profile the baseline characteristics of the cohort. Categorical data (e.g. biological sex) were analysed using frequencies and percentages. Continuous data (e.g. age) were analysed using means and standard deviations (SD) or median and Page 5 of 12

interquartile ranges (IQR) where data demonstrated evidence of skewness (e.g. BI). One-way within-subjects ANOVAs were conducted to examine differences in functional status (Barthel Index) and HRQoL (EQ5D5L) across timepoints - index, 30-days, and 180-days. Separate multivariate logistic regressions were conducted to explore predictors of adverse outcomes at 30- and 180days. Multimorbidity [30] and frailty [31, 32] are predictors for adverse outcomes for older adults. Based on previous research, frailty, age, biological sex, falls at baseline, presence of co-morbidities and number of interventions received from the CST-OP were the predictors explored. For all logistic regression models, odds ratios with 95% odds ratio scale CIs were reported. A 5% level of significance was used for all statistical tests. All statistical analyses were undertaken using SPSS Version 24.

Results

A total of 303 participants were recruited from February 2022- June 2023. Figure 1 describes the flow of patients in the study. Consecutive participants living in urban and rural settings who were referred to the CST-OP team by their GP were identified by a member of the MDT. Across the three sites, nine people declined to participate and a further 33 were approached for participation but did not meet the inclusion criteria. Demographic and clinical characteristics of the overall sample are presented in Table 2.

The mean age of participants was 83.2 years (SD = 5.7) with females representing 67.7% of the total population. The majority of the population were white Irish (99.3%) and almost half were widowed (45.9%) and lived alone



Fig. 1 Prisma flow diagram

Table 2 Baseline characteristics

	Total (<i>N</i> = 303)
Age, mean ± SD	83.23 (5.8)
Female, n (%)	205 (67.7)
Ethnicity, n (%)	
White Irish	301 (99.3)
Other white background	1 (0.3)
Black Irish	1 (0.3)
Marital status, n (%)	
Married	123 (40.6)
In a relationship	1 (0.3)
Single	24 (7.9)
Widowed	139 (45.9)
Separated/divorced	16 (5.3)
Residential status, n (%)	
Lives alone	143 (47.2)
Lives with family (spouse)	44 (14.5)
Other	116 (38.3)
Presenting problem, n (%)	
Falls	133 (43.9)
Reduced Mobility	46 (15.2)
Increased Frailty	42 (13.9)
Cognitive Impairment	22 (7.3)
Dizziness	14 (4.6)
Increased dependency	8 (2.6)
Unsteady gait	7 (2.3)
Hypertension	5 (1.7)
Parkinsons	4 (1.3)
Syncope	3 (1.0)
Vertigo	2 (0.7)
Anxiety	2 (0.7)
Pain	2 (0.7)
COPD	2 (0.7)
Functional decline	2 (0.7)
Chronic Pain	2 (0.7)
Headaches	1 (0.3)
Breathlessness	1 (0.3)
Post CVA	1 (0.3)
Confusion	1 (0.3)
Increased carers burden	1 (0.3)
Sleep deprivation	1 (0.3)
Atrial Fibrillation	1 (0.3)
Socioeconomic status, n (%)	
Affluent	6 (2.0)
Marginally above average	125 (41.3)
Marginally below average	128 (42.2)
Disadvantaged	33 (10.9)
Very Disadvantaged	11 (3.6)
Living circumstances, n (%)	
Single storey house	29 (9.6)
2 storey house	165 (54.5)

Table 2 (continued)

	Total (N = 303)
3 storey house	5 (1.7)
Flat ground floor	6 (2.0)
Flat above ground	2 (0.7)
Bungalow	92 (30.4)
Sheltered housing	2 (0.7)
Other	2 (0.7)
Smoking, n (%)	
Unknown	1 (0.3)
Never	201 (66.3)
Active	22 (7.3)
Previous	78 (25.7)
Occasional	1 (0.3)
Alcohol, n (%)	
Unknown	1 (0.3)
Never	163 (53.8)
Active	58 (19.1)
Previous	30 (9.9)
Occasional	51 (16.8)
History of falls in past 12-months, n (%)	178 (58.7)
Barthel Index, median (IQR)	18 (17–20)
CFS median (IQR)	5 (4–5)
EQ-5D-5L Index Value, median (IQR)	0.7 (0.4–0.8)
Mobility, median (IQR)	2 (2–3)
Self-care, median (IQR)	1 (1–3)
Usual activities, median (IQR)	2 (1–3)
Pain, median (IQR)	2 (2–3)
Anxiety, median (IQR)	2 (1–3)
EQ-5D-5L visual analog scale, median (IQR)	70 (50–80)
Charlson comorbidity index, median (IQR)	3 (2–5)

Median and IQR are presented where data are not normally distributed

(47.2%). The prevalence of frailty, categorised as ≥ 5 on the CFS, was 55.4% (n = 168). The most common presenting problem to the CST-OP was due to falls (43.9%), with over half of the cohort experiencing a fall in the 12 months prior to their index visit (58.7%). The median Barthel score was 18 (IQR = 3) and the median CFS score was 5 (IQR = 1) therefore, defined as living with mild frailty. Data regarding frailty status using the CFS were not reported for eight participants. Data on co-morbidities were not reported for one participant.

Outcomes at 30-days

At 30-day follow-up, three participants died and data on functional status were unavailable for two participants (n = 2 uncontactable). Data on process outcomes including ED attendance, AMU attendance, MAU attendance, LIU attendance EMS use, unplanned hospital admission, NH admission were unavailable for two participants.

Data were unavailable for ten participants on the patient satisfaction (PAIEC) outcome (n = 3 died; n = 1 declined; n = 6 not reported). Data on HRQOL were not available for 8 participants on the VAS scale (n = 3 died; n = 4 not reported) and for six participants for the index values (n = 3 died; 3 not reported).

Incidence of functional decline was reported at 26.4% (n = 80) across the overall number of participants as

Table 3 30- and 180- day descriptives

Outcome	0–30 days	30–180 days
Died, n (%)	3 (1)	9 (3)
ED attendance, n (%)	21 (6.9)	72 (23.8)
AMU attendance, n (%)	3 (1)	8 (2.6)
MAU attendance, n (%)	2 (0.3)	27 (8.9)
LIU attendance, n (%)	3 (1)	10 (3.3)
EMS Use	1 (0.3)	3 (1)
Hospital admission	20 (6.6)	60 (19.8)
Combined acute care use	36 (11.8)	97 (32.0)
NH admission, n (%)	12 (4)	31 (10.2)
Falls incidence	42 (13.9)	75 (24.8)
Functional decline (binary), n (%)	80 (26.4)	102 (33.7)
Discharge from CST-OP, n (%)	40 (13.2)	261 (86.1)
Primary care service use, n (%)	226 (74.6)	278 (91.7)
PAIEC, mean (SD)	82.80 (1.1)	-

Abbreviations: ED emergency department, AMU acute medical unit, MAU medical assessment unit, LIU local injury unit, EMS emergency medical services (ambulance services), NH nursing home, CST-OP community specialist team for older people, PAIEC patient assessment of integrated elderly care

Table 4 Total sample logistic regression models

measured by the BI. At 30-days the mortality rate was 1.0% (n = 3). The average PAIEC score was 82.1 (SD = 1.1)). A detailed analysis of the PAIEC is available in Additional File 3.

In terms of process outcomes (see Table 3), almost seven percent of the cohort experienced an unplanned ED presentation (6.9%) (n = 21), 6.6% experienced an unplanned hospital admission (n = 20) and 35.6% had an OPD appointment in the acute setting (n = 108). Almost twelve percent (n = 36) of participants used acute care services. Twelve participants were admitted to a NH (4.0%). At 30-day follow-up, 13.2% of participants were discharged from the CST-OP (n = 40).

Separate logistic regression models were estimated to explore if baseline characteristics predicted adverse outcomes at 30-day (Table 4). Our pooled data demonstrated that the presence of frailty (measured as ≥ 5 on the CFS) is a significant predictor of functional decline at 30-days OR 1.48 (1.11,1.95), NH admission 2.088 (1.10,4.11), hospitalisation OR 2.21 (1.33, 3.80), ED presentation OR 2.16 (1.31, 3.66), primary care use OR 1.34 (1.00, 1.88) and mortality OR 5.66 (1.33, 23.33) at 30-days. Female biological sex was a significant predictor of higher primary care service use.

Outcomes at 180-days

At 180-day follow-up 12 participants died and data on this outcome were unavailable for four participants. Data on functional status outcome were unavailable for six participants. Data from three participants were

	Functional decline (binary)	NH admission	Hospitalisation	ED admission	PC services	Mortality
			30-days			
CFS, OR [CIs]	1.48 (1.11,1.96)*	2.09(1.06,4.11)*	2.213 (1.29, 3.80)*	2.16 (1.31, 3.56)*	1.34 (1.00, 1.78)*	5.57 (1.32, 23.33)*
Age, OR [CIs]	1.00 (0.96,1.05)	1.05 (0.94, 1.17)	1.023 (0.94, 1.11)	0.97 (0.89, 1.05)	1.04 (0.99, 1.90)	1.02 (0.83, 1.25)
Biological sex, OR [CIs]	1.01 (0.57, 1.79)	1.37 (0.35, 5.37)	0.36 (0.13, 0.97)*	0.47 (0.18, 1.20)	0.70 (0.38, 1.27)	0.24 (0.02, 3.30)
Falls at baseline (12- month hx), OR [Cls]	1.03 (0.60, 1.78)	1.43 (0.40, 5.13)	0.72 (0.27, 1.95)	1.12 (0.43, 2.93)	1.21 (0.70, 2.12)	**not applicable
Charlson, OR [Cls]	1.01 (0.99, 1.03)	0.96 (0.71, 1.28)	0.92 (0.71, 1.18)	0.99 (0.95, 1.05)	1.14 (0.98, 1.32)	0.77 (0.37, 1.60)
			180-days			
	Functional decline (binary)	NH admission	Hospitalisation	ED admission	PC services	Mortality
CFS, OR [CIs]	1.67 (1.25, 2.23)*	1.50 (0.98, 2.30)	1.50 (1.09, 2.07)*	1.58 (1.16, 2.14)*	1.43 (0.87,2.34)	2.62 (1.16, 5.93)*
Age, OR [Cls]	1.04 (0.99, 1.09)	1.12 (1.04, 1.20)*	1.01 (0.96, 1.06)	1.00 (0.96, 1.05)	0.89 (0.82,0.98)*	1.09 (0.96, 1.24)
Biological sex	0.77 (0.50, 1.329)	1.092 (0.47, 2.51)	0.97 (0.52, 1.83)	0.71 (0.40, 1.28)	0.15 (0.03, 0.70)*	0.75 (0.17, 3.37)
Falls at baseline (12- month hx), OR [Cls]	1.17 (0.69, 1.98)	1.52 (0.67, 3.41)	1.22 (0.67, 2.24)	0.70 (0.40, 1.23)	0.52 (0.19, 1.38)	0.50 (0.11, 2.21)
Charlson, OR [CIs]	0.99 (0.88, 1.13)	1.12 (0.94, 1.32)	1.04 (0.91, 1.19)	0.95 (0.83, 1.09)	0.98 (0.79, 1.24)	0.96 (.68, 1.36)

Abbreviations: CFS clinical frailty scale, ED emergency department, NH nursing home, CST-OP community specialist team older people, PC primary care, OR odds ratio, CI confidence interval, hx history

* p < 0.05. **As there were 0 count of falls in the group that did not die, there was not enough power to include falls at baseline (12-month history) in this analysis [33]

missing for process outcomes ED attendance, AMU attendance, MAU attendance, LIU attendance EMS use, unplanned hospital admission, from one participant for PCCC use and from five participants for NH admission. Data were missing from seven participants for falls incidence and from eight participants for HRQoL.

There was a significant difference in functional status, F (2,556) = 12.57, p < 0.001, η^2 = 0.43. Self-reported functional status was maintained at 30-days post index visit 17.6 (2.7) mean (SD), but there was a significant decline at 180-days 17.1 (3.5) mean (SD). The mortality rate was 3% (*n* = 9) at 180-days. The incidence of functional decline was 33.7% (*n* = 102). In terms of process outcomes (see Table 3), 23.8% (*n* = 71) of participants experienced an unscheduled ED presentation, 19.8% (*n* = 60) experienced an unplanned hospital admission, 10.2% (*n* = 31) were admitted to a NH and 53.8% (*n* = 163) had an OPD appointment in the acute setting. Thirty-two percent (*n* = 97) of participants used acute care services. At 180-day follow-up 86.1% (*n* = 161) were discharged from the CST-OP.

Separate logistic regression models were estimated to explore if baseline characteristics predicted adverse outcomes at 180-days (Table 4). Our pooled data demonstrated that the presence of frailty (as measured as \geq 5 on the CFS) is a significant predictor of functional decline OR 1.67 (1.25, 2.23), NH admission OR 1.50 (0.98, 2.30), hospitalisation OR 1.50 (1.09, 2.07), ED presentation OR 1.58 (1.16, 2.14), and mortality OR 2.62 (1.16, 5.93) at 180-days. Female biological sex and increasing age were significant predictors of higher primary care service use.

There was a significant improvement in HRQoL index values between index visit and 30-days 0.7 (0.30) mean (SD) and between index and 180-days 0.7 (SD 0.3) mean (SD), F (2,542) = 13.84, p < 0.001, $\eta^2 = 0.49$. No significant differences were observed between index and 30-days but there was a significant decline in HRQoL as per the VAS between 30- and 180-days (p = 0.04, 95% confidence interval (CI) 0.08–5.68).

Multidisciplinary care received by participants

The number of interventions provided by the CST-OP allied health professionals is outlined in Additional File 4. Most participants received physiotherapy input (61.1% at 30-days and 64.7% at 180-days). The second most common allied health professional input was SLT at 30-days followed by OT and dietetic input respectively (Additional File 4). Almost 16.0% of participants received OT input at 180-days, 15.5% received speech and language input and 7.9% were seen by a dietician at 180-days (Additional File 4).

Community services and integration of healthcare

Participants also received care for PCCC services.

Almost three quarters of participants used primary care services (n = 226) over the 30-day period while 91.7% (n = 278) used PCCC services between 30- and 180-days. A detailed breakdown of PCCC use is available in Additional File 5. The number of GP attendances increased from 31.0% attending the GP between index and 30-days while 69.3% attended the GP between 30-days and 180-days. An increase of home help services was also observed (29.7% at 30-days vs 46.2% at 180-days). A low rate of onward referral to routine community allied health professional services was noted across time points with 8.3% being referred for PT, 7.9% for OT, 1.0% for SLT and dietetics at 30-days.

Discussion

This prospective cohort study explored the clinical and process outcomes of community-dwelling older adults who were screened by and referred to one of three CST-OP hubs in the Mid-West of Ireland by their GP and received CGA, over a period of six months after their initial hub attendance. The presence of frailty (as measured as ≥ 5 on the CFS) was a significant predictor of functional decline, NH admission, hospitalisation, ED presentation, primary care use and mortality at 30-days and of functional decline, hospitalisation, ED presentation and mortality at 180-days.

Our findings demonstrate that despite the pre-frail/ frail presentation of older adults to the CST-OP hub, functional status was maintained at 30-days. There was, however, a significant reduction in functional status at 180-days. Our findings parallel those of two prospective cohort studies that reported a significant decrease in physical functioning among German and American community-dwelling older adults \geq 75 years over time [34, 35]. Similarly, our findings are further comparable to the Brazilian PerGERO prospective cohort study of community-dwelling older adults who underwent OPD CGA [36]. Seventy-seven percent of participants in this study were living with frailty or pre-frailty and had mean age of 82 years (SD = 8). Based on data provided by the main author, over a 12-month follow-up period 20.28% experienced functional decline, 9.9% died, 24.1% were hospitalized, 55.6% attended the ED and 2.0% were admitted to a NH [36]. However, it must be noted that some clinical and methodological differences between this study and our cohort study existed. Namely, this study included some older adults who were not living with frailty, the team composition of this study only included nurses and geriatricians, and it lacked detail on any follow-up intervention procedures post assessment [36]. A decline in functional status can be attributed to several factors. At a biological level, ageing is characterised as damage at a molecular and cellular level that ultimately leads to a progressive decline in bodily functions [20].

Findings from our prospective cohort study also align with those from a recent Cochrane review of 21 RCTs examining the effectiveness of community-based CGA that found little to no improvement on functional status (SMD -0.09, 95% CI -0.24-0.05) and other clinical and process outcomes including mortality (RR 0.88, 95% CI 0.76-1.02), ED presentations (RR 0.65, 95% CI 0.26-1.59), NH admission (RR 0.93, 95% CI 0.76- 1.14) and little change in HRQoL (SMD 0.10, 95% CI 0.00-0.21 among community-dwelling older adults [19]. This review provided data on 7,893 older adults across 10 countries and four continents. Significant heterogeneity was apparent across studies. Firstly, seven studies identified participants based on frailty status whereas the remainder used alternative strategies to identify at-risk older adults such as need for social support, healthcare use, functional impairment, multimorbidity, low income status or high risk of NH admission. Secondly, the setting in which the intervention was carried out varied. Nine studies were predominantly carried out at home, while the remaining 12 studies were carried out in 'OPD' community clinics or general practice settings. While all studies included a member of the team with specialist geriatric expertise, there was considerable heterogeneity in the composition of the MDT and the number of healthcare professionals involved. Furthermore, there was significant ambiguity in the description of CGA, with limited information on how the care plan was integrated across settings. Little information including dosage of healthcare interactions with the patient, who delivered what parts of the intervention and the length of follow-up within the individualised care plan highlighted the 'black box' that is CGA. Lastly, due to the variety of outcome measures included, authors of this review recommend the need for further trials to examine the effect of community based CGA on functional status and HRQoL are required. Given that previous longitudinal data reported adverse socioeconomic circumstances are significantly associated with functional decline in older adults [37], further trials examining the effect CGA on functional status among this cohort is required.

Outcomes at 30-and-180-day follow-up highlighted that older adults reported a significantly higher HRQoL compared to baseline and high satisfaction with care. A fundamental component of the CGA process is the person-centred multifactorial assessment and development of an integrated and coordinated plan of care [38]. A recent qualitative evidence synthesis and metaethnography of stakeholders' experiences of CGA in the community and out-patient settings found that CGA in a home based or OPD setting allows for a holistic and integrated approach to care for community-dwelling older adults while increasing patient satisfaction and accessibility to care [39]. It was also highlighted in this qualitative synthesis that clear communication between HCPs and patients supported a positive experience of CGA. However divergent experiences of meaningful involvement of older adults and their caregivers during the CGA process in the community/OPD setting exists [39]. HCPs often assume that patients and caregivers are involved in the CGA process. However, older adults and their caregivers often experience a lack of understanding of what CGA is and an inadequate participation in care planning [39]. In this prospective cohort study, the interdisciplinary team engaged in active goal setting and care planning with the patient and their caregiver from the outset along with regular communication between the case manager and the patient throughout the care journey. This entailed HCPs participating in open, two-way communication about the outcomes of their initial assessment, potential follow-up assessments, referrals and treatment options when required, thereby enhancing communication and the integrated care pathway.

Implications for research and practice

Frailty poses increased risk of adverse outcomes for older adults. Older adults prefer to live in their own home for as long as possible [40, 41]. Our findings demonstrate that the presence of frailty as defined by the CFS, places community dwelling older adults at risk of adverse outcomes including NH admission. In this study, the CFS was included in the pre-defined inclusion criteria for referral to the CST-OP hub to stratify a cohort of older adults at risk of frailty. The identification of frailty is an indication for CGA [17], and the WHO states that detection of early markers of declines in intrinsic capacity is crucial to maintain, delay or reverse functional decline, prevent unnecessary emergencies and reduce healthcare utilisation among older adults [3]. CST-OP care may have a role in reducing potentially avoidable hospital admission and hospital acquired disability.

In terms of scale-up and implementation, integrated care is a complex intervention with significant implications for research and practice. The CST-OP model of care closely reflects the most common components of integrated care strategies outlined in a recent systematic review [12]. By providing individualised, comprehensive and MDT care plans alongside effective case management techniques, the CST-OP model exemplifies the key elements categorized by the Rainbow Model of Integrated Care taxonomy, as described in the systematic review by Hayes and colleagues [12]. These findings underscore the importance of further research to explore the scalability and broader implementation of such integrated care models. The alignment of with the WHO guideline on 'Integrated care models: an overview' [42] highlights the relevance of these components in enhancing clinical practice. Future research should focus on evaluating the effectiveness of 'hub' versus home-based CGA for community-dwelling older adults.

The heterogeneity of research exploring patient reported outcomes is evident across community-based CGA interventions [19, 21]. Future use of standardised assessments to assess functional status and HRQoL for community-based CGA is warranted [19, 21]. Only six of the 22 included trials in the Cochrane Review by Briggs and colleagues measured HRQoL [19]. Moreover, measurement of patient satisfaction or experience of community-based CGA was not included [19]. This cohort study addressed this research gap through incorporating a person-centred perspective through inclusion of a PROM, EQ-5D-5L [29]. Given that implementation of PROMs, including HRQoL, that enable collaborative person-centred interventions enable more effective healthcare [23], HRQoL could be considered as a primary outcome for future RCTs that examine the impact of CGA. Furthermore, outcomes of this cohort study may be used to inform the design and delivery of future RCTs that examine the effectiveness of community-based CGA.

Strengths and limitations

This is the first study that explored person-centered integrated CGA as a model of care for older adults who are referred to and screened by their GP to a CST-OP in an Irish setting. The use of patient reported outcome measures is one of the key strengths of this study and the impact of care was explored at both clinical and process level. The low rates of attrition at 30 (n=2; 0.7%) and 180-days (n=4; 1.3%) further enhance the reliability of our findings. This multi-site study increases the generalizability of findings. The involvement of PPI involvement informing the included outcomes is another strength of the study. This study supports the growing emphasis in research and policy on adopting a community-based approach to the delivery of care to older adults.

As a result of the observational design of this study, the lack of randomization and of a control group is a limitation to this study. Although the analysis controlled for confounding factors, the true effect of exposures and outcomes cannot be out ruled. The majority of the population were white Irish which may affect the generalisability of findings to more diverse populations. Furthermore, the consecutive recruitment of older adults who were referred by their GP may introduce selection bias on the basis of the requirement to attend the CST-OP hub for inclusion in this study. Thus, this may impact the generalisability of findings for a vulnerable population of older adults who find it difficult to access care or findings may over-represent those who are more inclined to access care and participate. While the option to refer into the CST OP hub was available to all GPs in the catchment area, we did not gather data on the proportion (or profile) of those who referred into the service. Finally, the self-reporting of functional status may incur recall bias.

Conclusion

The model of integrated care delivered by the CST-OP may improve outcomes and mitigate against potentially avoidable ED presentations and hospitalisations among community-dwelling older adults. Presence of frailty was a significant predictor for adverse outcomes at 30- and 180days, and a score of ≥ 5 on the CFS frail was associated with increased risk of functional decline, increased rates of mortality, NH admission, hospitalisation or ED presentation at 30- and 180-days. Although the functional status decreased at long-term follow-up, older adults' HRQoL significantly improved. Integrated care facilitating transfer of care away from the acute towards the primary care setting are key to the reform of healthcare delivery to older adults. Future research should consider the impact of a domiciliary based versus 'hub' based integrated model of care on communitydwelling older adults, using RCT methodology.

Abbreviations

CST-OP	Community Specialist Teams for Older Persons
CGA	Comprehensive Genatric Assessment
HRQOL	Health-related quality of life
ED	Emergency Department
WHO	World Health Organization
MDT	Multidisciplinary team
RCT	21 Randomised controlled trials
SMD	Standardised mean difference
CI	Confidence interval
FTE	Full-time equivalent
CNS	Clinical nurse specialist
ANP	Advanced nurse practitioner
GP	General Practitioner
OTA	Occupational therapist assistant
CFS	Clinical Frailty Scale
EQ5D5L	EuroQoL-5D-5L
PAIEC	Patient Assessment of Integrated Elderly Care
SD	Standard deviations
IQR	Interquartile ranges
PC	Primary care
OR	Odds ratio
NH	Nursing home
Hx	History
	-

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12875-025-02895-x.

Supplementary Material 1.	
Supplementary Material 2.	
Supplementary Material 3.	
Supplementary Material 4.	
Supplementary Material 5.	

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Authors' contributions

CH conceptualised the study and was responsible for design of the work, analysis and interpretation of the data and writing the original draft preperation. RG was responsible for conceptualisation of the study, design of the work, analysis and interpretation of the data, supervision, and revised the manuscript from a critical perspective. AW reviewed data analysis. CH and CD were involved in the extraction of data. All authors including CH, RG, KR, CD, CF, BC, AL, MM, and AW contributed to the drafting and editing of the manuscript. All authors have read and approved the final draft of the manuscript.

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Data availability

The datasets used and analysed within this study are available from the corresponding author on request.

Declarations

Ethics approval and consent to participate

The study adheres to the Declaration of Helsinki and ethical approval for the study was granted by the Research Ethics Committee, University of Limerick Hospitals Group, Mid-West Region (Ref. 116/2021). Hard copies of signed participant consent forms were obtained for all participants.

Consent for publication

Written informed consent was obtained from all participants who were recruited during the duration of the study.

Competing interests

The authors declare no competing interests.

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