An evidence-based and stakeholder-informed approach to advancing comprehensive geriatric assessment models of care in emergency and acute care settings

An evidence-based and stakeholder-informed approach to advancing comprehensive geriatric assessment models of care in emergency and acute care settings

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A thesis submitted for the degree of Doctor of Philosophy at the Faculty of Education and Health Sciences, University of Limerick, Ireland

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Submitted to the University of Limerick, September 2023

Abstract

Title
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Background
Comprehensive geriatric assessment (CGA) is considered the reference standard approach to improving a range of outcomes for hospitalised older adults living with frailty. To date, the delivery and impact of CGA in the emergency department (ED) has not been extensively studied.

Aim
This thesis aimed to identify and develop the evidence base for CGA models of care in emergency and acute care settings.

Methods
First, an updated systematic review and meta-analysis synthesised the totality of evidence regarding the effectiveness of acute geriatric unit (AGU) care among hospitalised older adults with acute medical complaints. Second, a qualitative systematic review and meta-ethnography synthesised stakeholders' experiences of CGA in an inpatient hospital setting. Third, a prospective cohort study explored the longitudinal outcomes of older adults who received CGA in the ED of a university teaching hospital in Ireland. Lastly, a national consensus building study established the core elements of a frailty at the front door (FFD) model of care using a modified real-time Delphi technique. This programme of research is aligned with contemporary models of successful ageing and is underpinned by the principles of Public and Patient Involvement (PPI).

Results
The updated systematic review and meta-analysis identified that AGU care was associated with a reduction in functional decline at six-month follow-up and an increased probability of living at home at three-month follow-up. The meta-ethnography illustrated a reciprocal and refutational synthesis, reflective of the disparate experiences of CGA across stakeholder groups. The prospective cohort study found that CGA in the ED may improve outcomes by mitigating against the adverse effects of potentially avoidance hospital admission and focusing on integration of services across the continuum of care. Finally, development of a consensus derived FFD model of care represents an important step in generating national standards, implementation of a service model as intended, and enhances opportunities for scientific impact.

Conclusion
The findings and unique contributions arising from this thesis aim to inspire the design and delivery of evidence-based CGA models of care with a particular focus on identifying the optimum target population, operational models of CGA, core intervention components, and outcomes of interest. Future research should continue to operationalise effective PPI and evaluate the fidelity of CGA models of care through completion of process evaluations.

Declaration

I hereby declare that the work contained in this thesis is my own, and was completed with the counsel of my supervisors, Professor Rose Galvin and Professor Katie Robinson. No part of this thesis has been submitted for any other degree or any institution.

Signed: Ide E Shaughnessy

Acknowledgements

During the last three years, a number of wonderful people have supported me on this PhD journey.

First and foremost, to my amazing supervisors, Prof Rose Galvin and Prof Katie Robinson. What can I say – I will be forever grateful to you both for the unwavering support, guidance, and encouragement you gave me over the past three years. From the high quality supervision, academic support, unique perspectives, timely feedback, the laughs, chats, the list goes on! I have loved every minute of this journey and a part of me is a little sad that our supervisory relationship is coming to an end. Individually and as a duo, I have learnt so much from you both, and hugely admire and respect your passion for ageing research. Thank you.

To Dr Aoife Whiston and Dr Christine Fitzgerald, who contributed their support and expertise to individual studies – thank you for your insights related to quantitative and qualitative analyses. To Louise Barry, Gillian Corey, Collette Devlin, and Deirdre Hartigan, thank you all for doing a stellar job when completing participant follow-up as part of a study embedded within this thesis.

To the older adults and their family members who participated in the Public and Patient Involvement advisory group – thank you for being so generous with your time. Your insights and perspectives were invaluable and certainly enriched this thesis. It was a privilege to work with you all.

To all my wonderful colleagues in University Hospital Limerick – thank you for all your support and flexibility over the past three years and for always checking in on my progress! A special thank you to Fiona Steed, former Group Lead of Allied Health who supported my engagement in this PhD and who was a constant source of inspiration since joining the team in UHL in 2018. To my Occupational Therapy manager, Leonora Carey – thank you for your leadership and support of my flexible working arrangements, and for granting my (often last minute!) leave requests, particularly at the final stages of write up.

To all my friends (too many to name!) – I count myself very lucky to have such an incredibly kind, trustworthy, and fun circle of friends in my life. Thank you all for everything, particularly over the last three years.

And finally, to my family – thank you for your unwavering and unconditional support. In particular to my parents for always getting behind me no matter what 'project' I decide to take on! Thank you for all the sacrifices you made to ensure Miriam, Michael, and I were given every opportunity to further our education and to feel fulfilled in life. To Miriam and Michael – thank you for being you and for always looking out for me.

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List of Abbreviations

ADL	Activities of Daily Living
AFN	Acute Frailty Network
AGU	Acute Geriatric Unit
BI	Barthel Index
CASP	Critical Appraisal Skills Programme
CCI	Charlson Comorbidity Index
CENTRAL	Cochrane Central Register of Controlled Trials in the Cochrane Library
CFS	Clinical Frailty Scale
CGA	Comprehensive Geriatric Assessment
CI	Confidence Interval
CINAHL	Cumulative Index of Nursing and Allied Health Literature
COS	Core Outcome Set
CSTOP	Community Specialist Team Older People
ED	Emergency Department
EM	Emergency Medicine
EQ-5D-5L	EuroQoL Survey 5-Dimensions and 5-Levels Form
FFD	Frailty at the Front Door
GRADE	Grading of Recommendations, Assessment, Development and Evaluations
HAD	Hospital-Associated Disability
HCP	Health Care Professional
HSCP	Health and Social Care Professionals
HSE	Health Service Executive
IAEM	Irish Association of Emergency Medicine
IQR	Interquartile Range
ISAR	Identification of Seniors at Risk
ICT	Information and Communications Technology
MD	Mean Difference
MDT	Multidisciplinary Team
MMSE	Mini Mental State Examination
MTS	Manchester Triage System
NCPOP	National Clinical Programme for Older People
NICPOP	National Integrated Care Programme for Older People

NH	Nursing Home
OR	Odds Ratio
OSF	Open Science Framework
PC	Primary Care
PPI	Public and Patient Involvement
PRISMA	Preferred Reporting of Items for Systematic Reviews and Meta-Analyses
PROM	Patient-Reported Outcome Measure
PREM	Patient-Reported Experience Measure
PSQ-18	Patient Satisfaction Questionnaire-18-Item
QoL	Quality of Life
RCT	Randomised Controlled Trial
RoB	Risk of Bias
RR	Risk Ratio
SD	Standard Deviation
SMD	Standardised Mean Difference
STROBE	Strengthening the Reporting of the Observational studies in Epidemiology
UHL	University Hospital Limerick
UN	United Nations
WHO	World Health Organisation

List of Outputs

Publications as primary author

1. O'Shaughnessy, Í., Robinson, K., O'Connor, M., Conneely, M., Ryan, D., Steed, F., Carey, L., Leahy, A. and Galvin, R. (2021) 'Effectiveness of acute geriatric unit care on functional decline and process outcomes among older adults admitted to hospital with acute medical complaints: a protocol for a systematic review', *BMJ Open*, 11(10), p.e050524.

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1. O’Shaughnessy, Í., Robinson, K., Whiston, A., Barry, A., Corey, C., Devlin, C., Hartigan, D., Synnott, S., McCarthy, A., Moriarty, E., Jones, B., Carroll, I., O’Connor, M., Conneely, M., Steed, S., Carey, L., Shchetkovsky, D., Shanahan, E., Leahy, A., Quinn, Q., Ryan, D. and Galvin, R. (2023) ‘Comprehensive geriatric assessment in the emergency department: a prospective cohort study of process, clinical, and patient-reported outcomes’. (In Press, *Clinical Interventions in Aging,* December 2023).

List of Oral and Poster Presentations

Published Oral Abstracts

O’Shaughnessy, Í., Robinson, K., O’Connor, M., Conneely, M., Ryan, D., Steed, F., Carey, L., Leahy, A., Shanahan, E., Quinn, C. and Galvin, R. (2022) ‘Effectiveness of acute geriatric unit care on functional decline, clinical and process outcomes among hospitalised older adults with acute medical complaints: a systematic review and meta-analysis’, *European Geriatric Medicine,* 13(Suppl 1), p.S1-S439. [Prize for best oral communication]

Accepted Oral Presentations

1. O'Shaughnessy, Í., Robinson, K., O'Connor, M., Conneely, M., Ryan, D., Steed, F., Carey, L., Leahy, A., Shanahan, E., Quinn, C. and Galvin, R. (2022) 'Effectiveness of acute geriatric unit care on functional decline, clinical and process outcomes among hospitalised older adults with acute medical complaints: a systematic review and meta-analysis'. *WONCA World Rural Health Conference*. June 2022.

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3. O'Shaughnessy, Í., Fitzgerald, C., Whiston, A., Harnett, P., Whitty, H., Mulligan, D., Mullaney, M., Devaney, C., Lang, D., Hardiman, J., Condon, B., Hayes, C., Holmes, A., Barry, L., McCormack, C., Bounds, M., Robinson, K., O'Connor, M., Ryan, D., Shchetkovsky, D., Steed, F., Carey, L., Ahern, E. and Galvin, R. (2023) 'Establishing the core elements of a frailty at the front door model of care using a modified real-time Delphi technique'. *Irish Gerontological Society Annual Scientific Meeting.* September 2023.

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Accepted Poster Presentations

1. O’Shaughnessy, Í., Robinson, K., O’Connor, M., Conneely, M., Ryan, D., Steed, F., Carey, L., Leahy, A., Shanahan, E., Quinn, C. and Galvin, R. (2022) ‘Effectiveness of acute geriatric unit care on functional decline, clinical and process outcomes among hospitalised older adults with acute medical complaints: a systematic review and meta-analysis’, *Irish Gerontological Society Annual Scientific Meeting.* November 2021.

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Chapter 1: Introduction

1.1 Population Ageing

Demographic projections suggest that the populations of almost all nations are ageing. Today, for the first time in history, most people can expect to live into their 60s and beyond (Beard *et al.* 2016). It is forecasted that the number of people aged 60 years and older will increase from 1 billion in 2019 to 1.4 billion in 2030, representing 16.5% of the global population. By 2050, the global population of older adults will have more than doubled, to 2.1 billion (WHO, 2020). Ireland, like many other countries has seen a steady increase in life expectancy and has an ageing population. By 2031, it is estimated that there will be more than one million older adults in Ireland, representing an increase from 13.6% (2017) to 20% of our overall population (Department of Health 2018).

This global demographic shift presents both opportunities and challenges. A longer life is an invaluable social, cultural, economic, and familial resource (Beard and Bloom 2015). It provides an opportunity to reconsider not only what older age might be, but the ways we relate to each other and the things we aspire to (Beard *et al.* 2015). Yet, the extent of the opportunities afforded by extra years of life are heavily dependent on one key characteristic – health. Although increasing longevity is often assumed to be accompanied by an extended period of good health, the quality of these additional years remains unclear (Crimmins *et al.* 2011). Most developed world countries have accepted the chronological age of 65 years as the numerical criterion to refer to an older person (Kowal and Dowd 2001); however, this somewhat arbitrary age cut-off does not assume equivalence with biological age (Bernabeu *et al.* 2023).

At a biological level, ageing is characterised by a gradual, lifelong accumulation of molecular and cellular damage that results in a progressive, generalised impairment in many body functions, and an increased vulnerability to environmental challenges (Kirkwood 2008). As people age, they are more likely to experience multimorbidity, that is, the co-occurrence of two or more chronic conditions (Navickas *et al.* 2016). Although not an inevitable part of ageing, the presence of chronic diseases hinders health span and is associated with decreased quality of life (QoL), higher rates of healthcare utilisation, and polypharmacy (Yarnall *et al*. 2017; Wallace *et al.* 2015). There is growing interest in the biological underpinnings of ageing and in identifying ways to measure biological age as distinct from chronological age (Belsky *et al.* 2015). While this work is helpful in quantifying longitudinal change across multiple organ systems, it also serves to better capture the heterogeneity that is a hallmark of ageing. Furthermore, it helps researchers and clinicians advance from historical demographic stereotyping of older age towards a more coherent public health response to population ageing.

1.2 Policy Responses to Healthy Ageing

Health in older age is a complex construct. The multifaceted dynamics between underlying physiological change, illness, and multimorbidity can result in physical and cognitive conditions that are not captured by traditional disease classifications (Beard *et al.* 2019; Inouye *et al.* 2007). This means that disease-based conceptualisations are often considered inadequate surrogate measures of health in an older adult (Nguyen *et al*. 2021; Mitnitski *et al.* 2017). Rather than using the entry points of chronological age or the presence or absence of disease, the most important determinant of health for an older adult may be their level of functional ability (Beard *et al*, 2016). Moreover, comprehensive assessments of functioning are also strong predictors of survival and other outcomes that older adults consider meaningful (Lordos *et al*. 2018; Chatterji *et al.* 2015). In 2015, the World Health Organisation (WHO) released the first *World Report on Ageing and Health*, which reviewed current knowledge and gaps and proposed a public health framework for action on population ageing (WHO 2015). The report reconstructed the definition of healthy ageing to centre on the concept of functional ability, with a specific focus on enabling older adults to be, and to do, the things they have reason to value. It comprises the intrinsic capacity, that is, the composite of all the physical and mental characteristics of an individual, relevant environmental characteristics, and the interactions between the individual and these characteristics (Eendebak and WHO 2015). In keeping with this focus on functional ability, a key priority of the WHO is to embrace the United Nations (UN) resolution on the Decade of Healthy Ageing (2021–2031), which is underpinned by implementation of collaborative actions across member states to ensure older adults can live long and healthy lives in the communities in which they reside (WHO 2020; Amuthavalli Thiyagarajan *et al*. 2022). The 10-year global plan addresses four interconnected areas: (i) to change how we think, feel and act toward age and ageing; (ii) ensure that communities foster the abilities of older adults; (iii) deliver person-centred integrated care and primary health services that are responsive to older adults; and (iv) provide access to long-term care for older adults who need it. Embracing the UN's resolution on the Decade of Health Ageing underscores the importance of evidence-based and data-driven guidance to ensure meaningful implementation of global strategies, programmes, and policies focused on healthy ageing.

Ireland, like many other nations is tasked with introducing collaborative actions to keep pace with changing population demographics and to ensure the objectives of the UN Decade of Healthy Ageing are realised. The organisational structure and management of the Irish health service underwent a significant period of change in 2005 with the abolition of Health Boards and establishment of the national Health Service Executive (HSE) followed by the formation of Hospital Groups in 2013 and Community Health Organisations in 2015. In 2010 and 2016, the HSE established clinical programmes to look at more optimal ways of caring for our ageing population across the continuum of care – the National Clinical Programme for Older Persons (NCPOP) and the National Integrated Care for Older Persons (NICPOP), respectively. Both clinical programmes are leading out on the development of end-to-end pathways that describe cohesive primary, secondary, and acute care services for older adults with a specific focus on those with complex needs and supporting them at home (Harnett *et al.* 2020). However, a review of the practices of multidisciplinary teams (MDTs) delivering integrated models of care across various settings in Ireland found that progress has been constrained by organisational factors including fragmented funding structures, high turnover of senior level decision-makers, a lack of multiannual funding, and complex professional arrangements (Barry *et al*. 2021). Ireland formally adopted a comprehensive integrated care policy in 2018 as part of its ten-year Sláintecare Reform Programme mapping a path to universal healthcare where everyone has equitable access to services based on need, and not ability to pay (Department of Health 2018). The objective of this programme is to improve population health by delivering the "*the right care, in the right place, at the right time, by the right team*". While there is evidence that government's implementation strategy and actions plans are focusing on reforming a complex adaptive system, limited progress has been made towards expanding entitlements and achieving the Sláintecare vision of universal healthcare (Thomas *et al.* 2021). It is imperative that the development and implementation of healthy ageing strategies and models of integrated care are underpinned by the diverse values of older adults and that policymakers and researchers give due consideration to the influence of the socio-economic and physical environment in which older adults reside.

1.3 Models of Successful Ageing: The Capability Approach

Healthy ageing strategies and models have invariably produced a discursive construction of an ideal health that focuses on maintaining high physical and mental functioning and remaining socially engaged (Peng and Fei 2013; Stenner *et al.* 2011). This perspective may be perceived as placing individual responsibility on older adults for ageing 'successfully' (Rubenstein and de Medeiros 2015; Chapman 2005) with many researchers deeming it oppressive because such an ideology reinforces the social exclusion of marginalised older adults due to inequalities that are exacerbated in older age (Allmark and Machaczek 2015; Venkatapuram 2013; Estes *et al.* 2003). Given that almost 60% of older adults live in low- and middle-income countries (WHO), healthy ageing discourses must consider the deleterious effects of socio-economic and political factors, which impact opportunities to age 'successfully' (Holstein and Minkler 2003). Stephens (2017) framed these critiques around three central issues: (i) support for oppressive ideals and homogenising ageist discourses; (ii) a dominant ideology of individual responsibility for well-being; and (iii) support for healthism and denial of embodied ageing and death.

Social and environmental factors are inextricably linked with functioning and have a powerful influence on health and longevity; therefore, an understanding of the impact of these contextual factors must be central to any strategy aimed at promoting healthy ageing (Beard and Petitot 2010). Findings from a recent systematic review that synthesised the global reach of ageism on older adults' health showed the existence of a strong and consistent link between ageism and adverse health outcomes (Chang *et al.* 2020). The review included both structural (i.e., in which societal institutions promote systematic bias against older adults) and individual level (i.e., in which older adults assimilate negative views of ageing from their culture) studies and reported adverse outcomes across 11 health domains among over seven million older adults.

Sen's (1993) capability approach provides a nuanced theoretical framework for research and policy in ageing and health by framing older adults' well-being in terms of their capability to function in the ways that they value. The capability approach is a socially, environmentally, and ethically oriented framework that recognises differences in social standings and material circumstances that influence an older adult's capabilities as well as diversity in values (Sen 2002). Application of such an approach addresses the critiques of traditional ageing strategies outlined by Stephens (2017) by shifting our understanding and core underpinnings of healthy ageing to more inclusive identities for older adults. A central principle of the capability approach is to evaluate the impact of social arrangements, living conditions, and health disparities on the freedom of older adults to live the life they value (Alkire 2005). The 'extent of freedom' is influenced by access to resources that support well-being; therefore, achieving individual capability requires social action to remove structural barriers that impede participation and optimal functioning (Marmot *et al.* 2010). Because the dominant discourses, which underscore research and policy have powerful influences on the way in which healthy ageing is constructed, adoption of the capability approach in research can ensure a focus on the capability of older adults to achieve valued functioning, rather than being responsible for ageing 'successfully'. Accordingly, this thesis has adopted the capability approach to inform the programme of research studies contained within it, and in doing so ensures older adults are empowered to contribute as key stakeholders and research partners when establishing the design and implementation of the evidence base. Such an approach draws parallels with Public and Patient Involvement (PPI), which is described by the National Institute for Health Research funded initiative, INVOLVE, as an active partnership between the public, patients, and researchers whereby research is carried out 'with' or 'by' members of the public rather than 'to', 'about' or 'for' them (Hayes *et al.* 2012). PPI ensures a focus on topics that are relevant and important to health service users (Crowe *et al.* 2015; Brett *et al.* 2014), which strengthens research from an ethical standpoint by ensuring the health service user's voice is equitably represented (Muller *et al.* 2019). This thesis is underpinned by PPI and aims to identify and develop meaningful research priorities that are responsive to the needs and preferences of older adults.

1.4 Healthcare Utilisation among Older Adults

Structural demographic change and advances in global health over the past 100 years are, from every lens, a success and enable the longevity dividend of older adults to be realised (Olshansky *et al.* 2006). Configuration of healthcare systems to optimise the health outcomes of older adults is an ongoing priority as demand for healthcare continues to rise. Internationally, health and social care systems recognise the need for systems to move from episodic and hospital-centric to longitudinal, coordinated, and integrated care models, reflecting the growth in multimorbidity and complexity of care needs among older adults. However, acute hospital-based care continues to be the default option for many older adults with the emergency department (ED) serving as the primary portal of entry to access inpatient care (Conroy and Turpin 2016). The international evidence suggests that older adults are the predominant users of inpatient hospital services accounting for 50% of hospital bed days (Boucher *et al*. 2023) and 25% of all ED attendances (Berning *et al.* 2020). Older adults admitted to hospital face the combined challenges of the precipitating illness or injury and the constraints of the physical hospital environment (Mudge *et al.* 2019; Palmer *et al.* 1994). Large international studies have shown that hospitalised older adults are at particular risk of adverse events such as functional decline, delirium, falls, and incontinence (Loyd *et al.* 2020; Chong *et al.* 2018; Reynish *et al*. 2017; Long *et al.* 2013). The reasons underlying older adults' higher rate of adverse outcomes are multifaceted; however, the most potent intrinsic factor is the clinical condition of frailty (Hubbard *et al*. 2017; Clegg *et al*. 2013). Frailty is a well-established construct and is characterised as a state of increased vulnerability to poor resolution of homoeostasis after a stressor event, which increases the risk of adverse outcomes (Rockwood and Howlett 2018; Mitnitski *et al.* 2018). Older adults living with frailty are at greater risk of health crises and can be conceptualised as complex systems, vulnerable to physiological and psychological stressors caused by both intrinsic and environmental factors (Theou *et al.* 2018; Gilbert *et al.* 2018).

In terms of process and clinical outcomes following emergency care, a quantitative synthesis of 32 international studies found that older adults utilise more healthcare resources, experience long ED stays, and demonstrate higher rates of adverse outcomes at 30 days such as functional decline (37%), unscheduled ED re-attendance (17%), emergency or unscheduled hospitalisation (18%), and death (6%) (Galvin *et al.* 2017). Older adults consistently report negative experiences in the ED, which are mainly related to long waiting times, constraints imposed by the physical environment, and insufficient physiological, psychological and information support (van Oppen *et al.* 2019; Shanker *et al.* 2014; Hoon *et al.* 2012). A forthcoming qualitative evidence synthesis on older adults' experiences of transition to the community following ED discharge found that older adults often report fragmentation and discontinuity of care as well as unresolved symptoms on discharge, which negatively impact their functional abilities and are subsequently a key driver of early ED re-attendance (Condon *et al.* 2023). Furthermore, frailty status on admission to hospital is predictive of multiple adverse outcomes among older adults including in-hospital mortality, long hospital stays, functional decline at hospital discharge, and mortality in the medium- and long-term (Cunha *et al.* 2019). Given the pervasive impact of emergency and acute care on health outcomes, older adults living with frailty require an individualised approach to care and modifications to standardised protocols that are responsive to their needs and preferences. Moreover, patient engagement in research priority-setting partnerships provides an opportunity to incorporate perspectives of older adults with the lived experience of frailty when setting the research agenda on the optimisation of health and social care systems, thereby ensuring the delivery of holistic models of care (Cottey *et al*. 2023; Bethell *et al.* 2019; Parker *et al.* 2019).

1.5 Comprehensive Geriatric Assessment in Hospital Settings

The increasing number of emergency hospital admissions among older adults is a growing public health concern. From a systems perspective, there is an urgent need to re-evaluate configuration of services to meet this increased demand for resources. New models of care are being developed and evaluated that provide an alternative to hospital-based care for older adults where healthcare services are delivered in the home (Norman *et al.* 2023; Shepperd *et al*. 2022; Bernard *et al.* 2021). Unifying all evidence-based changes to optimise healthcare delivery, PPI, and outcomes for older adults living with frailty is Comprehensive Geriatric Assessment (CGA). CGA was first coined in 1991 as a multidisciplinary diagnostic and therapeutic assessment process focused on determining an older adult's medical, functional, psychological capability to ensure a coordinated and integrated plan for follow-up (Rubenstein *et al*. 1991). Common to assessment and intervention practices are the following key components, which are believed to account for its effectiveness: speciality knowledge; multidimensional and structured assessment; coordinated MDT meetings; formulation of an integrated care plan around patient-centred goals; access to rehabilitation; and iterative review of progress and care planning (Ellis *et al.* 2017). Over the past 2–3 decades, the benefits of inpatient CGA on key clinical and process outcomes have been substantiated in several systematic reviews of randomised controlled trials (RCTs) (Ellis *et al.* 2017; Bachmann *et al*. 2010; Van Craen *et al.* 2010; Baztán *et al.* 2009; Stuck *et al.* 1993; Rubenstein *et al*. 1991). CGA is typically delivered by a MDT inclusive of, but not limited to, specialist medical, nursing, and therapy staff working in a designated ward environment e.g., 'Evaluation and Management Unit' or a mobile inpatient consultation service in non-designated units (Ellis *et al.* 2017). However, uncertainty remains about how best to implement CGA hospital-wide (Conroy *et al*. 2019) with limited high-quality evidence in existence to support the effectiveness of CGA in the ED (Harding 2020; Conroy *et al.* 2011) notwithstanding the deleterious outcomes older adults experience due to prolonged exposure to such an environment. Furthermore, the reviews that highlighted the effectiveness of inpatient CGA did not always examine the impact of frailty as a determinant of CGA outcome or stratify older adults based on clinical characteristics, that we consider important today, such as the presence or absences of clinical syndromes. Additionally, there has been limited focus on qualitative synthesis of the international evidence on older adults' perceptions and experiences of CGA in an inpatient hospital setting.

1.6 Thesis Aim and Outline

This programme of research addresses these gaps in the evidence base and responds to and resonates with key priorities identified in national and international ageing, emergency, and integrated care strategies relating to the development and delivery of a continuum of high-quality care services and supports that are responsive to the changing needs and preferences of older adults. To this end, this thesis aims to advance CGA models of care in emergency and acute care settings underpinned by an evidence-based and stakeholder-informed approach. This thesis constitutes a thesis-by-publication (Chapters 2–7) with an introductory chapter (Chapter 1) and discussion chapter (Chapter 8) to unify the body of evidence.

An overview of the thesis and the objectives of each chapter are presented in Table 1.1. Each chapter is preceded by the candidate's contribution and is followed by its own reference list. The thesis chapters are organised as follows:

Chapter 1 (Introduction) provides an overview of the policy responses underpinning health ageing strategies and the challenges older adults experience in emergency and acute care settings. This introductory chapter outlines the theoretical and evidence-based approaches to conducting this research, and henceforth, signposts the remaining chapters contained in the thesis.

Chapter 2 (Study 1) describes the methods used to conduct a quantitative systematic review, which aims to update and synthesise the totality of evidence related to the effectiveness of acute geriatric unit (AGU) care on functional decline, clinical, and process outcomes among older adults admitted to hospital with acute medical complaints.

Chapter 3 (Study 1) presents findings from an updated systematic review and meta-analysis that compared outcomes of older adults with acute medical complaints admitted to an AGU with those who received conventional hospital care. Underpinned by the Cochrane handbook for systematic reviews of interventions, this updated review raises important considerations for the conduct of future research and admission criteria to an AGU.

Chapter 4 (Study 2) presents findings from a qualitative systematic review and meta-ethnography that synthesised stakeholders' experiences of CGA in an inpatient hospital setting. It addresses a gap in the international evidence and identifies important implications related to organisational and relational dimensions of CGA for future research and clinical practice.

Chapter 5 (Study 3) presents a protocol for a prospective cohort study that aims to explore the clinical, process, and patient-reported outcomes of older adults who receive an interdisciplinary CGA in the ED at University Hospital Limerick over a period of six months after their initial ED attendance.

Chapter 6 (Study 3) presents findings from a prospective cohort study that explored the longitudinal outcomes of older adults who received an interdisciplinary CGA in the ED at University Hospital Limerick over a period of six months. It adds to the body of international evidence focused on the impact of CGA in the ED as well as informing the design of future robust trials of CGA in this setting.

Chapter 7 (Study 4) presents findings from a national consensus building study aimed at establishing the core elements of a frailty at the front door model of care using a modified real-time Delphi technique. It describes the methods used to achieve consensus and the findings of the Delphi process.

Chapter 8 (Discussion) provides an integrated summary of the findings of this programme of research and positions them in the context of current evidence and health policy, as well as future research and clinical practice.

Table 1.1. Overview of chapters and studies that comprise the thesis

Chapter	Study design	Study Title	Status
2	Protocol for systematic review	Effectiveness of acute geriatric unit care on functional decline and process outcomes among older adults admitted to hospital with acute medical complaints: a protocol for a systematic review	Published *BMJ Open*
3	Systematic review and meta-analysis	Effectiveness of acute geriatric unit care on functional decline, clinical and process outcomes among hospitalised older adults with acute medical complaints: a systematic review and meta-analysis	Published *Age and Ageing*
4	Qualitative evidence synthesis	Stakeholder's experiences of comprehensive geriatric assessment in an inpatient hospital setting: a qualitative systematic review and meta-ethnography	Published *BMC Geriatrics*
5	Protocol for a prospective cohort study	Comprehensive geriatric assessment in the emergency department: a protocol for a prospective cohort study	Published *HRB Open Research*
6	Prospective cohort study	Comprehensive geriatric assessment in the emergency department: a prospective cohort study of process, clinical and patient-reported outcomes	Published *BMC Emergency Medicine*

7	E-Delphi study	Establishing the core elements of a frailty at the front door model of care using a modified real-time Delphi technique	In Press *Clinical Interventions in Aging*

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Chapter 2: Effectiveness of Acute Geriatric Unit Care on Functional Decline and Process Outcomes among Older Adults Admitted to Hospital with Acute Medical Complaints: A Protocol for a Systematic Review

Status: Published *BMJ Open* 2021

Citation: O'Shaughnessy, Í., Robinson, K., O'Connor, M., Conneely, M., Ryan, D., Steed, F., Carey, L., Leahy, A. and Galvin, R. (2021) 'Effectiveness of acute geriatric unit care on functional decline and process outcomes among older adults admitted to hospital with acute medical complaints: a protocol for a systematic review', *BMJ Open*, 11(10), p.e050524.

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2.1 Candidate's Contribution: The candidate was lead author on this protocol and was responsible for conceptualisation of the study, development and design of methodology, registration of PROSPERO record, development and refinement of manuscript drafts, and management of journal submission and revisions.

2.2 Abstract

Introduction: Older adults are clinically heterogeneous and are at increased risk of adverse outcomes during hospitalisation due to the presence of multiple comorbid conditions and reduced homeostatic reserves. AGUs are units designed with their own physical location and structure, which provide care to older adults during the acute phase of illness and are underpinned by a multidisciplinary CGA model of care. This review aims to update and synthesise the totality of evidence related to the effectiveness of AGU care on clinical and process outcomes among older adults admitted to hospital with acute medical complaints.

Design: Updated systematic review and meta-analysis.

Methods and Analysis: MEDLINE, CINAHL, CENTRAL, and Embase electronic databases will be systematically searched from 2008 to February 2021. Trials with a randomised design that deliver an AGU intervention to older adults admitted to hospital for acute medical complaints will be included. The primary outcome measure will be functional decline at discharge from hospital and at follow-up. Secondary outcomes will include length of hospital stay, cost of index admission, incidence of unscheduled hospital re-admission, living at home (the inverse of death or institutionalisation combined; used to describe someone who is in their own home at follow-up), mortality, cognitive function, and patient satisfaction with the index admission. Title and abstract screening of studies for full text extraction will be conducted independently by two authors. The Cochrane risk of bias 2 tool will be used to assess the methodological quality of the included trials. The quality of evidence for outcomes reported will be assessed using the Grading of Recommendations Assessment, Development and Evaluations framework. A pooled meta-analysis will be conducted using Review Manager, depending on the uniformity of the data.

Ethics and Dissemination: Formal ethics approval is not required as all data collected will be secondary data and will be analysed anonymously. The authors will present the findings of the review to a PPI stakeholder panel of older adults that has been established at the Ageing Research Centre in the University of Limerick. This will enable the views and opinions of older adults to be integrated into the discussion section of the paper.

Strengths and Limitations:

- This review will be conducted using a standardised and rigorous methodology.

  To ensure scientific rigor when assessing intervention effects, we have chosen only to include trials with a randomised design.
- Four databases covering the biomedical, nursing and allied health peer-reviewed literature will be searched.
- It is proposed that this review will identify the characteristics and components of CGA within an AGU in terms of the intervention, staffing and resources.
- The conclusion of the review will be limited if there is significant heterogeneity across studies, which are identified for inclusion and meta-analyses.

PROSPERO Registration*:* CRD 42021237633

2.3 Background

With population aging worldwide, the number of older adults attending the ED continues to increase, with evidence of growth in attendances over the past decade beyond that expected from international demographic changes (Morley *et al*. 2018). It is anticipated that the number of adults aged ≥65 years will increase from one billion in 2019, to 1.4 billion by 2030 and further increase to 2.1 billion by 2050 (WHO 2017). The ED is often the main portal of entry to unscheduled care for older adults who account for up to 25% of all attendances (Galvin *et al.* 2017). This disproportionate level of ED use by the older population has significant ramifications related to ED crowding (Morley *et al*. 2018; Van den Heede *et al*. 2016) and is considered a major patient safety concern as well as being associated with reduced quality of patient care (Carter *et al*. 2014). Older adults are clinically heterogeneous and often present to the ED and acute care services with a nonspecific complaint or with classical frailty syndromes, which are often triggered by a minor stressor event (Conroy and Turpin 2016) such as an infection or a complication associated with introduction of a new medication. Their complex medical and psychosocial needs may complicate their ED care (Elliot *et al*. 2017; Ellis *et al*. 2014) and thus increase their susceptibility to adverse outcomes. Up to 60% of older adults who present to the ED are admitted for inpatient care as demonstrated in a retrospective cohort study of 550 older adults (Kennelly *et al*. 2014).

There is broad agreement within the literature that hospital admission poses a significant risk for older adults (Gilbert *et al*. 2018; Theou *et al.* 2018) and that system wide reform is required to manage the associated deterioration that occurs in vulnerable older adults due to prolonged exposure to such an environment. Lloyd *et al.* (2020) reported a 30% (95% confidence interval (CI) 24% to 33%) prevalence rate of hospital-associated disability (HAD) among older adults in their meta-analysis of 15 longitudinal studies of hospitalised older adults in acute care. The reasons underlying older adults' higher rate of adverse outcomes during hospitalisation are multifaceted; however, the most potent intrinsic factor is the clinical condition of frailty (Hubbard *et al*. 2017; Clegg *et al*. 2013). Frailty is a well-established construct and is characterised as a state of increased vulnerability to poor resolution of homoeostasis after a stressor event, which increases the risk of adverse outcomes (Rockwood and Theou 2020; Mitnitski *et al.* 2018).

Changes to organisational structure and processes are therefore required to better meet the needs of older adults within acute care (Lafont *et al*. 2011). Underpinning all the innovative and evidence-based changes in the way care is delivered is CGA, which is considered more effective than usual care for older adults living with frailty (Ellis *et al*. 2017). CGA was first coined by Rubenstein *et al.* in 1991 and is defined as a *"multidisciplinary diagnostic process intended to determine a frail elderly person's medical, psychosocial, and functional capabilities and limitations in order to develop an overall plan for treatment and long-term follow-up"* (Rubenstein *et al*. 1991, p.9S). Social and nutritional assessments have recently been recognised as important dimensions of CGA (Conroy *et al.* 2019). CGA is both therapeutic and diagnostic and emphasises improving the QoL and functional status of older adults living with frailty and at the same time, improving prognosis and outcomes (Rubenstein *et al*. 1991). Ellis *et al.* (2017) conducted a Cochrane review of 29 trials and 13,766 participants, which synthesised the evidence on the effectiveness of CGA for older adults admitted to hospital. Older adults who received CGA were more likely to be alive and in their own homes after an emergency admission to hospital and were less likely to be admitted to a nursing home (NH) at discharge or at three to 12 months' follow-up. However, the authors were unable to determine whether the results show a difference in effect between discrete specialised wards and mobile MDTs across several wards as the analysis was underpowered. Therefore, greater understanding of the specific impact and organisational forms of CGA delivery in acute services are required to advance the evidence base. Dedicated AGUs, are units designed with their own physical location and structure, which provide care to older adults during admission to hospital for an acute medical illness including acute exacerbations of chronic diseases (Baztán *et al*. 2009). Whilst variations in the definition exist (Palmer *et al.* 2014) all are based on the seminal research on AGUs (Ellis and Langhorne 2004; Calkins *et al*. 1998). Furthermore, inclusive of all definitions are specialised MDTs who embed geriatric competencies into their practice.

The effectiveness of AGU care for older adults admitted to hospital with acute medical disorders was previously examined in a systematic review and meta-analysis of five RCTs, four non-randomised trials, and two case-control studies (Baztán *et al*. 2009). The five RCTs dated from 1985–2000 and found that admission to an AGU conferred a lower risk of functional decline at hospital discharge and older adults were more likely to be living at home after discharge when compared with conventional care units. However, only two of the five RCTs reported on functional decline at discharge; one RCT presented results at three-month follow-up, with no differences in the incidence of functional decline reported between groups. Meta-analysis of case fatality either in hospital or at three-month follow-up did not show any significant differences between groups. Furthermore, authors were unable to draw firm conclusions on length of hospital stay between groups due to heterogeneity among trials that reported on this outcome. Further studies on caring for older adults in an AGU have shown lower incidence of adverse outcomes such as delirium (Vidán *et al*. 2009) and association with trends of lower length of hospital stay as well as greater cost effectiveness when compared to conventional care units (Borenstein *et al*. 2016; Barnes *et al*. 2012; Zelada *et al*. 2009;). More recently, the impact of AGU care has focused on health related QoL and functional decline following discharge from hospital (Ekerstad *et al*. 2017). A prospective controlled trial where an AGU intervention was provided to 206 older adults living with frailty, aged ≥75 years, in need of acute in-patient treatment when compared to routine care (n = 202) found that older adults in the intervention group were less likely to present with decline in health related QoL and in activities of daily living (ADLs) at three-month follow-up.

Our review aims to update and synthesise the totality of recent research evidence related to the effectiveness of AGU care among older adults admitted to hospital with acute medical complaints. We hypothesise that older adults admitted to an AGU experience less functional decline and more favourable process outcomes when compared with conventional care units.

2.4 Methods

Study Design

This protocol for a systematic review will be conducted in accordance with the Preferred Reporting of Items for Systematic Reviews and Meta-Analyses Protocols (PRISMA-P) guidelines (Shamseer *et al*. 2015) (Appendix 1). The systematic review and meta-analysis will comply with the reporting guidance outlined in 27-item PRISMA checklist (Page *et al*. 2021). The methodology for this review will be underpinned by the Cochrane handbook for systematic reviews of interventions (Higgins *et al*. 2020). To ensure scientific rigor when assessing intervention effects, we have chosen only to include trials with a randomised design. RCT's including cluster trials and quasi-RCT's will also be included in this systematic review.

Search Strategy

Searches were carried out in the following electronic databases – MEDLINE, Cumulative Index of Nursing and Allied Health Literature (CINAHL), Cochrane Central Register of Controlled Trials in the Cochrane Library (CENTRAL), and Embase. A search string was developed using the keywords in the systematic review and meta-analysis published in 2009 (Baztán *et al*. 2009). Exploded subject headings and associated keywords covering the topics of older adults, AGU, CGA, and RCT were applied to relevant databases outlined above. An example search strategy from MEDLINE in Ebsco is presented in Appendix 2. Studies were limited from the year 2008 onwards as this review aims to update a previous meta-analysis (Baztán *et al*. 2009). Trials included in the previous version of the review will be integrated into the new evidence found. The reference lists of all potentially eligible studies will be hand searched for additional papers. Studies in all languages will be included; the authors will seek translation for studies published in languages other than English.

Eligibility Criteria

Trials will be included that meet the following inclusion criteria:

Population – older adults (≥65 years) admitted to the acute care setting for medical reasons.

Intervention – in keeping with the definition used by Baztán *et al.* (2009) in the previous meta-analysis, the intervention comprises an AGU intervention delivered by an MDT during the acute phase of illness to prevent functional decline and related complications in older adults admitted to the acute care setting. The 2017 Cochrane review by Ellis *et al.* (2017) will be used as the reference standard when describing the components of CGA across the included trials. In their review they outline the following components: clinical leadership; structured assessment; MDT meetings; goal setting; involving patients and carers in goal setting; outpatient follow-up; ward environment; adequate time; speciality knowledge, experience, competence; and tailoring treatment plans to the individual.

Comparison – usual care, other non-AGU interventions such as admission to acute medical wards.

Exclusion Criteria

Trials will be excluded if their population is <65 years and if the intervention is aimed at specific medical or surgical complaints or speciality units such as stroke or orthogeriatrics. To ensure we did not include trials that evaluate interventions in the sub-acute phase, exclusions will apply where patients have been transferred from other speciality units such as intensive care to an AGU or admitted to an AGU three or more days after a hospital admission.

Outcome Variables

The primary outcome measure will be functional decline on discharge from hospital and at follow-up. Functional decline will be defined as loss of independence in one or more ADLs compared with the status prior to admission. Various ADL indices such as the Katz index of independence in ADL (Katz *et al*. 1963) and the Barthel Index (BI) (Mahoney and Barthel 1965), which use a numerical scale to measure performance in ADLs will be included in our meta-analysis. Secondary outcomes will include length of hospital stay, living at home (the inverse of death or institutionalisation combined; used to describe someone who is in their own home at follow-up), mortality, cost of index admission, incidence of unscheduled hospital re-admission, cognitive function, and patient satisfaction with index admission. For the outcome living at home, we will not measure the proportion of older adults in receipt of personal assistance and/or services. All secondary outcomes will be recorded at discharge from hospital and at follow-up periods reported in trials.

Screening

References generated from the search strategy will be exported into Endnote software and duplicates deleted. Two authors (ÍO'S and RG) will independently screen relevant studies by title and abstract for eligibility. Studies that are selected by the reviewers as meeting the inclusion criteria will undergo a full text review. If a disagreement about eligibility arises, both authors will meet to come to a consensus. Where consensus cannot be reached, third and fourth authors will be consulted (KR and MO'C).

Data Synthesis and Analysis

Data will be independently extracted from the relevant trials by two reviewers (ÍO'S and RG); data from trials in the previous version of the review will also be extracted. The information compiled will include trial authors, year of publication, study population, sample size, interventions provided, controls provided, outcomes measured and duration of follow-up. Data will be gathered into a pre-prepared Microsoft Excel document. A pooled meta-analyses will be carried out where the data are homogenous, which will be determined by the outcomes measured and the time points accessed across the included trials. For the primary outcome of functional decline, we will calculate risk ratios (RRs) with a 95% CI to determine the intervention effect. The same approach will be applied for all dichotomous secondary outcome measures. For continuous outcomes (length of hospital stay and cost of index admission) we will calculate the intervention effect using mean differences (MD) and 95% CIs where trials all used the same method of measurement. Standardised mean differences (SMD) and 95% CIs will be applied where trials used different methods of measurement. The median and interquartile range (IQR) will be used in the event that the mean and standard deviation (SD) are not reported (Wan *et al*. 2014). Authors will be contacted where data are not available. Data for the meta-analyses will be analysed using Review Manager 5.4. (Cochrane Collaboration).

We will explore heterogeneity across the trials by visually inspecting the forest plots and the associated I^2 statistics. We will consider I^2 >50% as significant heterogeneity. If I^2 is ≤50% we will apply a fixed-effects method. If I^2 is greater than 50%, we will explore the individual trial characteristics to identify potential sources of heterogeneity, using pre-planned subgroup analyses. Where there is substantial heterogeneity, we will perform a meta-analysis using both fixed-effects and random-effects models and we will present the most conservative outcome. We will conduct separate subgroup analyses after excluding trials that were conducted in the previous version of the review (those published in or before year 2000) (Baztán *et al*. 2009).

We will conduct a sensitivity analysis to explore the effect of the methodological features on outcomes: 1) randomisation process (data will be re-analysed excluding trials with inadequate or unclear allocation concealment) and 2) bias in the measurement of the outcome (re-analysis of trials without evidence of or with unclear masking of outcome assessor).

Quality Assessment

Trials that meet the inclusion criteria, inclusive of trials in the previous version of the review, will be assessed for risk of bias (RoB) using the Cochrane RoB 2 tool (Sterne *et al*. 2019). Two independent reviewers (ÍO'S and RG) will assess each trial's RoB under the following domains: randomisation process, deviation from intended intervention, missing outcome data, outcome measurement, selective reporting, and the overall RoB. If a disagreement about RoB arises, both authors will meet to come to a consensus. Where consensus cannot be reached, third and fourth authors will be consulted (KR and MO'C). The Grading of Recommendations, Assessment, Development and Evaluations (GRADE) framework will be used to assess the quality of evidence for outcomes reported and to summarise data narratively (Balshem *et al*. 2011). Outcomes will be graded at one of four levels of evidence – very low certainty, low certainty, moderate certainty, and high certainty (Murad *et al*. 2017).

Public and Patient Involvement

The authors will present the findings of the review to a PPI stakeholder panel of older adults that has been established at the Ageing Research Centre in the University of Limerick (Conneely *et al.* 2020). The focus of this session will be to discuss the findings with this group so that the discussion section of the paper can integrate the views and opinions of older adults.

2.5 Discussion

This review will update and synthesise the evidence relating to the effectiveness of AGU care on clinical and process outcomes for older adults admitted to hospital with acute medical complaints. The clinical and social complexity of hospitalised older adults is having an impact on delivery of healthcare services internationally (Ruiz *et al*. 2015). CGA and related care is considered a complex intervention; (Craig *et al*. 2008) therefore, it is proposed that this review will identify the characteristics and components of CGA within an AGU in terms of the intervention, team composition, and resources. The 10 elements of CGA reported by trialists in the 2017 Cochrane review will be used as a reference standard (Ellis *et al*. 2017). This will have relevance for clinicians, researchers, and policymakers and will enable recommendations to be made regarding current and future AGU establishment following evidence-based research. We chose functional decline as our primary outcome as maintaining independence in the performance of ADLs is an important determinant of QoL for older adults (Courtney *et al.* 2012).

By synthesising the evidence surrounding AGU care for older adults with acute medical complaints, there is potential for a reduction in an older adult's length of hospital stay as is the case in orthogeriatric care (González-Montalvo *et al*. 2010). Reducing length of hospital stay can potentially preserve an older adult's functional status and thus reduce the risk of increased morbidity and mortality (Grimmer *et al*. 2013). Subsequently, this can save hospital bed days and overall reduce hospital costs while enabling older adults to live long and healthy lives in the communities in which they reside.

Ethics and Dissemination

Formal ethics approval is not required for this review as all data collected will be secondary data and will be analysed anonymously. The findings of this review will be disseminated through publication in a peer-review journal and presented at relevant conferences.

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Conflicts of interest

None to declare

2.6 References

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Chapter 3: Effectiveness of Acute Geriatric Unit Care on Functional Decline, Clinical, and Process Outcomes among Hospitalised Older Adults with Acute Medical Complaints: A Systematic Review and Meta-Analysis

Status: Published *Age and Ageing* 2022

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Citation: O'Shaughnessy, Í., Robinson, K., O'Connor, M., Conneely, M., Ryan, D., Steed, F., Carey, L., Leahy, A., Shanahan, E., Quinn, C. and Galvin, R. (2022) 'Effectiveness of acute geriatric unit care on functional decline, clinical and process outcomes among hospitalised older adults with acute medical complaints: a systematic review and meta-analysis', *Age and Ageing*, 51(4), p.afac081.

3.1 Candidate's Contribution: The candidate was lead author on this updated systematic review and meta-analysis and was responsible for conceptualisation of the study, development and design of methodology, data curation, analysis, visualisation and presentation. The candidate led on development and refinement of manuscript drafts, management of journal submission and revisions, and dissemination of the published work at both national and international conferences.

3.2 Abstract

Background: The aim of this systematic review and meta-analysis was to update and synthesise the totality of research evidence on the effectiveness of AGU care for older adults admitted to hospital with acute medical complaints.

Methods: MEDLINE, CINAHL, CENTRAL and Embase databases were systematically searched from 2008 to February 2022. Screening, data extraction and quality grading were undertaken by two reviewers. Only trials with a randomised design comparing AGU care and conventional care units were included. Meta-analyses were performed in Review Manager 5.4 and the GRADE framework was used to assess the certainty of evidence. The primary outcome was incidence of functional decline between baseline two-week prehospital admission status and discharge and at follow-up.

Results: 11 trials recruiting 7,496 participants across three countries were included. AGU care resulted in a reduction in functional decline at six-month follow-up (RR 0.79, 95% CI 0.66 to 0.93; moderate certainty evidence) and an increased probability of living at home at three-month follow-up (RR 1.06, 95% CI 0.99 to 1.13; high certainty evidence). AGU care resulted in little or no difference in functional decline at hospital discharge or at three-month follow-up, length of hospital stay, costs, the probability of living at home at discharge, mortality, hospital readmission, cognitive function or patient satisfaction.

Conclusions: AGU care improves clinical and process outcomes for hospitalised older adults with acute medical complaints. Future research should focus on greater inclusion of clinical and patient-reported outcome measures.

3.3 Background

Population ageing poses a major challenge to international healthcare systems with older adults being the predominant users of inpatient hospital services (WHO, 2017). Older adults are clinically heterogeneous and are at increased risk of adverse outcomes during hospitalisation due to the presence of multiple comorbid and complex conditions (Lim SS *et al*. 2013; Ruiz *et al*. 2015). The most potent intrinsic risk factor in this population group is the clinical condition of frailty (Hubbard *et al*. 2017; Clegg *et al*. 2013). The presence of diminished homeostatic reserves leaves older adults more vulnerable to iatrogenic complications that are not specific to the underlying presentation and occur during the course of care (Lafont *et al.* 2011). HAD, characterised by an acceleration in functional decline with concomitant loss of independence in ADLs is a common phenomenon (Zisberg *et al.* 2015). Prevalence of HAD in acute care of older adults was reported at 30% in a recent meta-analysis of 15 studies (Loyd *et al*. 2020), which highlights the elevated risks this patient population are exposed to during hospitalisation.

CGA is considered the gold standard approach to improving a range of outcomes for older adults living with frailty in acute hospitals (Ellis *et al*. 2017). A central tenet of CGA delivery are MDTs who identify medical, social, and functional needs and develop a coordinated and integrated plan for treatment and follow-up (Rubenstein *et al.* 1991). Several organisational forms of CGA delivery have been proposed to achieve effective and efficient care for older adults with undifferentiated medical complaints; however, the optimal method by which to deliver care hospital wide is unclear (Conroy *et al*. 2019). Mobile inpatient geriatric consultation teams and dedicated geriatric evaluation and management units have shown favourable effects on mortality at six and eight months after discharge (Deschodt *et al*. 2013), functional decline at discharge from hospital and institutionalisation at one year follow-up (Van Craen *et al*. 2010), respectively. A previous meta-analysis published in 2009 included five RCTs and explored the outcomes of hospitalised older adults by examining the effectiveness of admission to an AGU when compared to conventional hospital care (Baztán *et al*. 2009). The authors defined an AGU as a unit designed with its own physical location and structure, which provide care to older adults during admission to hospital for an acute medical illness including acute exacerbations of chronic diseases. Findings showed that compared with older adults admitted to conventional care units, those admitted to an AGU showed a lower odds of functional decline at discharge from hospital (Odds ratio (OR) 0.82, 95% CI 0.68 to 0.99) and increased odds of living at home after discharge from hospital (OR 1.30, 95% CI 1.11 to 1.52). Since this review was published, several primary research studies have examined the impact of AGU care on clinical and process outcomes more broadly.

Our review aims to update the totality of research evidence related to the effectiveness of AGU care compared with conventional care units among older adults admitted to hospital with acute medical complaints.

3.4 Methods

Registration

The PRISMA-P (Shamseer *et al*. 2015) was used to prepare this manuscript. The protocol was registered on PROSPERO (CRD 42021237633) and published elsewhere (O'Shaughnessy *et al*. 2021). A completed PRISMA checklist (Page *et al*. 2021) is presented in Appendix 3.

Deviations from the Protocol

Since protocol publication, the authors updated their interpretation of heterogeneity and the associated I^2 statistic (Higgins *et al*. 2021). Due to expected clinical and methodological heterogeneity between intervention and conventional care units across international healthcare systems, we elected to use a random-effects model for all meta-analyses.

Search Strategy and Study Selection

MEDLINE in EBSCO, CINAHL, CENTRAL, and EMBASE databases were searched with exploded subject headings and relevant keywords, in all languages. Databases were searched from 2008 to 07 February 2022 as this review is an update of a previous meta-analysis (Baztán *et al*. 2009). Trials included in the previous version of the review were integrated into the new evidence found. We only included peer-reviewed publications i.e., grey literature and abstracts were excluded. An example search strategy from MEDLINE in EBSCO is presented in Appendix 2. References generated from the search strategy were exported into Endnote software and duplicates deleted; reference lists of included studies were searched for additional papers.

To ensure scientific rigor when assessing intervention effects, we chose to only include trials with a randomised design. RCTs including cluster-RCTs and quasi-RCTs were also included in this updated systematic review and meta-analysis.

Eligibility Criteria

Included trials satisfied the following criteria:

Population – older adults (≥65 years) admitted to an AGU with acute medical complaints.

Intervention – access to an AGU model of care delivered by MDTs during the acute phase of illness to prevent functional decline and related complications in older adults admitted to the acute care setting (Baztán *et al*. 2009). The Cochrane review by Ellis *et al.* (2017) was used as the reference standard when describing the components of CGA across the included trials. In their review, they outline the following components: clinical leadership; structured assessment; MDT meetings; goal setting; involving patients and carers in goal setting; outpatient follow-up; ward environment; adequate time; specialty knowledge, experience and competence; and tailoring treatment plans to the individual.

Comparison – usual care, other non-AGU interventions such as admission to acute medical wards.

Exclusion Criteria

We excluded trials that involved patients aged <65 years and that evaluated interventions aimed at specific medical or surgical complaints or speciality units such as stroke or orthogeriatric units. To ensure we did not include trials that evaluated interventions in the sub-acute phase, we excluded trials where patients were transferred from other speciality units such as intensive care to an AGU or where patients were admitted to an AGU three or more days after a hospital admission.

Outcome Variables

The primary outcome measure was functional decline between baseline two-week prehospital admission status and discharge and at follow-up. We defined functional decline as a net decrease in the number of ADLs performed independently when compared with prehospital admission baseline (Sager *et al*. 1996). To assess independence in ADLs we considered any validated measure of functional status e.g., the Katz index of independence in ADLs (Katz *et al*. 1963), BI (Mahoney and Barthel 1965), ADL Staircase (Sonn 1996) etc.

The secondary outcomes were length of hospital stay, cost of index admission, living at home, mortality, incidence of unscheduled hospital re-admission, cognitive function, and patient satisfaction with the index admission. Outcomes were recorded at discharge from hospital and at follow-up periods reported in trials.

Data Extraction

Two authors (ÍO'S and RG) independently conducted title and abstract screens identifying trials for full-text extraction. Full-text screening was used to identify a final list of included trials. In cases of disagreement, a third author (MO'C) reviewed the trials and agreement was reached by consensus. Relevant data were extracted independently by two authors (ÍO'S and RG) from the included trials into a pre-established Microsoft excel file.

Quality of Evidence and Risk of Bias

Two authors (ÍO'S and RG) independently assessed the RoB using the Cochrane RoB 2 tool (Sterne *et al*. 2019) under the following domains: randomisation process, deviation from intended intervention, missing outcome data, outcome measurement, selective reporting, and the overall RoB. The GRADE framework was used to assess the quality of evidence for outcomes reported and to summarise data narratively (Schünemann *et al*. 2021).

Data Synthesis

For the primary outcome of incidence of functional decline, we calculated RRs with 95% CIs to determine the intervention effect. We dichotomised the overall outcome and considered functional decline to be a deterioration in ADLs; we excluded measures where the direction of change was not presented i.e., improved, maintained, decreased. RRs with 95% CIs were applied to all other dichotomous secondary outcomes (living at home, mortality, etc.) For continuous outcomes (length of hospital stay and cost of index admission) we calculated the MD between AGU care and conventional care units with a 95% CI. When the SD was not available, we estimated it from the standard error or 95% CI (Higgins *et al*. 2021), which were reported in two trials. Data for the meta-analyses were analysed using Review Manager 5.4 software. Due to the expected differences in delivery of AGU interventions across international healthcare system and the date range of included trials, we elected to use a random-effects model for all meta-analyses.

Dealing with Missing Data

We contacted the authors of included trials to request missing data. The SD for three trials that reported outcomes on length of hospital stay and costs were obtained from a previous systematic review, which examined the effectiveness of AGU care based on the Acute Care for Elders model with acutely ill or injured older adults (Fox *et al*. 2012).

Assessment of Heterogeneity

We explored heterogeneity across the trials by visually inspecting the forest plots and the associated I^2 statistics. We considered I^2 >50% as significant heterogeneity. For outcomes where I^2 was >50%, we explored the individual trial characteristics to identify potential sources of heterogeneity, using pre-planned subgroup analyses. Analyses were repeated after removing trials that were conducted in the previous version of the review.

Sensitivity Analysis

We applied a fixed-effect model as a form of sensitivity analysis. We explored changes in intervention effect by removing trials with evidence of a high RoB in the randomisation process and missing outcome data.

3.5 Results

Trial Identification

The literature search yielded 16,534 records. Following title and abstract screening, 43 articles were selected for full-text critical reading (figure 3.1). Ten studies (Westgård *et al*. 2020;

Westgard *et al*. 2018; Ekerstad *et al*. 2018; Ekerstad *et al*. 2017; Ekerstad *et al*. 2017; Åhlund *et al*. 2017; Borenstein *et al*. 2016; Barnes *et al*. 2012; Wald *et al*. 2011; Zelada *et al*. 2009) recruiting 3,939 participants, including six original trials and four subsequent papers reporting secondary outcomes related to the original trials by Westgard *et al.* (2020) and Ekerstad *et al.* (2017) were included. As this is an updated review, data from five trials (Asplund *et al*. 2000; Counsell *et al*. 2000; Landefeld *et al*. 1995; Harris *et al*. 1991; Collard *et al*. 1985;) and one secondary analysis (Covinsky *et al*. 1997) recruiting 3,557 participants from the previous version of the review were integrated into the new evidence found. Therefore, a total of 11 trials recruiting 7,496 older adults were identified.

Descriptive Characteristics of Included Trials

The trials dated from 1985–2020; seven were conducted in the United States (Borenstein *et al*. 2016; Barnes *et al.* 2012; Wald *et al*. 2011; Zelada *et al*. 2009; Counsell *et al*. 2000; Landefeld *et al*. 1995; Collard *et al*. 1985), three in Sweden (Westgard *et al*. 2020; Ekerstad *et al*. 2017; Asplund *et al*. 2000), and one in Australia (Harris *et al*. 1995). Seven were RCTs (Westgård *et al*. 2020; Barnes *et al.* 2012; Asplund *et al*. 2000; Counsell *et al*. 2000; Landefeld *et al*. 1995; Harris *et al.* 1991; Collard *et al.* 1985), three were quasi-RCTs (Ekerstad *et al*. 2017; Wald *et al*. 2011; Zelada *et al*. 2009), and one was a cluster-RCT (Borenstein *et al*. 2016). Authors of six trials were contacted for additional information (Westgård *et al*. 2020; Barnes *et al*. 2012; Asplund *et al*. 2000; Counsell *et al*. 2000; Landefeld *et al*. 1995; Harris *et al*. 1991) The descriptive characteristics of included trials is presented in table 3.1.

Patient selection criteria to the intervention unit was largely based on age and the presence of an acute medical complaint that did not require admission to a speciality unit (Westgård *et al*. 2020; Ekerstad *et al*. 2017; Borenstein *et al.* 2016; Wald *et al*. 2011; Asplund *et al*. 2000; Zelada *et al*. 2009; Landefeld *et al*. 1995). Three of the 11 trials included patients aged ≥65 years (Borenstein *et al*. 2016; Zelada *et al*. 2009; Collard *et al*. 1985), six aged ≥70 years (Barnes *et al.* 2012; Wald *et al*. 2011; Asplund *et al.* 2000; Counsell *et al.* 2000; Harris *et al.* 1991; Landefeld *et al*. 1995), and two trials included patients aged ≥75 years (Westgard *et al*. 2020; Ekerstad *et al.* 2017). Three trials operated frailty criterion through use of screening tools when selecting patients for inclusion (Westgard *et al*. 2020; Ekerstad *et al.* 2017; Borenstein *et al.* 2016). Eight trials admitted patients to the intervention unit directly from the ED (Westgård *et al.* 2020; Borenstein *et al.* 2016; Zelada *et al.* 2009; Asplund *et al.* 2000; Counsell *et al.* 2000; Landefeld *et al.* 1995; Harris *et al.* 1991; Collard *et al.* 1985), one trial admitted patients directly from the ambulance or primary care (Ekerstad *et al.* 2017), and two trials did not report source of admission (Barnes *et al.* 2012; Wald *et al.* 2011). The characteristics of the intervention units were similar across trials. Bed capacity ranged from 10 beds to 34 beds; three trials did not report this unit (Westgård *et al*. 2020; Borenstein *et al.* 2016; Barnes *et al*. 2012. The key components of intervention units are outlined in table 3.2. The core MDT comprised of at least one geriatrician and/or primary physician and registered nurses with geriatric training. A physiotherapist was included in all 11 intervention units, a social worker in nine units, and an occupational therapist was included in eight units. The presence of a dietitian was reported in four units (Westgård *et al*. 2020; Borenstein *et al.* 2016; Asplund *et al*. 2000; Landefeld *et al*. 1995), and a pharmacist was included in two units (Borenstein *et al.* 2016; Wald *et al.* 2011).

The follow-up period varied. Seven of the 11 trials provided data on one or several of the outcome variables at three months, at a minimum (Westgard *et al.* 2020; Ekerstad *et al*. 2017; Barnes *et al.* 2012; Asplund *et al*. 2000; Counsell *et al.* 2000; Landefeld *et al*. 1995; Harris *et al.* 1991). Six trials reported on the primary outcome of functional decline, five at three months (Ekerstad *et al*. 2017; Asplund *et al*. 2000; Counsell *et al.* 2000; Landefeld *et al*. 1995; Harris *et al*. 1991) and three at six months (Westgård *et al*. 2020; Counsell *et al*. 2000; Harris *et al*. 1991).

Methodological Quality

Assessment of the RoB for specific outcomes and endpoints are included in Appendix 4. Four trials were rated as having a high RoB in the randomisation process as the sequence was generated based on bed availability in two trials (Ekerstad *et al.* 2017; Zelada *et al*. 2009) and an open allocation schedule was used in two trials (Wald *et al*. 2011; Harris *et al*. 1991). Use of an appropriate analysis to estimate the effect of assignment to intervention e.g., intention-to-treat was only reported in five trials, which threatened the deviations from intended intervention (Westgård *et al*. 2020; Ekerstad *et al*. 2017; Borenstein *et al*. 2016; Asplund *et al*. 2000; Counsell *et al*. 2000). Only one trial published a protocol with prespecified outcomes (Westgard *et al*. 2020). Appendix 5 summarises the certainty of the evidence for outcomes included in the meta-analyses using the GRADE framework (Schunemann *et al*. 2021).

Functional Decline

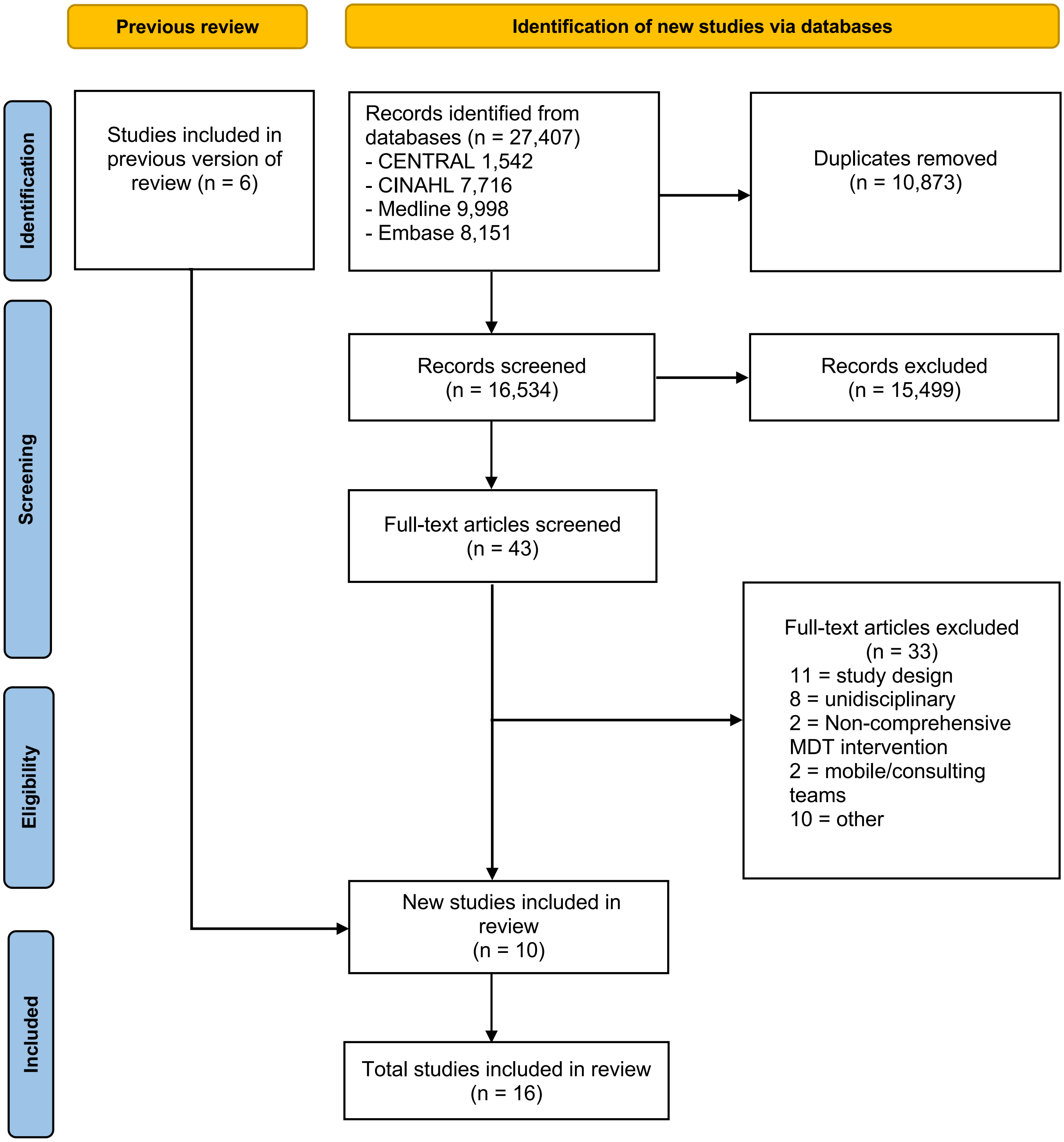
AGU care resulted in little or no difference in functional decline between baseline two-week prehospital admission status and discharge (RR 0.89, 95% CI 0.75 to 1.04, I^2 = 55%; low certainty evidence) (Barnes *et al*. 2012; Zelada *et al*. 2009; Counsell *et al*. 2000; Landefeld *et al*. 1995) (figure 3.2.1), or at three-month follow-up (RR 0.49, 95% CI 0.12 to 1.91, I^2 = 97%; very low certainty evidence) (figure 3.2.2). Five trials (Ekerstad *et al*. 2017; Asplund *et al*. 2000; Counsell *et al*. 2000; Landefeld *et al*. 1995; Harris *et al*. 1991) reported outcomes at three-month follow-up, with complete data in two trials (Ekerstad *et al*. 2017; Counsell *et al*. 2000). AGU care was associated with a 21% reduction in functional decline at six-month follow-up (RR 0.79, 95% CI 0.66 to 0.93, I^2 = 0%; moderate certainty evidence) (figure 3.2.3).

Three trials (Westgard *et al*. 2020; Counsell *et al*. 2000; Harris *et al*. 1991) reported outcomes, with complete data in two trials (Westgård *et al*. 2020; Counsell *et al*. 2000).

Length of Hospital Stay

Ten of the 11 trials reported data on length of hospital stay, with complete data in nine trials (Ekerstad *et al*. 2017; Borenstein *et al*. 2016; Barnes *et al*. 2012; Wald *et al*. 2011; Zelada *et al*. 2009; Asplund *et al*. 2000; Counsell *et al*. 2000; Landefeld *et al*. 1995; Harris *et al*. 1991). Results indicated that there was no benefit from admission to an AGU on length of hospital stay (MD -0.36, 95% CI -0.99 to 0.26, $I^2 = 77\%$; low certainty evidence).

Figure 3.1. PRISMA diagram for updated systematic reviews



Costs

Seven trials reported data on the cost of the index admission, with complete data in six trials (Ekerstad *et al*. 2017; Barnes *et al*. 2012; Wald *et al*. 2011; Asplund *et al*. 2000; Counsell *et al*. 2000; Covinsky *et al*. 1997). Four of the included trials were conducted in the United States (Barnes *et al*. 2012; Wald *et al*. 2011; Counsell *et al*. 2000; Covinsky *et al*. 1997) and two in Sweden (Ekerstad *et al*. 2017; Asplund *et al*. 2000). One of the Swedish trials reported costs in US dollars (Ekerstad *et al*. 2017); costs related to the trial conducted by Asplund *et al.* (2000) were calculated by applying the exchange rate (Swedish krona – US dollars) provided by authors at the time of the trial. AGU care was not associated with cost savings (MD -123.79USD, 95% CI -567.80USD to 320.22USD, $I^2 = 45\%$; low certainty evidence).

Living at Home

AGU care did not increase the probability of living at home at discharge (RR 1.03, 95% CI 0.99 to 1.07, $I^2 = 28\%$; high certainty evidence) (Borenstein *et al*. 2016; Barnes *et al*. 2012; Wald *et al*. 2011; Asplund *et al*. 2000; Counsell *et al*. 2000; Landefeld *et al*. 1995; Harris *et al*. 1991; Collard *et al*. 1985) (figure 3.3.1). An increase in the probability of living at home was associated with AGU care at three-month follow-up (RR 1.06, 95% CI 0.99 to 1.13, $I^2 = 35\%$; high certainty evidence) (Asplund *et al*. 2000; Counsell *et al*. 2000; Landefeld *et al*. 1995; Harris *et al*. 1991) (figure 3.3.2).

Admission to a Long-Term Care Institution

AGU care resulted in no difference in the probability of admission to a long-term care institution at discharge (RR 1.01, 95% CI 0.78 to 1.30, $I^2 = 72\%$; low certainty evidence) (Borenstein *et al*. 2016; Wald *et al*. 2011; Asplund *et al*. 2000; Counsell *et al*. 2000; Landefeld *et al*. 1995; Collard *et al*. 1985), or at three-month follow-up (RR 0.88, 95% CI 0.72 to 1.09,

$I^2 = 30\%$; moderate certainty evidence) (Asplund *et al*. 2000; Counsell *et al*. 2000; Landefeld *et al*. 1995). Two of the six trials that contributed to the analysis of this measure, referred to long-term care institutions as skilled nursing facilities, rehabilitation hospitals, NHs, or other institutions assisting with daily activities (Borenstein *et al*. 2016; Landefeld *et al*. 1995). Three trials classified them as NHs (Asplund *et al*. 2000; Counsell *et al*. 2000; Collard *et al*. 1985) and the remaining trial (Wald *et al*. 2011) did not provide detail on the nature of the discharge institution.

Table 3.1. Descriptive characteristics of trials included in the systematic review and meta-analysis

Reference (first author, year of publication)	**Methods & setting**	**Participants**	**Interventions**	**Outcomes**
Collard *et al.* 1985	Randomised controlled trial 2 community hospitals, USA	695 participants (218 intervention, mean age 78.5 years; 477 control, mean age 78 years) Medical and surgical patients aged 65 years or older, admitted from the emergency department.	**Intervention:** 2 acute geriatric units (10 beds in each unit across 2 hospitals). Comprehensive geriatric assessment, interdisciplinary team conferences twice weekly, early discharge planning. Core team: registered trained nurse for study, physician, social worker, occupational therapist, physical therapist. **Control:** Not described	Case fatality Institutionalisation Self-rated health Length of hospital stay Costs
Harris *et al.* 1991	Randomised controlled trial General hospital, Australia	267 participants (97 intervention, mean age 79 years; 170 control, mean age 78 years) Medical patients aged 70 years or older, not residing in a nursing home. 100% admitted from the emergency department.	**Intervention:** Acute geriatric unit (14 beds). Comprehensive geriatric assessment. Core team: registered trained nurse for study, physician, social worker, occupational therapist, physiotherapist **Control:** Similar medical staff but less time devoted by nursing and dedicated physiotherapist, occupational therapist, and social worker. Similar process to discharge planning.	Case fatality Institutionalisation Functional status Cognitive status Length of hospital stay
Landefeld *et al.* 1995 Covinsky *et al.* 1997	Randomised controlled trial University hospital, USA	651 participants (327 intervention, mean age 80.2 years; 324 control, mean age 80.1 years)	**Intervention:** Acute geriatric unit (14 beds). Prepared environment, comprehensive assessment, daily multidisciplinary team rounds and medical review, early discharge	Case fatality Institutionalisation Functional status Cognitive status

		Medical patients aged 70 years or older, not admitted to a speciality unit (intensive care, cardiology, oncology). 100% admitted from the emergency department.	planning. Core team: geriatrician, registered nurse, social worker, physical therapist, nutritionist **Control:** Similar hospital supported staffing ratios and access to similar hospital support services.	Self-rated health Length of hospital stay Costs Hospital re-admission
Asplund *et al.* 2000	Randomised controlled trial University hospital, Sweden	413 participants (190 intervention, mean age 81 years; 223 control, mean age 81 years) Medical patients aged 70 years or older, not admitted to a speciality unit (intensive care, cardiology, oncology). 100% admitted from the emergency department.	**Intervention:** Acute geriatric unit (11 beds); unit organised solely for study. Comprehensive assessment, weekly interdisciplinary team conference, early rehabilitation, and discharge planning. Core team: geriatrician, internist, registered nurse, physiotherapist, occupational therapist, dietitian. **Control:** Two internal medical wards (30 beds in each). No geriatrician, physiotherapist, occupational therapist, or dietitian routinely available. Part-time social worker. Frequent relation between staff of both acute geriatric and usual care units.	Case fatality Institutionalisation Functional status Cognitive status Psychological well-being Length of hospital stay Costs Hospital re-admission
Counsell *et al.* 2000	Randomised controlled trial General hospital, USA	1531participants (767 intervention, mean age 80 years; 764 control, mean age 79 years) Medical patients aged 70 years or more, not admitted to a speciality unit (intensive care, cardiology, oncology) and not residing in a nursing home prior to	**Intervention:** Acute geriatric unit (34 beds). Prepared environment, comprehensive assessment, daily interdisciplinary conference, daily medical review, early discharge planning. Core team: geriatrician, registered nurse, social worker, physiotherapist.	Case fatality Institutionalisation Functional status Patient, caregiver, and staff satisfaction Length of hospital stay

		hospitalization. 100% admitted from the emergency department.	**Control:** Similar attending physician and nursing staff to patient ratio and hospital support services.	Costs Hospital re-admission
Zelada *et al.* 2009	Quasi-randomised controlled trial Community teaching hospital, USA	143 participants (68 intervention, mean age 79.6 years; 75 control, mean age 76.1 years) Medical patients aged 65 years or older, not admitted to a speciality unit (intensive care, cardiology, oncology, surgical) or transferred from other services and with a predicted length of stay of > 24 hours. 100% admitted from the emergency department	**Intervention:** Acute geriatric unit (10 beds). Comprehensive assessment, daily medical review, weekly interdisciplinary team conference, early rehabilitation, and discharge planning. Core team: geriatrician, one medical resident of the specialty, general care nurses, physical therapist, occupational therapist, social worker (one day per week). **Control:** Internal medicine care unit attended by an internist physician, a medical resident of the specialty, and general care nurses. Access to physical and occupational therapy, and a social worker was by means of referral.	Functional status Cognitive status Affective status Length of hospital stay
Wald *et al.* 2011	Quasi-randomised controlled trial Community teaching hospital, USA	217 participants (122 intervention, mean age 80.5 years; 95 control, mean age 80.7 years) Medical patients aged 70 years or older, not admitted to a speciality unit (pulmonary, cardiology, oncology) and not transferred to or from the Hospitalist-ACE or control services to another service (e.g., intensive care unit or orthopaedic surgery).	**Intervention:** Hospitalist Acute Care for Elders (ACE) unit (12 beds). Standardised geriatric assessment designed to identify and address geriatric syndromes, daily interdisciplinary team rounds (Monday-Friday), novel inpatient geriatrics curriculum, early discharge planning. Core team: hospitalist attending with additional training in geriatric medicine, registered nurse, physiotherapist, occupational therapist,	Recognition of abnormal functional status Recognition of abnormal cognitive status Incidence of falls during index admission Incidence of use of physical restraints and sleep aids Documentation of code status

			pharmacist, social worker, and case manager. **Control:** Four general internal medicine wards, two staffed by outpatient general internists and medical sub-specialists, and two by academic hospitalists. The general medical teams attended daily discharge planning rounds with a discharge planner and social worker focused exclusively on discharge planning.	Length of hospital stay Costs Hospital re-admission
Barnes *et al.* 2012	Randomised controlled trial University hospital, USA	1632 participants (858 intervention, mean age 80.6 years; 774 control, mean age 80.6 years) Medical patients aged 70 years or older with a predicted length of stay of > 2 days.	**Intervention:** ACE Unit (bed capacity not specified). Prepared environment, patient-centred care, comprehensive assessment, daily interdisciplinary team rounds. Core team: geriatrician, geriatric clinical nurse specialist, registered nurse, social worker, physical therapist. **Control:** General inpatient unit with varied age range. Core team not described.	Case fatality Functional status In hospital process care measures such as physical therapy consults, use of physical restraints, orders for bed rest, documentation on discharge planning Length of hospital stay Hospital re-admission Costs
Borenstein *et al.* 2016	Cluster randomised controlled trial University hospital, USA	1384 participants (792 intervention, mean age 81.1 years; 592 control, mean age 80.7 years) Frail patients aged 65 years or older admitted from the emergency department or directly	**Intervention:** Five general medical units using principles of comprehensive geriatric assessment, daily interdisciplinary team huddle (Monday-Friday). Core team: Physician advisor (not the primary physician responsible for	Case fatality Incidence of iatrogenic complications Days spent in ICU during index admission

		from a doctor's clinic. Patients transferred from speciality units (including intensive care) or other hospitals were excluded.	the plan of care, nurses (including clinical nurse specialist), social worker and pharmacist. Screening checklists administered by nurses determined when referrals to specialty care (e.g., occupational therapy, physical therapy, and dietitian services) were indicated. **Control:** Five general medical units. Core team not described.	Length of hospital stay Institutionalisation Hospital re-admission
Ekerstad *et al.* 2017	Quasi-randomised controlled trial County hospital, Sweden	408 participants (206 intervention, mean age 85.7 years; 202 control, mean age 85.6 years) Frail patients aged 75 years or older, 100% admitted through the ambulance service or primary care.	**Intervention:** Two acute geriatric units (48 beds in total)**.** Comprehensive geriatric assessment with use of validated instruments, interdisciplinary team and patient-centred approach to care, early rehabilitation, and discharge planning. Core team: geriatrician, nurses including specialised admission and discharge nurses, physiotherapist, occupational therapist. **Control:** Conventional acute medical care unit. Input from occupational therapists and physiotherapists operated on a referral basis after assessment by physician or nurses.	Health-related quality of life Functional status Degree of frailty Length of hospital stay Mortality Hospital re-admission Use of municipal help services Costs
Westgard *et al.* 2020	Randomised controlled trial University hospital, Sweden	155 participants (78 intervention, mean age 86.2 years; 77 control, mean age 87.5 years) Frail medical patients aged 75 years or older, not admitted via a "fast	**Intervention:** Acute geriatric unit (bed capacity not specified). Comprehensive geriatric assessment, daily multidisciplinary team conference (Monday-Friday), early rehabilitation	Functional status Self-rated health Patient satisfaction with functional and health status

		track" pathway (stroke, acute myocardial infarct or hip fracture) to a designated ward or not requiring intensive care. 100% admitted from the emergency department.	and discharge planning, person-centred care. Core team: geriatrician, nurses, nurse assistants, occupational therapist, physical therapist. Social worker and dietitian input as indicated. **Control:** Physician led general internal medicine ward. No specialised multidisciplinary team approach or CGA; physicians were specialists in internal medicine. Input from occupational therapists and physiotherapists operated on a referral basis.	Patient satisfaction with hospital care

Table 3.2. Components of CGA outlined in trials

	Clinical leadership	Structured assessment	Multidisciplinary team meetings	Goal setting	Involving patients and carers in goal setting	Outpatient follow-up	Ward environment	Adequate time	Speciality knowledge, experience & competence	Individualised treatment plans
Collard *et al*. 1985	●	●	●	●	●	●	●	**N/R**	●	●
Harris *et al.* 1991	●	●	**N/R**	**N/R**	**N/R**	**N/R**	●	**N/R**	**N/R**	●
Landefeld *et al*. 1995	●	●	●	**N/R**	**N/R**	**N/R**	●	**N/R**	**N/R**	●
Asplund *et al*. 2000	●	●	●	**N/R**	**N/R**	**N/R**	●	**N/R**	●	●
Counsell *et al*. 2000	●	●	●	**N/R**	**N/R**	**N/R**	●	**N/R**	**N/R**	●
Zelada *et al*. 2009	●	●	●	**N/R**	**N/R**	**N/R**	●	**N/R**	●	●
Wald *et al*. 2011	●	●	●	**N/R**	**N/R**	**N/R**	●	**N/R**	**N/R**	●
Barnes *et al*. 2012	●	●	●	**N/R**	**N/R**	**N/R**	●	**N/R**	●	**N/R**
Borenstein *et al*. 2016	●	●	●	**N/R**	**N/R**	**N/R**	●	**N/R**	●	●
Ekerstad *et al.* 2017	●	●	●	●	**N/R**	**N/R**	●	**N/R**	●	●
Westgard *et al.* 2020	●	●	●	●	**N/R**	●	●	**N/R**	●	●

Legend

● = reported

N/R = not reported

Mortality

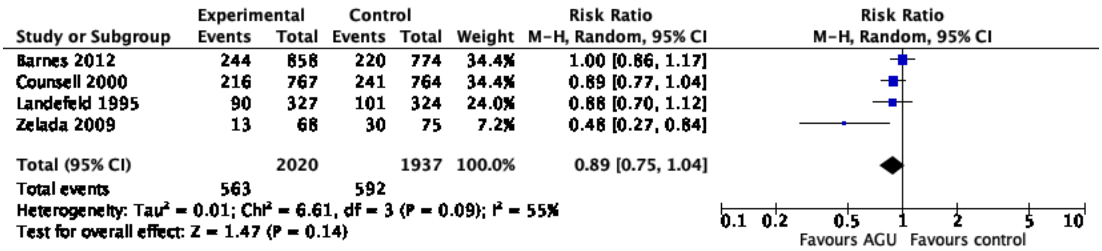
AGU care resulted in little or no difference in mortality during the index admission (RR 0.89, 95% CI 0.68 to 1.17, $I^2 = 27\%$; low certainty evidence) (Ekerstad *et al*. 2017; Borenstein *et al*. 2016; Barnes *et al*. 2012; Asplund *et al*. 2000; Counsell *et al*. 2000; Landefeld *et al*. 1995; Harris *et al*. 1991; Collard *et al*. 1985;) (figure 3.4.1), or at three-month follow-up (RR 0.93, 95% CI 0.79 to 1.09, $I^2 = 4\%$; low certainty evidence) (Ekerstad *et al*. 2017; Asplund *et al*. 2000; Counsell *et al*. 2000; Landefeld *et al*. 1995; Harris *et al*. 1991) (figure 3.4.2).

Hospital Re-admission

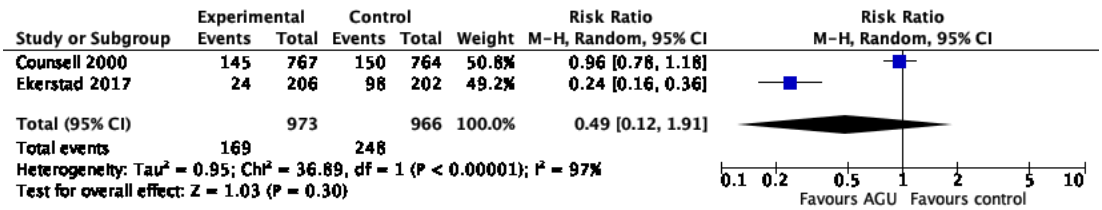
AGU care resulted in no difference in the probability of re-admission to hospital at one-month (RR 1.01, 95% CI 0.80 to 1.28, $I^2 = 53\%$; low certainty evidence) (Ekerstad *et al*. 2017; Borenstein *et al*. 2016; Wald *et al*. 2011; Counsell *et al*. 2000), or three-month follow-up (RR 0.95, 95% CI 0.82 to 1.09, $I^2 = 15\%$; moderate certainty evidence) (Ekerstad *et al*. 2017; Barnes *et al*. 2012; Counsell *et al*. 2000; Landefeld *et al*. 1995;).

Figure 3.2. Functional decline at discharge from hospital and at three and six-month follow-up

3.2.1. Functional decline at discharge (from baseline 2-week pre-hospital admission status)



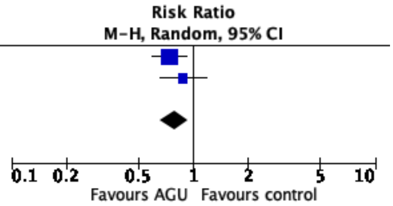
3.2.2. Functional decline at three-month follow-up



3.2.3. Functional decline at six-month follow-up

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Risk Ratio M-H, Random, 95% CI
Counsell 2000	119	767	160	764	65.2%	0.74 [0.60, 0.92]
Westgard 2020	39	78	44	77	34.8%	0.88 [0.65, 1.17]
Total (95% CI)		845		841	100.0%	0.79 [0.66, 0.93]
Total events	158		204			

Heterogeneity: Tau² = 0.00; Chi² = 0.85, df = 1 (P = 0.36); I² = 0%
Test for overall effect: Z = 2.73 (P = 0.006)



Cognitive Function

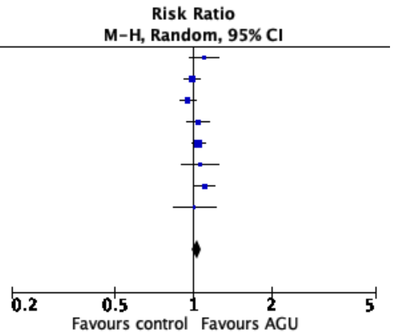
Three trials reported data on cognitive function on discharge from hospital (Zelada *et al*. 2009; Landefeld *et al*. 1995; Harris *et al*. 1991), with complete data in two trials (Zelada *et al*. 2009; Landefeld *et al*. 1995). It was not feasible to perform a meta-analysis as the outcome was measured differently across trials. Zelada *et al.* (2009) reported a higher incidence of impaired cognitive function as measured by the Mini Mental State Examination (MMSE) (Folstein *et al*. 1975) in the AGU group. Results reported in Landefeld *et al.* (1995) were similar between groups. Only one trial presented data at three-month follow-up (Asplund *et al*. 2000), which found that fewer AGU patients had impaired cognitive function on the MMSE.

Figure 3.3. Living at home at discharge from hospital and at three-month follow-up

3.3.1. Living at home at discharge

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Risk Ratio M-H, Random, 95% CI
Asplund 2000	134	190	143	223	7.0%	1.10 [0.96, 1.26]
Barnes 2012	537	858	490	774	17.1%	0.99 [0.92, 1.07]
Borenstein 2016	516	792	405	592	17.1%	0.95 [0.88, 1.03]
Collard 1985	162	218	340	477	11.9%	1.04 [0.95, 1.15]
Counsell 2000	604	767	573	764	24.2%	1.05 [0.99, 1.11]
Harris 1991	69	97	114	170	4.9%	1.06 [0.90, 1.25]
Landefeld 1995	260	327	233	324	13.8%	1.11 [1.01, 1.21]
Wald 2011	83	122	64	95	4.0%	1.01 [0.84, 1.22]
Total (95% CI)		3371		3419	100.0%	1.03 [0.99, 1.07]
Total events	2365		2362			

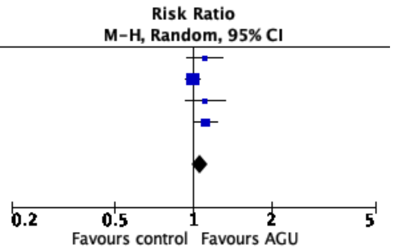
Heterogeneity: Tau² = 0.00; Chi² = 9.66, df = 7 (P = 0.21); I² = 28%
Test for overall effect: Z = 1.54 (P = 0.12)



3.3.2. Living at home at three-month follow-up

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Risk Ratio M-H, Random, 95% CI
Asplund 2000	117	190	124	223	14.6%	1.11 [0.94, 1.30]
Counsell 2000	552	767	552	764	45.5%	1.00 [0.94, 1.06]
Harris 1991	67	97	106	170	12.7%	1.11 [0.93, 1.32]
Landefeld 1995	236	327	210	324	27.3%	1.11 [1.00, 1.24]
Total (95% CI)		1381		1481	100.0%	1.06 [0.99, 1.13]
Total events	972		992			

Heterogeneity: Tau² = 0.00; Chi² = 4.58, df = 3 (P = 0.21); I² = 35%
Test for overall effect: Z = 1.56 (P = 0.12)



Patient Satisfaction

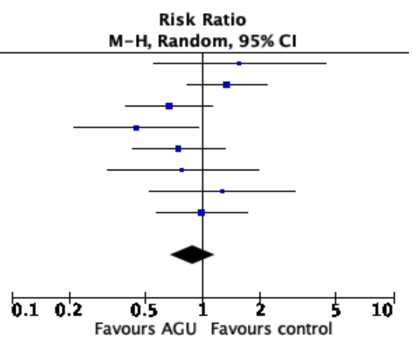
Patient satisfaction with hospital care during the index admission was presented in two trials. Westgård *et al.* (2020) reported no differences between groups on patient satisfaction with hospital care (OR 0.94, 95% CI 0.34 to 2.57). Trialists used eight questions based on the Pyramid Questionnaire (Arnetz and Arnetz 1996); participants were provided with a scale with five responses from agree completely to disagree completely. The results above pertain to the statement: 'I am satisfied with the hospital care'. Counsell *et al.* (2000) reported higher satisfaction with care among patients cared for in an AGU when compared with conventional care units (75 (mean) ± 16 (SD) vs 72 ± 17; p = 0.012). Likert scales, with a range of 0 – 100 were used to rate satisfaction with individual items on questionnaires. Both trials measured satisfaction at one-month follow-up.

Figure 3.4. Mortality during index admission and at three-month follow-up

3.4.1. Mortality during index admission

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Risk Ratio M-H, Random, 95% CI
Asplund 2000	8	190	6	223	5.9%	1.56 [0.55, 4.43]
Barnes 2012	40	858	27	774	19.2%	1.34 [0.83, 2.16]
Borenstein 2016	25	792	28	592	16.9%	0.67 [0.39, 1.13]
Collard 1985	8	218	39	477	10.4%	0.45 [0.21, 0.94]
Counsell 2000	21	767	28	764	15.8%	0.75 [0.43, 1.30]
Ekerstad 2017	8	206	10	202	7.5%	0.78 [0.32, 1.95]
Harris 1991	8	97	11	170	8.0%	1.27 [0.53, 3.06]
Landefeld 1995	24	327	24	324	16.3%	0.99 [0.57, 1.71]
Total (95% CI)		3455		3526	100.0%	0.89 [0.68, 1.17]
Total events	142		173			

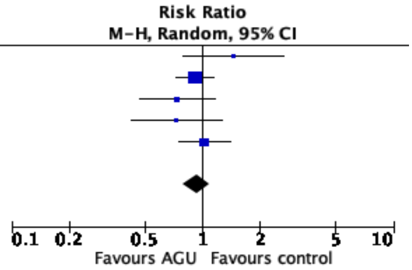
Heterogeneity: Tau² = 0.04; Chi² = 9.56, df = 7 (P = 0.21); I² = 27%
Test for overall effect: Z = 0.84 (P = 0.40)



3.4.2. Mortality at three-month follow-up

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Risk Ratio M-H, Random, 95% CI
Asplund 2000	21	190	17	223	6.9%	1.45 [0.79, 2.67]
Counsell 2000	122	767	133	764	46.4%	0.91 [0.73, 1.14]
Ekerstad 2017	27	206	36	202	12.1%	0.74 [0.46, 1.16]
Harris 1991	15	97	36	170	8.5%	0.73 [0.42, 1.26]
Landefeld 1995	66	327	64	324	26.0%	1.02 [0.75, 1.39]
Total (95% CI)		1587		1683	100.0%	0.93 [0.79, 1.09]
Total events	251		286			

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 4.17$, $df = 4$ ($P = 0.38$); $I^2 = 4\%$
Test for overall effect: $Z = 0.90$ ($P = 0.37$)



Sensitivity Analysis

Re-running analyses using a fixed-effects model resulted in a decrease in the probability of functional decline at three-months (RR 0.68, 95% CI 0.57 to 0.81; $I^2 = 97\%$) and in a reduced length of hospital stay (MD -0.40, 95% CI -0.67 to -0.13; $I^2 = 77\%$). Removal of trials with a high RoB in the randomisation process (Ekerstad *et al*. 2017; Wald *et al*. 2011; Zelada *et al*. 2009; Harris *et al*. 1991) resulted in a reduced length of hospital stay (MD -0.75, 95% CI -1.21 to 0.30; $I^2 = 47\%$). Also, re-running the analysis for functional decline between baseline two-week prehospital admission status and discharge, after removal of trials that had a high RoB in missing outcome data (Barnes *et al*. 2012) resulted in a decrease in the probability of decline (RR 0.82, 95% CI 0.65 to 1.03; $I^2 = 55\%$). No differences were found after excluding trials that were conducted in the previous version of the review (Baztán *et al*. 2009).

3.6 Discussion

Summary

The results of this updated systematic review and meta-analysis suggest that AGU care decreases the probability that hospitalised older adults with acute medical complaints will experience functional decline at six-month follow-up and are more likely to be living at home at three-month follow-up. Findings related to functional decline pertain to two trials, recruiting 1,686 older adults conducted in 2020 and 2000 (Westgård *et al*. 2020; Counsell *et al*. 2000).

Trialists did not report the specific factors associated with this medium-term effect. Maintaining independence in the performance of ADLs is an important determinant of QoL for older adults (Courtney *et al*. 2012); therefore, any intervention that assists in reducing the risk of functional decline must be considered and evaluated across the continuum of care (Cuevas-Lara *et al*. 2019). Although older adults had a higher probability of living at home at three months, no differences were found between groups at hospital discharge. This finding contrasts with those reported in the 2017 Cochrane review by Ellis *et al*. (2017) and previous meta-analyses (Fox *et al*. 2012; Baztán *et al*. 2009). Four of the eight trials that were included in the analysis for discrete wards in the 2017 Cochrane review (Ellis *et al*. 2017) did not meet our inclusion criteria and dated from 1982–1994. Low heterogeneity between trials (I^2 = 28%) (figure 3.3.1) adds to our confidence in the certainty of evidence for this outcome. The high heterogeneity between trials in length of hospital stay (I^2 = 77%) (Appendix 6) is comparable to a recent meta-analysis, which found that various CGA intervention models had no effect on length of hospital stay (Chen *et al*. 2021).

Characteristics of an AGU

The included trials provided variable levels of information about the characteristics and organisational form of conventional care units. This is an important consideration given that the effectiveness of AGUs is measured by comparison with these units. Where the core team were described, access to physiotherapy, occupational therapy, and social work tended to operate on a referral basis with limited focus on specialisation of care. However, healthcare systems and standards of care have undoubtedly evolved since several trials included in this updated review were conducted. CGA is considered a complex intervention (Skivington *et al*. 2021); therefore, this review aimed to identify the characteristics and components of CGA within an AGU. Whilst variability in reporting was observed, several distinct components emerged across all 11 trials. Clinical leadership from a geriatrician and/or primary physician and structured comprehensive assessment coupled with individualised intervention plans, delivered by a core team of professionals were consistent across trials. A dedicated ward environment and MDT meetings (ranging from daily in six trials to once a week in two trials) were also distinct features. Such features may contribute to the overall effectiveness of AGU care, as has been shown in patients with stroke (Langhorne *et al.* 2020).

Implications for Research and Clinical Practice

It is important to determine the main beneficiaries of admission to an AGU. In our review, the impact of frailty as a determining factor of CGA outcome and/or criterion for admission to an AGU was only examined in three of the 11 trials (Westgard *et al*. 2020; Ekerstad *et al*. 2017; Borenstein *et al*. 2016) Although contemporary research findings recommend selecting older adults for CGA interventions based on frailty criteria (Conroy *et al*. 2019; Parker *et al*. 2018) others found that it was beneficial to use an age-based criterion for selection (Schuurmans *et al*. 2004). Given that frailty status on admission to hospital is predictive of multiple adverse outcomes (Hubbard *et al*. 2017), future trials should include stratification by frailty and the influence of case mix on the effectiveness of AGU care must be examined. Furthermore, the overall RoB across included trials and outcomes was generally ‘high’ or ‘some concerns’ therefore highlighting the need for future methodologically robust trials. Inclusion of process evaluations, in line with the updated Medical Research Council framework for the evaluation of complex interventions should also be considered (Skivington *et al*. 2021).

CGA is considered a patient-centred process and is both therapeutic and diagnostic (Rubenstein *et al*. 1991); however, clinical and patient-reported outcome measures (PROMs) were not routinely included across trials. Future research should focus on inclusion of PROMs such as self-rated health status; use of PROMs may assist clinicians in re-focusing care and interventions around older adults' priorities and preferences (Parker *et al.* 2018).

Clinicians may anticipate moderate beneficial effects with respect to preservation of older adults' functional status and the probability of living at home in the medium term. Given the multifactorial care needs of hospitalised older adults, an interdisciplinary team approach whereby clinicians embed geriatric competencies into their practice is recommended (Geriatrics Interdisciplinary Advisory Group 2006).

Strengths and Limitations

This review was methodologically robust and adhered to PRISMA reporting guidelines for systematic reviews and meta-analyses. Most of the trials were conducted in the United States, which may limit generalisability to other health systems. The psychometric limitations imposed by dichotomising the primary outcome of functional decline meant that the interplay of floor or ceiling effects were a factor where there was no change in older adults' functional ability at discharge and/or follow-up. The quality and range of outcomes reported was variable, thereby limiting our ability to pool data across trials. Whilst trialists broadly reported the components of CGA within an AGU, they did not provide data on the critical components responsible for the favourable outcomes reported. Finally, apart from functional decline, conclusions cannot be drawn on the effectiveness of AGU care on relevant outcomes beyond three months following hospital discharge.

3.7 Conclusion

This updated systematic review and meta-analysis included 11, heterogeneous trials across three countries. AGU care decreases the probability that hospitalised older adults with acute medical complaints will experience functional decline at six-month follow-up and are more likely to be living at home at three-month follow-up. Future research should consider greater inclusion of clinical and PROMs. Clinicians should embed use of frailty criterion, when selecting older adults for admission to an AGU.

Ethics

Ethics approval was not required for this review.

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Conflicts of Interest

None to declare

3.8 References

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Chapter 4: Stakeholders' Experiences of Comprehensive Geriatric Assessment in an Inpatient Hospital Setting: A Qualitative Systematic Review and Meta-Ethnography

Status: Published *BMC Geriatrics* 2023

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Citation: O'Shaughnessy, Í., Fitzgerald, C., Hayes, C., Leahy, A., O'Connor, M., Ryan, D., Shchetkovsky, D., Steed, F., Carey, L., Quinn, C., Shanahan, E., Galvin, R. and Robinson, K. (2023) 'Stakeholders' experiences of comprehensive geriatric assessment in an inpatient hospital setting: a qualitative systematic review and meta-ethnography', *BMC Geriatrics*, 23: 821.

4.1 Candidate's Contribution: The candidate was lead author on this qualitative systematic review and meta-ethnography and was responsible for conceptualisation of the study, development and design of methodology, data curation, analysis, visualisation and presentation. The candidate led on development and refinement of manuscript drafts, management of journal submission, and dissemination of the work at national and international conferences.

4.2 Abstract

Background: CGA is considered the gold standard approach to improving a range of outcomes for older adults living with frailty admitted to hospital. To date, research has predominantly focused on quantitative syntheses of the international evidence with limited focus on qualitative synthesis of stakeholders' perspectives. This review aims to resolve this research gap by identifying and synthesising qualitative studies reporting multiple stakeholders' experiences of inpatient CGA.

Methods: A systematic search of five electronic databases was conducted. Qualitative or mixed methods studies that included qualitative findings on the experiences of CGA in an inpatient hospital setting from the perspective of health care professionals (HCP), older adults and those important to them were included. The protocol was registered on PROSPERO (Registration: CRD42021283167) and the 10-item Critical Appraisal Skills Programme (CASP) checklist was used to appraise the methodological quality of included studies. Results were synthesised as a meta-ethnography.

Results: Eleven studies, which reported on the experiences of 153 HCPs, 91 older adults, and 57 caregivers were included. The studies dated from 2011–2021 and three key themes were identified: (1) HCPs, older adults, and caregivers report conflicting views on CGA as a holistic process, (2) most HCPs, but only some older adults and caregivers, experience CGA goal setting and care planning as collaborative, and (3) all stakeholders value care continuity during the transition from hospital to home but often fail to achieve it.

Conclusion: While HCPs, older adults, and caregivers' values and ambitions related to CGA broadly align, their experiences often differ. The identified themes highlight organisational and relational factors, which positively and negatively influence CGA practices and processes in an inpatient hospital setting.

4.3 Background

Population ageing has transformed the demand for healthcare worldwide. Older adults accessing acute hospital care often present with multiple comorbidities, cognitive impairment, polypharmacy, and functional decline (Conroy *et al*. 2019; Ruiz *et al*. 2015). This accumulation of deficits is an indication for assessment of frailty (Rockwood and Mitnitski 2007), which is conceptualised as a state of increased vulnerability resulting from age-associated decline in physiological reserves (Clegg *et al*. 2013) and is predictive of multiple adverse outcomes during hospitalisation (Hubbard *et al*. 2017; Zisberg *et al*. 2015; Hein *et al*. 2014). CGA is considered the gold standard approach for hospital-based healthcare for older adults living with frailty (Ellis *et al*. 2017)**.** CGA is a multi-dimensional therapeutic and diagnostic process that is focused on improving the QoL and health outcomes of older adults living with frailty (Stuck and Iliffe 2011; Rubenstein *et al*. 1991).

To date, research conducted on the impact of CGA for older adults admitted to hospital has predominantly focused on quantitative syntheses of the international evidence. Compared to 'usual care', CGA has been shown to have positive effects on key clinical and process outcomes (O'Shaughnessy *et al*. 2022; Ellis *et al*. 2017; Van Craen *et al*. 2010). The CGA process in hospital settings increases the likelihood of being alive and living at home at three to 12 months' follow-up (Ellis *et al*. 2017; O'Shaughnessy *et al*. 2022), decreases the likelihood of admission to a NH at three to 12 months' follow-up (Ellis *et al*. 2017; Van Craen *et al*. 2010), and is associated with a reduction in functional decline at hospital discharge (Van Craen *et al*. 2010) and at six-month follow-up (O'Shaughnessy *et al*. 2022). This primary focus on quantitative outcome measurement is further illuminated in findings from an umbrella review, which aimed to describe the key elements, principal outcome measures, and characteristics of the main beneficiaries of inpatient CGA (Parker *et al*. 2018). Of the 13 systematic reviews included, only two included PROMs or patient-reported experience measures (PREMs) such as QoL or active listening, respectively. Given that CGA is underpinned by a person-centred approach to care (Morgan 2011), the authors recommended greater inclusion of PROMs and PREMs, which may guide HCPs in re-focusing assessment and intervention processes around older adults' priorities and preferences.

Optimisation of CGA delivery across different patient populations with multiple comorbidities was identified as one of the top 10 research priorities by older adults and caregivers in a recent James Lind Alliance Priority Setting Partnership (Parker *et al*. 2019). Qualitative research has identified important contradictions between the aims of CGA and patients' experiences, for example, a study, which explored older adults' experiences of CGA in an outpatient setting, revealed a dominant focus on illness symptoms and limitations related to ageing (Esbensen *et al*. 2016). It is increasingly important to understand older adults' perspectives as international healthcare systems continue to evolve and reconfigure to meet increased demand for resources (Shepperd *et al*. 2022; Kocman *et al*. 2019; Parker *et al*. 2017).

A number of qualitative studies exploring the experience of CGA in an inpatient hospital setting from the perspective of multiple stakeholders have been published; however, to our knowledge, no qualitative evidence synthesis has been completed on the topic. Our study aims to: (1) systematically search the qualitative literature to identify studies exploring HCPs, older adults and caregivers' experiences of CGA in an inpatient hospital setting, and (2) perform a meta-ethnography to synthesise the included studies with a view to developing new insights reflective of all stakeholders' experiences.

4.4 Methods

Design

A meta-ethnographic synthesis, informed by Noblit and Hare's (1998) seven-phase process of the qualitative evidence was selected to move beyond aggregation and description of the evidence to engagement in interpretative analysis and generation of new insights (France *et al*. 2019). The eMERGe guidelines (France *et al*. 2019) were adhered to in the conduct and reporting of this meta-ethnography with a completed checklist presented in Appendix 7. The original protocol for the synthesis was registered on PROSPERO (CRD42021283167).

Search Strategy

A systematic search of five electronic databases (CINAHL, PsychArticles, PsychInfo, MEDLINE, Social Sciences) was completed using 'geriatric assessment' and 'qualitative research' as keywords alongside exploded subject headings in May 2023; no limit was placed on date of publication. These databases were selected for inclusion of qualitative studies and health research. We only included peer-reviewed publications i.e., grey literature and abstracts were excluded, and studies were limited to those published in English. The search string can be found in Appendix 8. References generated from the search strategy were exported into Endnote X9 software and duplicates deleted. Reference lists of included studies were searched for additional papers.

Eligibility Criteria

We included studies that used recognised qualitative methods of data collection and analysis, which reported the experiences and/or perceptions of stakeholders involved in CGA within an inpatient hospital setting. Stakeholders included HCPs, older adults and those important to them e.g., family members and/or caregivers. The definition of CGA described by Parker *et al*. (2018) as a *"multidimensional, multidisciplinary process, which identifies medical, social and functional needs, and the development of an integrated/co-ordinated care plan to meet those needs"* (p.150) was used as the reference standard when determining the eligibility of studies for inclusion. Studies that used mixed methods where qualitative data could be extracted were also included. Studies that described CGA within an inpatient surgical, psychiatry, or long-term residential setting were excluded due to the expected differences in recovery trajectory and thus experience of hospitalisation.

Screening

Two reviewers (ÍO'S and KR) independently conducted title and abstract screening against inclusion criteria. Disagreements were resolved through discussion and consensus with a third reviewer (CF), where necessary. Full text articles were independently screened by two reviewers (ÍO'S and KR) for final decisions regarding inclusion, with disagreement resolved by consulting a third reviewer (CF).

Quality Appraisal

The 10-item CASP (2018) checklist was used to appraise the methodological quality of included studies. The CASP tool is widely used in healthcare-related qualitative evidence synthesis (Long *et al*. 2020; Hannes and Macaitis 2012) and is endorsed by the Cochrane Qualitative and Implementation Methods Group (Noyes *et al.* 2018). Two reviewers (ÍO'S and KR) independently appraised the quality of each study with disagreement resolved through involvement and discussion with a third reviewer (CF).

Data Extraction and Synthesis

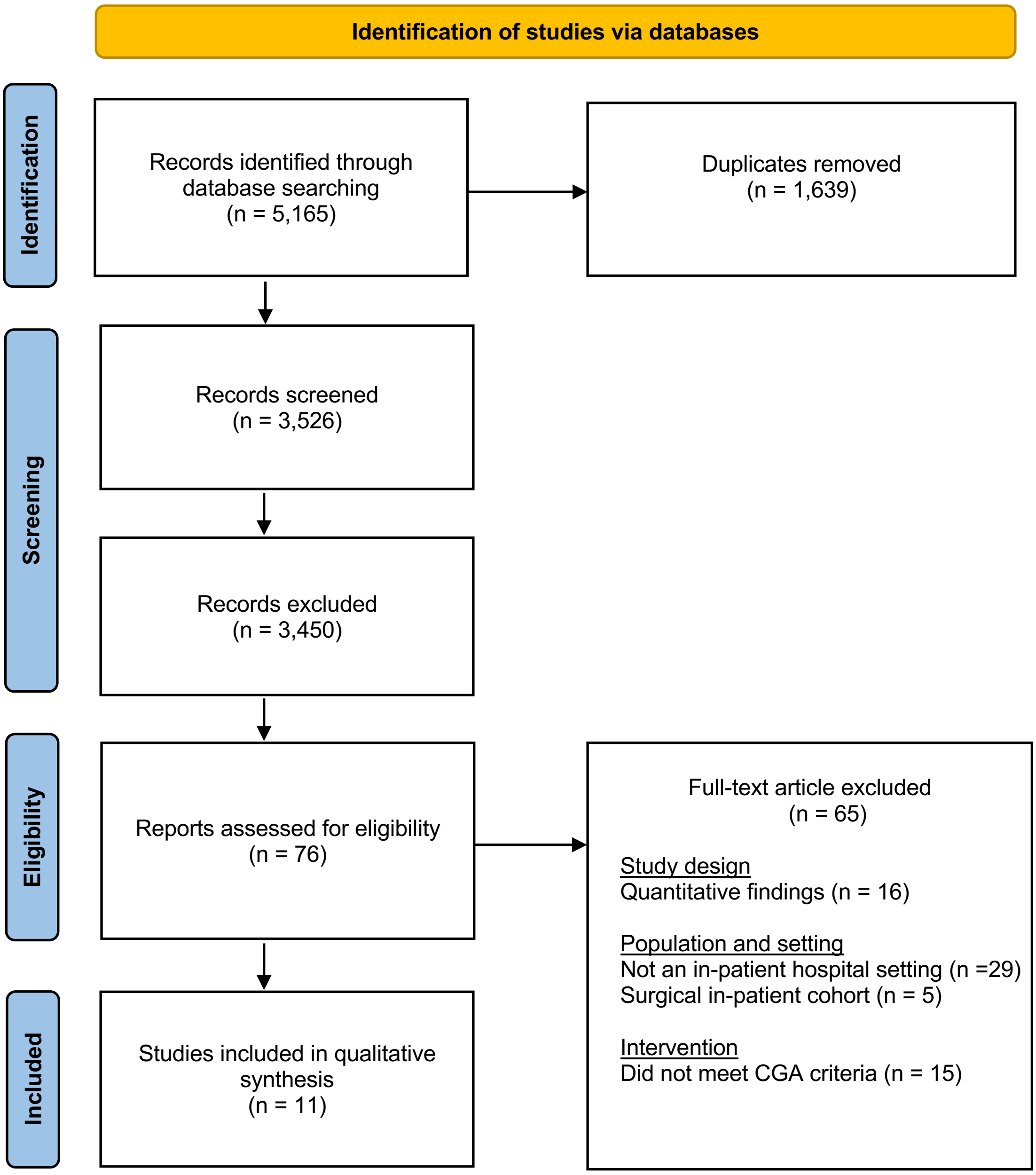
The qualitative synthesis was underpinned by the seven phases of meta-ethnography as originally developed by Noblit and Hare (1998). This is one of the most commonly utilised qualitative synthesis methods in healthcare research and is an iterative process, which focuses on the development of analytical rather than descriptive findings (Sattar *et al*. 2021). Phase one, 'getting started', involved describing the gap in research and development of the research question followed by phase 2, ‘deciding what is important’, which focused on a systematic search of the literature and quality appraisal of included studies. In phase three, ‘reading the studies’, two reviewers repeatedly read the included studies to ensure familiarisation with the key concepts or metaphors before extracting first- and second-order constructs i.e., participant quotes and/or concepts developed by authors of primary studies, respectively, into NVivo 12 Pro software. Phase four, ‘determining how the studies are related’ involved juxtaposing concepts from each study against one another using a grid format, which served as the foundation for phase five, ‘translating the studies into one another’. In phase six, ‘synthesising translations’, a line-of-argument was synthesised from third-order constructs. The line-of-argument is described as *“making the whole into something more than the parts alone imply”* (Noblit and Hare 1988, p.28). In the current study, the whole refers to the experiences of CGA in an inpatient hospital setting from the perspective of multiple stakeholders. The final phase ‘expressing the synthesis’ was achieved through writing up the results for dissemination. Phases four through to six were led by ÍO’S with critical feedback provided throughout by KR.

4.5 Results

Study Identification

The literature search yielded 5,165 records. Following removal of duplicates, title and abstract screening was completed on 3,526 articles and 73 articles were selected for full-text critical reading (Figure 4.1). Eleven studies recruiting 301 participants met inclusion criteria and were included in the meta-ethnography.

Figure 4.1. PRISMA diagram for a qualitative systematic review



Descriptive Characteristics of Included Studies

Details of the 11 included studies are outlined in Appendix 9. The studies dated from 2011–2021; four were conducted in the United Kingdom (Mäkelä *et al*. 2020; Gardner *et al.* 2019; Darby *et al*. 2017; Charalambous and Goldberg 2016), two in the Netherlands (Ribbink *et al*. 2021; de Vos *et al*. 2017), two in Sweden (Westgård *et al*. 2019; Åberg *et al*. 2017), and one in Australia (Harvey *et al*. 2017), Germany (Busetto *et al*. 2017) and France (Sifer-Rivière *et al*. 2011). With regards to population of interest, five studies were conducted with HCPs only (de Vos *et al*. 2017; Åberg *et al*. 2017; Busetto *et al*. 2017; Charalambous and Goldberg 2016; Sifer-Rivière *et al*. 2011), two included HCPs, older adults and caregivers (Gardner *et al*. 2019; Harvey *et al*. 2017), three included both older adults and caregivers (Ribbink *et al*. 2021; Mäkelä *et al*. 2020; Darby *et al*. 2017), and one included older adults only (Westgård *et al*. 2019). The 11 studies in this meta-ethnography reported on the experiences of 153 HCPs, 91 older adults, and 57 caregivers. The study with the smallest number of participants was Charalambous and colleagues (n = 8) (Charalambous and Goldberg 2016) while the study with the largest number of participants was Harvey and colleagues (n = 61) (Harvey *et al*. 2017). All studies were conducted in an inpatient hospital setting with one study specifically focusing on the subspeciality area of oncogeriatrics (Sifer-Rivière *et al*. 2011). While there was variation in the team composition and process of CGA across studies, nine studies reported a geriatrician led model of care (Ribbink *et al*. 2021; Mäkelä *et al*. 2020; Gardner *et al*. 2019; Westgård *et al*. 2019; Darby *et al*. 2017; de Vos *et al*. 2017; Åberg *et al*. 2017; Harvey *et al*. 2017; Busetto *et al*. 2017).

Quality Appraisal

A summary of the results using the 10-item CASP tool for quality appraisal are presented in Table 4.1. Five of the 11 studies exclusively employed qualitative methods (Åberg *et al*. 2017; Harvey *et al*. 2017; Busetto *et al*. 2017; Charalambous and Goldberg 2016; Sifer-Rivière *et al*. 2011), while six studies employed mixed methods (Ribbink *et al*. 2021; Mäkelä *et al*. 2020; Gardner *et al*. 2019; Westgård *et al*. 2019; Darby *et al.* 2017; de Vos *et al*. 2017). Of note, three of the mixed methods studies were conducted alongside a RCT, which evaluated the impact of CGA in an inpatient hospital setting (Mäkelä *et al.* 2020; Westgård *et al*. 2019; Darby *et al*.

2017). All 11 studies were clear in the aim of their research and the methodology utilised were appropriate. Only four studies addressed the relationship between researcher and participant (Ribbink *et al*. 2021; Mäkelä *et al*. 2020; Darby *et al.* 2017; Busetto *et al*. 2017) and three studies provided an insufficient description of the data analysis process (Ribbink *et al*. 2021; de Vos *et al*. 2017; Sifer-Rivière *et al*. 2011). However, given the ongoing debate regarding the application of appraisal methods in the field of qualitative research (Dixon-Woods *et al*. 2007), no studies were excluded on the basis of quality.

Table 4.1. Quality appraisal of included studies

	CASP Criterion 1	CASP Criterion 2	CASP Criterion 3	CASP Criterion 4	CASP Criterion 5	CASP Criterion 6	CASP Criterion 7	CASP Criterion 8	CASP Criterion 9	CASP Criterion 10
Citation	**Clear statement of aim**	**Qualitative methodology appropriate**	**Appropriate research design**	**Sampling**	**Data collection**	**Research reflexivity**	**Ethical consideration**	**Appropriate data analysis**	**Clear statement of findings**	**Research value**
Åberg *et al.* 2017	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes
Busetto *et al*. 2017	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Charalambous and Goldberg 2016	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes
Darby *et al*. 2020	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
de Vos *et al*. 2016	Yes	Yes	Yes	Yes	Yes	No	Yes	Unclear	Yes	Yes
Gardner *et al*. 2019	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Harvey *et al.* 2017	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Mäkelä *et al*. 2020	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ribbink *et al*. 2021	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes

Sifer- Rivière *et al*. 2011	Yes	Yes	Yes	Yes	Unclear	No	No	Unclear	Yes	Yes
Westgård *et al*. 2019	Yes	Yes	Yes	Unclear	Unclear	No	Yes	Yes	Yes	Yes

Synthesis

The analysis produced three themes (third-order constructs): (1) HCPs, older adults and caregivers report conflicting views on CGA as a holistic process, (2) most HCPs, but only some older adults and caregivers, experience CGA goal setting and care planning as collaborative, and (3) all stakeholders value continuity of care during the transition from hospital to home but often fail to achieve it. An overview of each study's contribution to the themes is outlined in Table 4.2.

Theme 1: Conflicting views on CGA as a holistic process

While there was consensus across HCPs about CGA as a holistic process to meet older adults needs, older adults, and caregivers had varied experiences of CGA as holistic and weren't always clear about the overall aim of CGA.

HCPs described CGA as enabling them to view the older adult as a whole and unique person with specific needs, wishes, preferences, and resources across studies (Gardner *et al*. 2019; de Vos *et al*. 2017; Åberg *et al*. 2017; Harvey *et al*. 2017; Busetto *et al*. 2017). This approach ensured the focus of assessment and intervention was "*less organ focused"* (Åberg *et al*. 2017) with greater emphasis placed on complex health problems and the interplay with functional abilities (Gardner *et al*. 2019; Åberg *et al*. 2017; Sifer-Rivière *et al*. 2011). HCPs also reported the importance of obtaining an understanding of the health event that precipitated admission as part of holistic consideration of the older adult:

"I think that this is one of our characteristics too, that we take in the whole person: How it was before (hospitalization), as this is really important for how we should think ahead." (Åberg *et al*. 2017)

Working as part of an MDT and collaborating with the older adult was described as a central tenet of CGA by HCPs that enabled a holistic assessment. Team working and collaboration with older adults was viewed as non-hierarchical (Gardner *et al*. 2019; de Vos *et al*. 2017; Åberg *et al*. 2017; Busetto *et al*. 2017) and *"overrunning traditional hierarchical profession-based structures"* was described as a key feature of team interaction (Åberg *et al*. 2017). Team working was enhanced by coordination and completion of joint assessments and use of structured proformas (Gardner *et al*. 2019; Åberg *et al*. 2017; Busetto *et al*. 2017), which made it possible to include various perspectives and interpretations of the information yielded by CGA:

I think that's partly the advantage of using multiple pairs of eyes to assess the patient. It's often only by taking into account different types of information that you find the right way to the patient." (Busetto *et al*. 2017)

HCPs described a style of team working that built on the varied disciplinary skills and expertise (Gardner *et al*. 2019; de Vos *et al*. 2017; Åberg *et al.* 2017; Busetto *et al*. 2017; Sifer-Rivière *et al*. 2011) and, in some instances, used a more distributed form of leadership and responsibility than the traditional genesis of the CGA (Gardner *et al*. 2019).

One contrasting HCP account was presented in a study focused on oncogeriatrics where cancer specialists reported consulting with geriatricians regarding medical decision making; however, challenges such as geriatricians having a less important, ambiguous, and constantly negotiated position in teams led by medical oncologists were also noted (Sifer-Rivière *et al*. 2011). In another study, a suboptimal electronic documentation system was seen by HCPs as unreliable and inefficient and created a barrier to MDT cooperation (Busetto *et al*. 2017).

Older adults and caregivers also experienced CGA as holistic, inclusive, and person-centred in some studies (Ribbink *et al*. 2021; Gardner *et al*. 2019; Harvey *et al*. 2017), with CGA credited as playing a critical role in the management of complex needs:

"...they listened and they treated the whole person not just her actual thing that she went in for." (Caregiver, male) (Harvey *et al*. 2017)

Accounts demonstrated ways that holistic assessments had been perceived to lead to direct interventions delivered by HCPs including management of medical problems, medication reconciliation, and restoration of functional abilities (Gardner *et al*. 2019). For some older adults a medically focused assessment encompassing diagnostic investigations and a physical examination and subsequent monitoring of medical stability aligned with their expectations of CGA, with reports suggesting that they valued this approach:

"I was told I would have X-rays, I would have blood taken, I would have examinations . . . to discover what problems I have. Which is what it is all about, really . . . to throw up something that might provide a clue, to sort of make the situation better." (Older adult, male) (Gardner *et al*. 2019)

Three studies reported contrasting experiences of older adults and caregivers (Mäkelä *et al*. 2020; Gardner *et al*. 2019; Darby *et al*. 2017). In one study, caregivers perceived that a physical examination dominated over broader dimensions of assessment, that they would have valued:

"I guess what I was expecting was for someone to see if . . . there's any additional help that can be offered. This was more on the medical side, just a couple of 'obs' [observations], yeah,

blood pressure and checking the blood readings, sugar levels, that's it." (Caregiver, female) (Gardner *et al*. 2019)

In the further two studies, older adults and caregivers reported a nebulous understanding of the overall aim of CGA (Mäkelä *et al*. 2020; Darby *et al*. 2017) and did not recognise it as a process of assessment and planning that involved them or was holistic. Perceptions of assessment and treatment were reported to be limited to *"just monitored and observed"* (Darby *et al*. 2017) during their period of hospitalisation. This statement was further illuminated in the reported experience from an older adult when asked specifically about his treatment:

"Well, nothing really. Just monitoring. Just had observations every hour or so, blood pressure, being diabetic they come and took my erm sugar level every now and again, examined me two or three times, but, never had any medication other than my tablets which I took in with me." (Older adult, male) (Darby *et al.* 2017)

Caregivers also reported prompting HCPs to complete aspects of functional assessments, for example of their relative's mobility and ADLs (Gardner *et al.* 2019). Furthermore, discrepancies were reported between HCPs assessments and caregiver observations with an insufficient acknowledgement of concerns by HCPs:

"I say, 'He's still confused, because he said some strange things to me', and [the nurse] says, 'Well, we haven't noticed that'." (Caregiver, male) (Mäkelä *et al*. 2020)

Table 4.2. Contribution of included studies towards themes

Citation	**Conflicting views on CGA as a holistic assessment process**	**Most HCPs but only some older adults and caregivers experience goal setting and care planning as collaborative**	**All stakeholders value care continuity during the transition home from hospital but often fail to achieve it**
Åberg *et al*. 2017	X	X	X
Busetto *et al*. 2017	X	X	X
Charalambous and Goldberg 2016		X	
Darby *et al.* 2020	X		X
de Vos *et al.* 2016	X	X	X
Gardner *et al*. 2019	X	X	X
Harvey *et al*. 2017	X	X	X
Mäkelä *et al*. 2020	X	X	X
Ribbink *et al*. 2021	X	X	X
Sifer-Rivière *et al*. 2011	X	X	X
Westgård *et al*. 2019		X	X

Theme 2: Most HCPs but only some older adults and caregivers experience goal setting and care planning as collaborative

This theme focuses on HCPs, older adults, and caregivers' experiences and appraisal of participation in relational dimensions of CGA such as goal setting and care planning

HCPs viewed goal setting as a central component of CGA and described the importance of early involvement of older adults and their caregivers in the process, which helped direct interventions delivered by all team members (de Vos *et al*. 2017; Åberg *et al*. 2017; Busetto *et al*. 2017):

'The more and the earlier we can inform the patient and inform the relatives, the calmer things get, the easier it is to work undisturbed and the more effective we can be ..." (Åberg *et al*. 2017)

The term *"perspective-integration"* illustrates HCPs description of including older adults needs and preferences together with assessment findings in the goal setting process (Åberg *et al*. 2017). One study described use of the "*Goal Attainment Scaling"* plan, which "*assisted in formulating individual goals, developing a personalized treatment plan, monitoring both the patient's and informal caregiver's progress and adjusting the interventions in a timely manner as necessary*" (de Vos *et al*. 2017). While HCPs aspired to involve older adults in goal setting in one study, they described difficulties achieving this, with reports highlighting the absence of older adults when creating goals at MDT meetings (Åberg *et al*. 2017). HCPs also reported factors such as cognitive impairment and medical instability as barriers to actively involving older adults in goal setting and care planning. However, cooperation between all HCPs and regular involvement of caregivers in the care process compensated for the loss of the older adult as the primary conduit of information, due for example, to cognitive or language deficits (Åberg *et al*. 2017; Busetto *et al*. 2017).

One study, which focused on nurses' experiences of documentation related to the CGA process for sharing with other HCPs reported feelings of exasperation over the excessive amount of time required to complete documentation and CGA care plans, which impacted their available time to directly interact with older adults (Charalambous and Goldberg 2016). A different experience of documentation was described in another study, where documentation was seen to make a positive contribution to the process of care planning when explicitly shared between older adults, caregivers and HCPs (Gardner *et al*. 2019).

Relational aspects of care through personal interactions with HCPs and the role of rapport and humour, were valued by older adults (Gardner *et al*. 2019), which shaped their experience of *"feeling respected as a person"* (Westgård *et al*. 2019). Reciprocity in relationships with HCPs enabled communication and participation in decision making related to older adults' needs and wishes:

"They asked and you could tell them what you were thinking or what you needed help with they said you can have help with this and that, and we said no we want to have help with this and that. It felt like they listened to us, and then we made a decision." (Older adult, male) (Westgård *et al*. 2019)

While older adults did not recognise the terminology of goal setting as a component of CGA (Gardner *et al*. 2019), they experienced a sense of enhanced confidence when HCPs reinforced their progress and achievements through supportive interactions:

"Speech therapy . . . I am practising, and the nurses on the ward they say, I can make myself clear to them . . . sheer persistence on my part, determination." (Gardner *et al.* 2019)

However, in one study, caregivers perceived the goals set by HCPs as "*too ambitious"* and did not reflect older adults' baseline level of functional abilities:

"He had a goal of walking 500 meters, whereas he could only walk less than 100 meters preadmission." (Caregiver, male) (Ribbink *et al.* 2021)

Older adults described contrasting levels of involvement in decision making pertaining to care planning across three studies (Ribbink *et al*. 2021; Mäkelä *et al*. 2020; Westgård *et al*. 2019). The words "*an irreversible decision made by a doctor"* illustrates the sense of feeling excluded from decision making in the study by Mäkelä *et al*. (2020). In another study, some older adults described feeling *"marginalised"* from participation in decision making when they were given information by HCPs but not offered an opportunity to discuss concerns related to their medical status or organisational routines on the ward or when they were not engaged in communication, informed or "*given the privilege to know what was going on*" (Westgård *et al*. 2019).

Limited opportunity to discuss concerns with HCPs regarding *"coping with needs and risks"* in the context of post discharge support was described as a source of anxiety for some caregivers (Mäkelä *et al*. 2020; Gardner *et al*. 2019) and resulted in a perception that care planning was unrealistic (Mäkelä *et al*. 2020). Some caregivers described an under appreciation by HCPs of the *"hidden"* support they provide, which was key to enabling older adults return home following hospital discharge:

"They were happy that [my mother] could cook for herself and clean and get herself up, which is all fine, except she can't because she relies pretty much on me . . . she assumes I'm not included in what you call 'help'." (Gardner *et al*. 2019)

Caregivers also described concerns regarding a lack of bidirectional communication where HCPs had not approached them during their relative's inpatient admission, including instances where a discharge plan was made without their involvement (Gardner *et al*. 2019). However, caregivers in one study expressed reluctance to challenge HCPs if their concerns were not acknowledged:

"You don't like to interfere and you don't like to be a nuisance." (Caregiver, female) (Mäkelä *et al*. 2020)

Theme 3: All stakeholders value care continuity during the transition home from hospital but often fail to achieve it

This theme relates to the experiences of CGA in an inpatient hospital setting, continuity of care, and the transition to home. While there was broad consensus across HCPs about processes and pathways that positively influenced these experiences, older adults and caregivers described heterogenous experiences of CGA across the continuum of care.

HCPs described striving for optimal continuity of care and seamless transitions from hospital to home (Gardner *et al*. 2019; de Vos *et al*. 2017; Åberg *et al*. 2017; Sifer-Rivière *et al*. 2011). Gardner and colleagues described referral to the "*hospital at home*" team as an expedited means of hospital discharge while ensuring continuity of care through continued observation and assessment of the older adult in their home environment:

“. . . we go on the basis of the assessment that follows CGA principles and the people that we tend to typically refer on . . . are those . . . who require a home-based assessment following ‘discharge to assess’ principles . . .” (Gardner *et al.* 2019)

Another study described the role of a *“transfer nurse”* who discussed and coordinated options for the *“post-discharge follow-up care trajectory”* with older adults and their family as soon as a discharge date was determined by the team (de Vos *et al*. 2017). This aimed to minimise delays in the care process and promote a positive discharge experience.

Various fora for team coordination and cooperation such as team conferences, board rounds, and ad hoc team discussions enabled the flow of information between HCPs to be *“synchronised”* with respect to older adults’ progress and discharge plans (Gardner *et al*. 2019; de Vos *et al*. 2017; Åberg *et al*. 2017). Prerequisites for effective and efficient team communication were accessibility of team members to one another, open communication style, and staff continuity (Åberg *et al*. 2017). Åberg and colleagues highlighted the importance of timely contact with caregivers and staff in municipality care to minimise potential delays in care processes and to ensure continuity in care and support (Åberg *et al*. 2017).

A digital file transfer system in one study supported the patient transfer process from hospital staff to post-discharge care providers avoiding the need for faxes, phone calls etc (de Vos *et al*. 2017).

While HCPs described efforts to achieve continuity of care across the transition process in one study, they acknowledged difficulties including system pressures and *“varying quality of information exchange between hospital and community sectors”* (Harvey *et al*. 2017). In another study, researchers found no evidence of how HCPs mobilised or linked with community resources to optimise continuity of care or service provision following hospital discharge (Busetto *et al.* 2017).

Older adults and caregivers also described inclusive processes, which facilitated a seamless transition from hospital to home (Gardner *et al*. 2019; Harvey *et al*. 2017). They valued personal contact with service providers who had a remit of bridging transitions and ensuring continuity of care between hospital and home (Gardner *et al*. 2019; Harvey *et al*. 2017):

"...they've been exceptional really, because today we went into my house and had a look. A nurse went with me...just to see what I had at home." (Older adult, female) (Harvey *et al*. 2017)

Other tailored strategies included pre-discharge family meetings, home visits, provision of a written discharge summary, and provision of information about onward referrals to community services, which HCPs had actioned (Gardner *et al*. 2019; Westgård *et al*. 2019; Harvey *et al*. 2017).

Conversely, the experience of planning for discharge home was described as an aspect of CGA that was frequently associated with suboptimal communication and unmet needs by older adults and caregivers, with four studies reporting gaps in information provision regarding post discharge care and follow-up (Mäkelä *et al*. 2020; Darby *et al*. 2017; Ribbink *et al*. 2021; Harvey *et al*. 2017). Older adults described the ambiguity around the date of discharge as disruptive in two studies (Ribbink *et al*. 2021; Harvey *et al*. 2017).

"Well the decisions about going home have been very staggered...one day it's you're going home and the next day it's the next day...and all of a sudden now it was Wednesday." (Older adult, male) (Harvey *et al*. 2017)

Older adults and caregivers acknowledged the challenges and time constraints imposed by the inpatient hospital setting, which they recalled, was not conducive to establishing rapport with HCPs and occasionally hindered their ability to engage in discussions regarding their health needs and discharge plan (Gardner *et al*. 2019; Westgård *et al.* 2019). Furthermore, older adults described a sense of feeling disempowered by inpatient hospital processes, which challenged their ability to engage in usual routines and ADLs (Gardner *et al*. 2019; Darby *et al*. 2017):

'When you go into hospital they . . . take the dosette box, and then they won't give me the tablets out of it. And until the doctor prescribes them, you don't get them. I've been awake at 1 o'clock at night, waiting for my tablets.' (Older adult, male) (Gardner *et al*. 2019)

The perception of an imperative to *"empty beds"* was felt by older adults during their period of hospitalisation, which they felt shaped the actions and decision making of HCPs (Mäkelä *et al*. 2020; Gardner et al., 2019).

"*They need to get you out, need the bed, and suddenly you're gone and there's things missing."* (Older adult, male) (Mäkelä *et al*. 2020)

In one study, caregivers recalled a personal responsibility to re-establish links with community services to mitigate against delays in follow-up due to gaps in information provision from hospital staff to community services, after hospital discharge:

"There always seems to be that lapse when people come out, there's no coordination at all of various areas." (Caregiver, male) (Mäkelä *et al*. 2020)

Many caregivers in one study commented on the lack of written summaries provided at hospital discharge, where copies of discharge summaries were provided, they were primarily viewed as communication between HCPs and did not address caregivers needs related to the trajectory of the older adult's health needs (Mäkelä *et al*. 2020).

Older adults perceived they had ongoing health and functional needs following hospital discharge (Ribbink *et al*. 2021; Mäkelä *et al*. 2020; Darby *et al*. 2017; Harvey *et al*. 2017) and they expressed concerns about *"continuing with a pattern of fluctuating symptoms and functional capabilities"* (Mäkelä *et al*. 2020) despite receiving a CGA during their acute hospital admission. They described having unacknowledged concerns about their overall health problems and timing of discharge home (Mäkelä *et al*. 2020; Darby *et al.* 2017), which older adults and caregivers in one study, attributed to subsequent hospital readmission:

"The doctor came round, looked at the chart, and says, 'Well, you can go home now'. I was just amazed. I came home, I couldn't swallow anything. . .The ambulance came out and they took me back." (Older adult, female) (Mäkelä *et al*. 2020)

Line-of-Argument Synthesis

The results of the studies reflect both a reciprocal and refutational synthesis. The incongruities and contradictions outlined in third-order constructs can be explained by the contrasting experiences of CGA across the three stakeholder groups. HCPs, older adults and caregivers' ambitions and values related to CGA often align. All three groups value care continuity, collaboration, and shared decision making. Their experiences of CGA differs, however. HCPs experience CGA as enhancing holistic care, enabling involvement of older adults and caregivers in relational aspects of care and improving care continuity following hospital discharge. Some older adults and caregivers do report positive experiences of CGA; however, the predominant experience is lack of clarity about what CGA is, insufficient involvement in goal setting and care planning, care discontinuity, and unmet healthcare needs following hospital discharge.

4.6 Discussion

The current meta-ethnography has systematically reviewed and synthesised the literature on the experiences of CGA in an inpatient hospital setting from the perspective of HCPs, older adults and those important to them. We identified three key themes: (1) HCPs, older adults, and caregivers report conflicting views on CGA as a holistic assessment process, (2) most HCPs, but only some older adults and caregivers, experience CGA goal setting and care planning as collaborative, and (3) all stakeholders value care continuity during the transition from hospital to home but often fail to achieve it.

While HCPs described a personalised and multidimensional approach to CGA underpinned by collaborative work practices, older adults and caregivers described heterogenous experiences of CGA. Three of the six studies conducted with older adults and caregivers reported a predominant experience of a medically focused assessment, which they broadly equated with diagnostic investigations and monitoring of medical stability (Mäkelä *et al*. 2020; Gardner *et al*. 2019; Darby *et al*. 2017) in contrast to HCP descriptions of a holistic assessment. The disparate descriptions of CGA as a holistic assessment process across stakeholder groups may have been influenced by environmental and time constraints imposed by the acute hospital setting (Mäkelä *et al.* 2020; Gardner *et al*. 2019; Darby *et al*. 2017, Westgård *et al*. 2019;

Harvey *et al*. 2017; Busetto *et al*. 2017). A growing body of primary qualitative research highlights the value of home-based CGA for community-dwelling older adults (Gardner *et al*. 2019; King *et al*. 2018; Stijnen *et al*. 2014; Cravens *et al*. 2005). The home environment in contrast to the hospital setting is described as supporting rapport building between older adults and HCPs and studies have noted that older adults valued the additional time spent by HCPs conducting CGA in the home environment (Stijnen *et al*. 2014; Cravens *et al*. 2005). Although evidence to support the effectiveness of CGA in hospital settings is compelling (Ellis *et al.* 2017), findings from this synthesis suggest further work is needed to ensure a holistic assessment of older adults is realised.

We found that while all stakeholders share similar ambitions and values with respect to relational aspects of CGA, this is not always reflected in older adults or caregivers' experiences and often resulted in lack of understanding around goal setting and coherence in care planning. Findings from our synthesis on lack of older adult and caregiver involvement in goal setting reflects findings of the Cochrane review of 29 randomised trials on the effectiveness of CGA for older adults admitted to hospital, where less than half of the trials reported goal setting with older adults and caregivers as a key intervention component (Ellis *et al.* 2017). Despite innovations in international healthcare systems seeking to expand the application of CGA (Shepperd *et al*. 2022; Dhesi *et al*. 2019; Parker *et al*. 2017), older adults and caregivers' level of participation in the management of acute illness and their interface with HCPs is not always recognised (Bridges *et al*. 2010; Adelman *et al*. 2014). Our findings draw parallels with those outlined in a scoping review of 13 studies, which explored informal caregivers' views on their perceived levels of involvement in collaborative discussions with HCPs (Wittenberg *et al*. 2018). Results found that HCPs do not always explicitly consider their views, roles, and responsibilities when collaborating with them. The process of shared decision making is well established in the literature (Elwyn *et al*. 2017) and facilitates a style of healthcare communication between older adults and HCPs when decisions have to be made regarding desired care and preferred health outcomes (Pel-Little *et al*. 2020). Application of shared decision making to everyday CGA practices and processes ensures older adults' priorities, preferences, and right to self-determination are respected and upheld (Bunn *et al.* 2018).

HCPs outlined processes of care and pathways that aimed to positively influence care continuity during the transition from hospital to home; however, older adults and caregivers' descriptions largely reflected a sense of fragmented care and challenges pertaining to management of fluctuating symptoms and functional abilities following hospital discharge. The vulnerabilities and adverse outcomes older adults are exposed to during points of care transition are well established in the literature (Boye *et al*. 2021; Tomlinson *et al*. 2020; Vaillancourt *et al*. 2017). In keeping with the WHO's vision for integrated care (WHO 2017), CGA in an inpatient hospital setting has the potential to optimise successful transitions of care through enhanced care coordination.

Implications for Research and Clinical Practice

In our meta-ethnography, only two of the six studies that were conducted with older adults included older adults with cognitive impairment (Mäkelä *et al*. 2020; Darby *et al*. 2017). Given that up to 40% of hospitalised older adults have some form of cognitive impairment and they are twice as likely to experience adverse events during hospitalisation such as sepsis, falls, or pressure ulcers (Reynish *et al*. 2017), future primary research studies should include this patient cohort to ensure their experiences of acute care and specific needs are sufficiently understood and met. A recent qualitative study of 18 families representing seven older adults with cognitive impairment and 20 family members, reported a diverse range of acute care experiences that vacillated between supportive and unsupportive hospital infrastructure and resources, comprehensive and fragmented integration of care processes, as well as variable levels of person- and family-centredness (Petry *et al*. 2019). These findings corroborate the need for a deeper understanding of acute care processes from the perspective of older adults with cognitive impairment and their caregivers.

Findings outlined in our meta-ethnography elucidate the divergent accounts and experiences of inpatient CGA across the three stakeholder groups, which have implications for understanding the scope of CGA as well as system-wide innovations that translate evidence into practice. These divergent findings should act as a prompt for researchers to explore engagement in structured or unstructured observation of inpatient CGA practices and processes as an adjunctive qualitative research method (Pretzlik 1994) when carrying out prospective qualitative research on the subject area. By documenting fieldwork notes on commonplace practices through observations, researchers gain greater insight into the influence of the physical environment (Mulhall 2003), which may augment or contextualise data collected through interview methods.

CGA is considered a person-centred process and is both therapeutic and diagnostic (Rubenstein *et al*. 1991); therefore, HCPs should focus on outcomes that older adults consider meaningful (Drouin *et al*. 2015). Application of the standard set of outcome measures developed and recommended by the International Consortium for Health Outcomes Measurement (Akpan *et al.* 2018) for older adults may assist HCPs in aligning assessment and intervention practices with older adults' needs and preferences, thereby ensuring CGA remains person-centred. Furthermore, effective communication is bidirectional between older adults and HCPs; if either the older adult or HCP is unclear about the information conveyed, the quality of the care delivered is undermined (Ratna 2019). By better understanding older adults' preferences and perspectives regarding how their clinicians communicate and share information with them, HCPs can continue to improve their communication with their patients and those important to them (Allen *et al*. 2023).

Strengths and Limitations

To the best of our knowledge, the current meta-ethnography represents the first systematic review and qualitative synthesis of the existing literature focused on multiple stakeholder experiences of CGA in an inpatient hospital setting. The synthesis was methodologically robust and adhered to the 19 criteria outlined in the eMERGe meta-ethnography reporting guidance (France *et al*. 2019). Meta-ethnography, by design, is predicated on interpretative analysis rather than aggregative description of included studies; therefore, other researchers may have drawn different conclusions from the data. However, to add scientific rigor to the process of derivation of third-order constructs, two reviewers (ÍO'S and KR) engaged with the primary studies included in the synthesis over a prolonged period of time. Furthermore, a numerical approach was applied to the analytic process whereby the number of studies contributing to each third-order construct was noted. Constructs were illustrated through use of quotations, which reflected both the reciprocal and refutational translation of studies (Atkins *et al*. 2008). Comparable and conflicting accounts of reported experiences across stakeholder groups and studies were explored throughout, which is a key strength of meta-ethnographic synthesis (Sattar *et al*. 2021).

However, our synthesis is not without limitations. We limited our inclusion criteria to English language studies only; therefore, additional published studies where English was not the chosen language may exist. All included studies were conducted in high income countries (worldbank.org), which may limit generalisability to other international healthcare systems. Given that only 11 primary studies, reporting the experiences of 301 participants, across three stakeholder groups were included, underdeveloped theories and/or concepts may have been a feature during phase six, 'synthesising translations'. However, there is currently no consensus on what constitutes too few or too many studies in a meta-ethnographic synthesis (Campbell *et al*. 2011).

4.7 Conclusion

This meta-ethnography synthesised the experiences of CGA in an inpatient hospital setting from the perspective of HCPs, older adults and those important to them. While HCPs, older adults, and caregivers' values and ambitions related to CGA broadly align, their experiences often differ. The identified themes highlight organisational and relational dimensions of care, which positively and negatively influence CGA practices and processes. Findings underscore the importance of involving older adults and those important to them as partners across the continuum of care.

Ethics

Ethics approval was not required for this review.

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Conflicts of interest

None to declare

4.8 References

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Chapter 5: Comprehensive Geriatric Assessment in the Emergency Department: A Protocol for a Prospective Cohort Study

Status: Published *HRB Open Research* 2022

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Citation: O'Shaughnessy, Í., Robinson, K., O'Connor, M., Conneely, M., Steed, F., Ryan, D., Carey, L., Shchetkovsky, D., Shanahan, E., Leahy, A. Quinn, C., Sheikhi, A., and Galvin, R. (2022) 'Comprehensive geriatric assessment in the emergency department: a protocol for a prospective cohort study', *HRB Open Research*, 5.

5.1 Candidate's Contribution: The candidate was lead author on this protocol and was responsible for conceptualisation of the study, development and design of methodology, facilitation of regular study planning meetings, submission of research ethics, registration of the study on clinicaltrials.gov, writing the initial draft of the manuscript, and management of journal submission and revisions.

5.2 Abstract

Background: CGA has been shown to improve outcomes in hospitalised older adults; however, there is currently no compelling evidence to support CGA interventions within the ED. The aim of this study is to explore the clinical and process outcomes of older adults who receive ED-CGA over a period of six months after their initial ED attendance.

Design: Prospective cohort study.

Methods: The STrengthening the Reporting of the OBservational studies in Epidemiology standardised reporting guidelines will be adhered to. Older adults aged ≥65 years who score ≥2 on the Identification of Seniors at Risk tool and present to the ED with a medical complaint during the operational hours of a dedicated interdisciplinary team, will be considered eligible for recruitment. Demographic and health assessment information will be obtained at the ED index attendance followed by completion of an interdisciplinary CGA. A dedicated research nurse will complete follow-up telephone interviews with participants at 30 days and six months. The primary outcome will be incidence of hospital admission from the ED index attendance. Secondary outcomes will include functional decline, patient satisfaction with the ED index attendance, health related QoL, unscheduled ED re-attendance(s), unscheduled hospital (re)admission(s), NH admission(s), healthcare utilisation, and death. Descriptive statistics will be used to profile the characteristics of the study participants and multivariate logistic and linear regression analysis will be used to analyse risk of adverse outcomes.

Ethics and Dissemination: Ethical approval was granted by the Research Ethics Committee, Quality and Safety Department, University of Limerick Hospital Group (107/2021). The authors will disseminate study findings through publication in a peer-reviewed journal and presentation at national and international conferences. PPI will be sought from a panel of older adults at the Ageing Research Centre in the University of Limerick.

Clinicaltrials.gov Identifier: NCT05252182.

5.3 Background

The significant growth in ED attendances is a growing public health issue (Morley *et al.* 2018), with attendances by older adults accelerating exponentially, beyond that due to population ageing alone (Lowthian *et al.* 2015). The most obvious causative factor for older adults increased aggregate demand for healthcare, specifically ED usage, is the clinical condition of frailty (Clegg *et al.* 2013). The presence of diminished homeostatic reserves leaves older adults more susceptible to acute exacerbations of comorbid and long-term conditions, which result in a concomitant increased demand for emergency and urgent care services (Vermeiren *et al.* 2016). There is unequivocal agreement within the literature that the ED is a challenging environment to deliver effective care to older adults living with frailty (Baum and Rubenstein 1987). The complexity underlying the nature of their presenting complaint, which is often non-specific in nature may complicate ED care (Salvi *et al.* 2007) and investment in additional time and resources is frequently indicated to deliver a holistic assessment across multiple domains (Limpawattana *et al.* 2016). This can be challenging in the context of ED time-based targets, which have historically been designed for persons with single system illnesses and robust social networks (Hommick *et al.*, 2016). Emergency medicine (EM) staff training has predominantly focused on clinically urgent and diagnostic specific complaints, thus creating a mismatch between the ED response and the changing demographic that they are increasingly facing (Conroy and Turpin 2016).

An ED attendance is often considered a sentinel event for an older adult (Sanders *et al.* 1996), with associated functional decline, increased risk of unplanned 30-day ED re-attendance, and mortality well documented (Shen *et al.* 2018; Nagurney *et al.* 2017; Lowthian *et al.* 2016). Conversely, it affords clinicians an opportunity to stratify a high-risk cohort followed by delivery of a holistic and bio-psychosocial intervention to mitigate against suboptimal clinical and process outcomes. These interventions include, but are not limited to, interface geriatrics and CGA (Conroy *et al.* 2011), health and social care professionals (HSCP) (Cassarino *et al.* 2019) and/or nursing interventions (Heeren *et al*. 2019), ED case management and post-discharge services referrals/liaison (Lowthian *et al.* 2015). CGA is considered more effective than usual care in improving a range of outcomes for hospitalised older adults living with frailty (Ellis *et al.* 2017). Evidence exists to support the feasibility of embedding CGA within the ED (Conroy *et al.* 2014) and an interdisciplinary model of care whereby clinicians integrate geriatric competencies into their practice has been recommended to meet the emergency needs of this patient population (Conroy and Turpin 2016).

Despite this recommendation, there is no robust high-quality evidence that ED-CGAs are effective at improving clinical and process outcomes. Conroy *et al.* (2011) conducted a systematic review and meta-analysis of five RCTs, which evaluated the role of CGA in older adults being rapidly discharged from the ED or Acute Medical Unit. They found no compelling evidence to support implementation of CGA interventions in this patient cohort in terms of mortality (RR 0.92, 95% CI 0.55 to 1.52), hospital re-admissions (RR 0.95, 95% CI 0.83 to 1.08), institutionalisation, functional status, QoL, or cognition. More recently, Harding (2020) provided an overview of five studies that measured the impact of ED-CGAs on secondary healthcare utilisation, specifically 30-day ED re-attendance and hospital admission. Two RCTs, one case matched cohort study, and two quasi-experimental pre and post intervention studies were reviewed. No definitive evidence was found to support the hypothesis that ED-CGAs can reduce ED re-attendance or hospital admission 30 days post index attendance. We propose to explore the clinical and process outcomes of older adults who receive an interdisciplinary ED-CGA over a period of six months after their initial ED attendance through the conduct of a prospective cohort study.

5.4 Methods

Study Design and Setting

The STrengthening the Reporting of the OBservational studies in Epidemiology (STROBE) standardised reporting guidelines will be followed in the conduct and reporting of this prospective cohort study (Von Elm *et al.* 2007). Participant data collection and follow-up will take place between February 2022 to January 2023 (inclusive).

The study setting will be the ED of University Hospital Limerick (UHL), which is a university teaching hospital with a large catchment area in the mid-west of the Republic of Ireland. UHL is the central hub for a larger hospital group with six hospital sites, all functioning as a single hospital system caring for a substantially rural population of approximately 470,000. The university teaching hospital is the only hospital in the group that has a 24/7/365 emergency care and critical care service and has 487 inpatient beds. 76,667 ED attendances were recorded in 2021 of which 19,901 were older adults aged ≥ 65 years.

Population of Interest

Older adults aged ≥ 65 years who present to the ED of UHL (Monday–Friday, 08:00–17:00) between February 2022 and July 2022 will be deemed eligible for recruitment provided they meet the following criteria:

Inclusion Criteria

We will include older adults aged ≥ 65 years who have a Manchester Triage System (MTS) category of 2–5 (Mackway-Jones 1997) and are presenting with a medical complaint. Eligible participants will be identified by a member of the interdisciplinary ED-CGA team and must screen positive for risk of adverse outcomes on the Identification of Seniors at Risk (ISAR) tool. The ISAR is composed of six simple yes/no items; a score of ≥ 2 indicates that the older adult is at increased risk of adverse outcome following ED index presentation (McCusker *et al.* 1999).

Exclusion Criteria

Exclusions to recruitment will apply where older adults are deemed not to have decision-making capacity to provide informed consent or if attendance to the ED is outside of the operational working hours of the interdisciplinary ED-CGA team. Those presenting with acute cardiac and/or neurological pathology, injuries requiring surgical intervention, or high illness acuity, which necessitates treatment in the resuscitation room throughout their ED attendance, will be excluded.

Recruitment and Data Collection

ED Index Attendance

A research nurse or clinical member of the interdisciplinary ED-CGA team will provide prospective participants with an information leaflet and explain the objective of the study. If the participant agrees to take part, he/she will be asked to read and sign a consent form. After consenting to recruitment, each participant will undergo a baseline assessment inclusive of a demographic questionnaire and a health assessment. Demographic information will include participant's gender, age, marital status, residential status (living alone, living with others, NH resident, other), ethnicity, socioeconomic status (level of education, past/present occupation), mode of arrival to the ED (private transport, ambulance, public transport, other), source of referral (self-referral, general practitioner (GP), out of hours GP, injury unit, NH, etc), index complaint, and triage category as per the MTS (Mackway-Jones 1997). The health assessment will comprise of the following measurements: the 21-item Charlson Comorbidity Index (CCI) score (Charlson *et al.* 1994) to profile baseline comorbidities; a list of prescribed medications;

frailty identification and risk stratification through Rockwood's Clinical Frailty Scale (CFS) (Rockwood and Theou 2020); a global measure of functional ability through the self-rated BI (Mahoney and Barthel 1965); delirium and cognitive screening through the 4AT (Bellelli *et al.* 2014); health related QoL through the EuroQoL survey 5-dimension and 5-levels form (EQ-5D-5L) (Rabin and de Charro 2001); and nutritional status through the Malnutrition University Screening Tool (Elia and Russell 2009).

Following baseline assessment, participants will undergo an interdisciplinary CGA across multiple domains including, medical, functional, cognitive, and psychosocial abilities (Rubenstein *et al.* 1991). The interdisciplinary team will comprise a registrar in geriatric medicine, specialist geriatric nurse, senior occupational therapist, senior physiotherapist, and senior medical social worker with dual governance from consultants in EM and geriatric medicine. Interventions delivered by the interdisciplinary team will include but not limited to, medical assessment, diagnostics and treatment, patient and family education on the outcome of the CGA and ED discharge plan, a review of diagnoses, medication reconciliation, prescription of enabling equipment to compensate for unresolved functional deficits, provision of home exercise/activity programmes and patient, and family education on self-management strategies, as appropriate. Members of the team will be guided by their clinical expertise and competencies, scope, and codes of professional practice. Individualised care planning and referrals to out-of-hospital pathways, as appropriate will be the forefront of the teams' practice. Where older adults are referred to specialist geriatric ambulatory care hubs, the focus will be on completing the priority domains and components of CGA in the ED with timely completion of the assessment in its entirety in the specialist hubs, within seven days of referral.

Follow-up Assessment

The research nurse will complete follow-up telephone interviews with participants at 30 days and six months. He/she will complete the 18-item Patient Satisfaction Questionnaire (PSQ-18) (Marshall and Hays 1994) at 30-day follow-up to explore participants' satisfaction with their ED attendance. The BI (Mahoney and Barthel 1965) and EQ-5D-5L (Rabin and de Charro 2001) will be completed with participants in addition to a questionnaire, which will look specifically at capturing healthcare utilisation e.g., geriatric ambulatory care services, GP visits, public health nurse visits, home care support, outpatient clinic attendance, HSCP input etc. The questionnaire will follow the same structure and outline as the prospective cohort study conducted by Leahy *et al*. (2020). Data on objective measures such as unscheduled ED re-attendance, hospital (re)admission(s), NH admission, and death will be ascertained from routine hospital data. Withdrawals and participants lost to follow-up will be recorded.

Outcome Variables

The primary outcome measure will be incidence of hospital admission from the index ED attendance. Secondary outcomes include functional decline (including functional decline at discharge among the admitted cohort), patient satisfaction with the index ED attendance, health-related QoL, incidence of unscheduled ED re-attendance(s), unscheduled hospital (re)admission(s), NH admission(s), healthcare utilisation, and death within 30 days and six months of the ED index attendance.

Sample Size

All prospective participants that meet inclusion criteria will be invited to participate. The primary outcome of this study is the incidence of admission post exposure to the interdisciplinary ED-CGA team. In order to detect a reduction in the admission rate of at least 25%, at 5% level of significance and with 80% power, we would require 128 participants.

Statistical Analyses

Pseudonymised data will be stored on an encrypted and password protected electronic data capture system (CASTOR). Members of the research team who have responsibility for entering pseudonymised participant data, will have their own unique log in and password for the system. Hard copies of baseline and follow-up questionnaires and consent forms will be stored in a locked cabinet in an office with restricted access.

Descriptive statistics will be used to profile the baseline characteristics of the cohort. Categorical measures (e.g., residential status) will be analysed in terms of frequencies and percentages; continuous measures (e.g., BI) will be analysed in terms of mean and SD for normally distributed data; and median and IQR for non-parametric data. Multivariate logistic and linear regression analysis will be used to analyse risk of adverse outcomes and we will report adjusted RRs or beta coefficients with 95% CIs. Anonymised data generated will be published in an open access repository with an associated data dictionary.

Study Status

Data collection and follow-up is ongoing. Study completion is expected in January 2023.

5.5 Discussion

EDs worldwide are challenged by an exponential growth in attendances, many of whom are older adults living with frailty who have higher burdens of chronic diseases and multiple comorbidities. It is clear that older adults' distinctive and multifactorial care needs are not suited to an episodic healthcare system designed around a single system illness. Health services and models of care must be adapted to meet the needs of an ageing international demographic. Further high-quality evidence is required to support the implementation of cost-effective and holistic models of care that are responsive to the needs and preferences of older adults within the ED.

This study will adopt a longitudinal approach to exploring older adults' outcomes following ED attendance, which will have relevance for clinicians, policymakers, and funders. Consideration of patient care as a continuum, rather than discrete encounters, has the potential to lead to identification of effective collaborative strategies and thus an integrated approach to care. The outcome variables included in the study will include a range of clinical, patient-reported, and process outcomes. Inclusion of PROMs will assist clinicians in re-focusing care on older adults' priorities and preferences.

Ethics and Dissemination

Ethics approval for the study was granted by the Research Ethics Committee, Quality and Safety Department, University of Limerick Hospital Group (Ref: 107/2021). In accordance with the Data Protection Act 2018 (Section 36(2)) written informed consent will be obtained from eligible participants (Appendix 10 and 11).

The authors will disseminate study findings through publication in a peer-reviewed journal and presentation at national and international conferences. A lay summary of findings will be presented to the PPI panel of older adults that has been established at the Ageing Research Centre in the University of Limerick (Conneely *et al.* 2020). The focus of this session will be to discuss the findings with this group so that the discussion section of the paper can integrate their views and opinions.

Data Availability

No data are associated with this article.

Funding

This research is funded through the Health Research Board of Ireland (Health Research Board, Grattan House 67-72 Lower Mount Street, Dublin 2, D02 H638 under the HRB Research Leader Award RL-2020-010). The funder had no role in this study.

Conflicts of Interest

None to declare

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Chapter 6: Comprehensive Geriatric Assessment in the Emergency Department: A Prospective Cohort Study of Process, Clinical, and Patient-Reported Outcomes

Status: In Press *Clinical Interventions in Aging,* December 2023

Authors: Ms Íde O'Shaughnessy, Prof Katie Robinson, Dr Aoife Whiston, Ms Louise Barry, Ms Gillian Corey, Ms Collette Devlin, Ms Deirdre Hartigan, Ms Aoife Synnott, Ms Aoife McCarthy, Dr Eoin Moriarty, Mr Bryan Jones, Ms Ida Carroll, Prof Margaret O'Connor, Dr Mairéad Conneely, Ms Fiona Steed, Ms Leonora Carey, Dr Denys Shchetkovsky, Dr Elaine Shanahan, Dr Aoife Leahy, Dr Colin Quinn, Dr Damien Ryan, Prof Rose Galvin.

6.1 Candidate's Contribution: The candidate was lead author on this prospective cohort study and was responsible for conceptualisation of the study, development and design of methodology, project administration, data curation, analysis, visualisation and presentation, PPI collaboration, and updated clinicaltrials.gov upon completion of the study. The candidate led on development and refinement of manuscript drafts, management of journal submission, and dissemination of the work at national conferences.

6.2 Abstract

Background: This study aimed to explore the process, clinical, and patient-reported outcomes of older adults who receive an interdisciplinary CGA in the ED over a period of six months after their initial ED attendance.

Methods: A prospective cohort study of older adults aged ≥ 65 years who presented to the ED of a university teaching hospital in the mid-west region of Ireland. Baseline assessment data comprising of a battery of demographic variables and validated indices were obtained at the index ED attendance. Telephone interviews were completed with participants at 30- and 180-day follow-up. The primary outcome was incidence of hospital admission following the index ED attendance. Secondary outcomes included participant satisfaction with index attendance, incidence of functional decline, health related QoL, incidence of unscheduled ED re-attendance(s), unscheduled hospital (re)admission(s), NH admission, and death.

Results: A total of 133 participants (mean age 82.43 years, SD = 6.89 years; 71.4% female) were recruited; 21.8 % of the cohort were admitted to hospital following the index ED attendance with a significant decline in function reported at hospital discharge ($Z = 2.97$, $p = 0.003$). Incidence of 30- and 180-day unscheduled ED reattendance was 10.5% and 24.8%, respectively. The outcome at the index ED attendance was a significant predictor of adverse outcomes whereby those who were discharged home had significantly lower odds of multiple adverse process outcomes at 30- and 180-day follow-up, and significantly higher function and health-related quality of life at 30-day follow-up.

Conclusion: While this study was observational, findings suggest CGA in the ED may improve outcomes by mitigating against the adverse effects of potentially avoidable hospital admissions and focusing on a longitudinal approach to healthcare delivery at the primary-secondary care interface. Future research should be underpinned by an experimental study design to address key limitations in this study.

6.3 Background

Older adults are the most frequent users of emergency care, accounting for up to 25% of all international ED attendances (Ukkonen *et al*. 2019; Samaras *et al*. 2010). This demographic shift in healthcare utilisation, specifically ED usage, is one factor contributing to the growing problem of ED crowding (Morley *et al*. 2018). An ageing population are vulnerable to an increasing accumulation of health deficits (Salisbury 2012; Rockwood *et al*. 2005) giving rise to the clinical condition of frailty (Clegg *et al*. 2013). Caring for older adults living with frailty presenting to the ED is increasingly recognised as a global public health concern (Adja *et al*. 2020) and was outlined as a top research priority by the Royal College of Emergency Medicine in a recent Priority Setting Partnership with the James Lind Alliance (Cottey *et al*. 2023).

Compared to younger patients, older adults living with frailty presenting to the ED experience longer ED stays (Brouns *et al.* 2015) and demonstrate higher rates of adverse outcomes such as functional decline (Nagurney *et al.* 2017), unplanned 30-day ED re-attendance (Lowthian *et al.* 2015), and inpatient mortality (Khandelwal *et al*. 2012). Application of frailty screening in the ED enables risk stratification of older adults who would benefit from specialist geriatric assessment and intervention to mitigate against suboptimal clinical and process outcomes (Brousseau *et al.* 2018). While a plethora of international evidence exists to support the diagnostic and predictive accuracy of a number of frailty screening tools in the ED (Leahy *et al*. 2023; O'Caoimh *et al*. 2022; Jørgensen and Brabrand 2017; Galvin *et al.* 2017), no individual screening tool is recommended by experts (Apóstolo *et al.* 2017). In essence, frailty identification and stratification in the ED via the use of any tool should serve as a trigger for commencement of CGA.

CGA is defined as a "*multidimensional diagnostic and therapeutic process focussed on determining a frail older person's medical, psychological and functional capability in order to develop a coordinated and integrated plan for treatment and follow-up"* (Rubenstein *et al.*

1991, p.9S). CGA is a resource-intensive and evidence-based intervention, which proactively identifies complex and multifactorial needs in older adults with the overall aim of restoring independence and improving QoL (Parker *et al.* 2018). Existing systematic reviews and meta-analyses provide compelling evidence that inpatient CGA is more effective than 'usual care' in improving a range of outcomes for hospitalised older adults living with frailty (Ellis *et al.* 2017; O'Shaughnessy *et al.* 2022; Van Craen *et al*. 2010; Stuck *et al.* 1993; Rubenstein *et al.* 1991). However, despite serving as the main portal of entry to inpatient care, limited high quality evidence exists to support the effectiveness of CGA in the ED (Conroy *et al.* 2011; Harding 2020). Conroy *et al.* (2011) conducted a systematic review and meta-analysis of five RCT, which evaluated the effectiveness of CGA interventions for older adults living with frailty being rapidly discharged from the ED or Acute Medical Unit. They found no compelling evidence that CGA in this setting had any effect on mortality, institutionalisation, hospital re-admissions, functional status, QoL, or cognition. However, there was significant variation in the content of the CGA delivered across the trials. Similarly, Harding (2020) provided an overview of five studies, which measured the impact of CGA in the ED on subsequent secondary healthcare utilisation post index ED attendance. No definitive evidence was found that CGA in the ED reduced re-attendances or admissions 30 days post-discharge. Both reviews highlighted the methodological limitations and clinical heterogeneity of included studies and recommended completion of future high-quality research that adopts a longitudinal approach to follow-up at the acute-community interface as well as standardisation of outcome measures.

Given the growing challenge of reducing adverse outcomes for older adults living with frailty following an ED attendance and the ambiguity about the content and effectiveness of CGA for this patient population in this setting, further research is warranted. To inform the design of future robust trials of CGA in this setting, we conducted a prospective cohort study aimed at exploring the process, clinical, and patient-reported outcomes of older adults who received CGA in the ED of a university teaching hospital in Ireland over a period of six months after their initial ED attendance.

6.4 Methods

Study Design and Setting

The prospective cohort study was conducted and reported in accordance with The STROBE guidelines (von Elm *et al.* 2007) with a completed checklist outlined in Appendix 12. The study protocol was registered on Clinicaltrials.gov (NCT05252182) and was published elsewhere (O'Shaughnessy *et al.* 2022). Study participants were recruited from the ED of UHL, which is a university teaching hospital with a large catchment area in the mid-west of the Republic of Ireland. UHL is the central hub for a larger hospital group with six hospital sites, all functioning as a single hospital system caring for a substantially rural population of approximately 470,000. The university teaching hospital is the only hospital in the group that has a 24/7/365 emergency care and critical care service and has 487 inpatient beds. In 2022, 79,892 ED attendances were recorded of which 20,526 were older adults aged ≥ 65 years.

Participants and Data Collection

Recruitment

Participants were recruited between February–July 2022 and were eligible for participation in the study if they were aged ≥65 years, had an MTS category of 2–5 (Mackway-Jones 1997), presented to the ED with a medical complaint between the hours of 08:00–17:00, Monday–Friday, and scored ≥2 on the ISAR tool (McCusker *et al.* 1999). Consecutive participants were identified through the ED triage system by a member of a dedicated interdisciplinary team. In accordance with the Data Protection Act 2018 (Section 36(2)) (Health Research Board 2018), all participants signed informed consent forms and received both written and verbal information about the study prior to recruitment.

Older adults who presented with acute cardiac and/or neurological pathology, injuries requiring surgical intervention, or high illness acuity, which necessitated treatment in the resuscitation room throughout their ED attendance, were excluded from recruitment.

Baseline Data Collection

Each participant underwent a baseline assessment, which comprised a battery of demographic variables and validated indices. Demographic information included participant's gender, age, marital status, residential status, ethnicity, socioeconomic status, source of referral, mode of arrival to the ED, index complaint, and triage category as per the MTS (Mackway-Jones 1997). The health assessment comprised the following measurements: the 21-item CCI score (Charlson *et al.* 1994) to profile baseline comorbidities; a list of prescribed medications; frailty identification and risk stratification through Rockwood's CFS (Rockwood and Theou. 2020); the ISAR tool (McCusker *et al*. 1999); a global measure of functional ability through the self-rated BI for ADL (Wade and Collin 1988); delirium and cognitive screening through the 4AT (Bellelli *et al*. 2014); and health-related QoL through the EQ-5D-5L (Rabin and de Charro 2001).

Exposure

Study participants received an interdisciplinary CGA, which focused on determining an older adult's medical, psychosocial, and functional capabilities and limitations with the view to developing a holistic treatment plan (Rubenstein *et al.* 1991). The interdisciplinary team comprised a registrar in geriatric medicine, specialist geriatric nurse, senior occupational therapist, senior physiotherapist, and senior medical social worker with dual governance from consultants in EM and geriatric medicine. Interventions delivered by the interdisciplinary team included but were not limited to, medical assessment, diagnostics and treatment, provision of information to older adults and those important to them on the outcome of CGA and ED discharge plan, completion of timely handover to community-based or inpatient services following ED discharge, medication reconciliation, prescription of enabling equipment to compensate for unresolved functional or mobility deficits, provision of home exercise/activity programmes, and patient and family education on self-management strategies, as appropriate. Individualised care planning and referrals to out-of-hospital pathways, as appropriate were at the forefront of the teams' practice, which aimed to promote an integrated and longitudinal approach to care. In keeping with the elements of CGA reported by Ellis *et al.* in the 2017 Cochrane review, the core team and components are outlined in greater detail in Appendix 13.

Follow-up Data Collection and Outcome Variables

A research nurse completed follow-up telephone interviews with participants at 30 days and six months after their index ED attendance. The primary outcome of interest was incidence of hospital admission following the index ED attendance. Secondary outcomes included participant satisfaction with the index ED attendance, incidence of functional decline (including functional decline at hospital discharge among the admitted cohort), health related QoL, incidence of unscheduled ED re-attendance(s), unscheduled hospital (re)admission(s), NH admission, healthcare utilisation, and death within 30 days and six months of the index ED attendance.

Satisfaction with the index ED attendance was assessed via the PSQ-18 (Marshall and Hays 1994), which was completed with participants at 30-day telephone follow-up by the research nurse. Functional decline was assessed via the BI (Wade and Collin 1988) at hospital discharge for those admitted following the index ED attendance and at 30- and 180-day telephone follow-up. Health-related QoL was assessed via the EQ-5D-5L (Rabin and de Charro 2001) at 30- and 180-day telephone follow-up. Healthcare utilisation (e.g., specialist geriatric ambulatory care services, GP, public health nurse, home care support, HSCP input, NH admission etc.) was assessed via a structured questionnaire at 30- and 180-day telephone follow up. Data on objective measures such as unscheduled ED re-attendance, hospital (re)admission(s) etc were gleaned from routine hospital data.

Statistical Analyses

Sample size calculation was based on a review of the international literature coupled with local metrics where the primary outcome of incidence of hospital admission was estimated to be in the region of 55% (Cassarino *et al*. 2021; Kennelly *et al*. 2014). We calculated our sample size a priori based on a predicted reduction of at least 25% in admission rate post exposure to the interdisciplinary team in the ED (O'Shaughnessy *et al*. 2022). It was determined that a sample size of at least 128 participants was required to detect this reduction, at 5% level of significance and with 80% power.

Descriptive statistics were used to profile the baseline characteristics of the total cohort split by outcome at index ED attendance i.e., admission, discharge home, transitional care, and inpatient rehabilitation. Categorical measures e.g., marital status was analysed in terms of frequencies and percentages; continuous measures e.g., BI, were analysed in terms of means and SD; median and IQR for continuous measures, which showed evidence of skewness e.g., ED length of stay. Separate multivariate logistic regressions were conducted where sufficient counts of incidence (≥10) were available to explore predictors of adverse outcomes at 30- and 180-days e.g., unscheduled ED re-attendance, hospital admission, and NH admission. Based on previous literature, age, gender, polypharmacy, and frailty (CFS) were the predictors explored using the enter method (O'Shaughnessy *et al*. 2021). A subsequent set of multivariate logistic regression models were then estimated to explore if outcomes at the index ED attendance – hospital admission versus discharge home, predicted aforementioned adverse outcomes at 30- and 180-days controlling for any significant predictors identified from the first set of logistic regression models. For all logistic regression models, ORs with 95% CIs were reported. Independent Samples T-Test and where necessary their non-parametric equivalent, Mann-Whitney U tests, were conducted to explore differences in PSQ-18, BI, EQ-5D-5L index value, and EQ Visual Analogue Scale (VAS) scores across admitted versus discharged home participants within various time-points. The PSQ-18 comprises seven subscales: general satisfaction, technical quality, interpersonal manner, communication, financial aspects, time spent with doctor, and accessibility and convenience. The sum score of all subscales ranges from 18 to 90 with higher scores indicating higher levels of satisfaction (Marshall and Hays 1994). The BI measures performance across 10 ADLs using an ordinal scale, which ranges from 20 to 0 in 1-point increments with higher scores indicating greater functional independence (Wade and Collin 1988). The EQ-5D-5L comprises five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each dimension has 5 levels: no problems, slight problems, moderate problems, severe problems, and extreme problems (Rabin and de Charro 2001). EQ-5D-5L data were converted to an index value using utility values for health states in Ireland (Hobbins *et al.* 2018). Health state index scores generally range from less than 0 (where 0 is the value of a health state equivalent to dead) to 1 (the value of full health), with higher scores indicating higher health utility. Additionally, the EQ VAS records the patient's self-rated health on a vertical VAS ranging from 100 to 0, where the endpoints are labelled 'The best health you can imagine' and 'The worst health you can imagine'. All analyses were computed with JASP statistical software.

6.5 Results

A total of 133 participants were recruited over a 6-month period. Table 6.1 illustrates participants' baseline characteristics including demographic and health measurements for the overall sample and by group based on outcome post index ED attendance i.e., inpatient admission, discharge home, transfer to transitional care (NH facility for a period of convalescence), and transfer to an inpatient rehabilitation facility.

The mean age of participants was 82.43 years (SD = 6.89 years) with females representing 71.43% of the total cohort. Almost three quarters of participants self-referred to the ED (72.18%) and 68.42% were conveyed via ambulance. The mean BI score was 15.87 (SD = 3.43) and 83.33% of participants experienced at least one fall in the 3-month period preceding their index ED attendance. The mean number of prescribed medications was 8.16 (SD = 3.58). In terms of frailty and risk stratification, participants had a median CFS score of 5.00 (IQR = 1.00) i.e., living with mild frailty and a median ISAR score of 2.00 (IQR = 1.00).

Outcomes at Index ED Attendance

At the index ED attendance, data pertaining to the number of prescribed medications were unavailable for 20 participants, CCI score for two participants, and EQ-5D dimensions for three participants. A total of 11 participants did not complete the satisfaction questionnaire (n = 1 lost to follow-up and n = 10 declined completion of the measure in its entirety).

In terms of the primary outcome of interest, 21.8 % (n = 29) of participants were admitted to hospital following the index ED attendance. There were no significant differences in PSQ-18 scores comparing the admission (M = 49.50, SD = 3.73) versus discharge (M = 50.15, SD = 4.29) cohort (U = 1026.00, p = 0.583). A significant difference in BI (U = 806.50, p = 0.001), EQ-5D-5L index value (U = 784.00, p < 0.001), and EQ VAS (U = 894.50, p = 0.014) scores was observed comparing the admission (M_{BI} = 13.93, SD_{BI} = 4.04; $M_{EQ\text{-}5D\ index}$ = 0.479, $SD_{EQ\text{-}}$

$_{5D\ index}$ = 0.330; $M_{ED\ VAS}$ = 53.93, $SD_{ED\ VAS}$ = 19.02) versus discharge (M_{BI} = 16.65, SD_{BI} = 2.90; $M_{EQ\text{-}5D\ index}$ = 0.698, $SD_{EQ\text{-}5D\ index}$ = 0.162; $M_{ED\ VAS}$ = 63.37, $SD_{ED\ VAS}$ = 12.56) cohort at index.

Functional Decline at Hospital Discharge

There was a significant decline in function as measured by the BI for participants admitted to hospital following the index ED attendance to their eventual discharge (Z = 2.97, p = 0.003) (Figure 6.1). Participants had a median length of hospital stay of 14 days (IQR = 15) days with 62% experiencing functional decline.

Table 6.1. Baseline characteristics and outcomes post index ED attendance

		Total (N=133)	Admission (N=29)	Discharged home* (N = 94)	Transitional care (N = 7)	Inpatient rehabilitation (N = 3)
Age, mean ± SD		82.43 (6.89)	81.51 (8.15)	82.51 (6.58)	83.57 (6.95)	86.33 (2.08)
Female, n (%)		95 (71.43)	22 (75.86)	64 (68.09)	7 (100)	2 (66.67)
Marital status, n (%)						
	Married	37 (27.82)	7 (24.14)	29 (30.85)	0 (0)	1 (33.33)
	Widowed	67 (50.38)	10 (34.48)	50 (53.19)	5 (71.43)	2 (66.67)
	Single	24 (18.05)	10 (34.48)	12 (12.77)	2 (28.57)	0 (0)
	Separated	5 (3.76)	2 (6.89)	3 (3.19)	0 (0)	0 (0)
Ethnicity, n (%)						
	White Irish	128 (96.24)	29 (100)	89 (94.68)	7 (100)	3 (100)
	Other White	3 (2.26)	0 (0)	3 (3.19)	0 (0)	0 (0)
	Asian	2 (1.15)	0 (0)	2 (2.13)	0 (0)	0 (0)
Residential status, n (%)						
	Family	61 (45.86)	10 (34.48)	48 (51.06)	1 (14.29)	2 (66.67)
	Alone	67 (50.38)	16 (55.17)	44 (46.81)	6 (85.71)	1 (33.33)
	Other**	5 (3.76)	3 (10.34)	2 (2.13)	0 (0.00)	0 (0.00)
Educational level, n (%)						
	Primary	40 (30.53)	8 (27.59)	32 (34.78)	0 (0.00)	0 (0.00)
	Secondary	64 (48.85)	14 (48.28)	42 (45.65)	6 (85.71)	2 (66.67)
	Third level	24 (18.32)	7 (24.14)	16 (17.39)	1 (14.29)	0 (0.00)
	Post-graduate	3 (2.29)	0 (0.00)	2 (2.17)	0 (0.00)	1 (33.33)
History of falls in past 3 months						
	Yes, n (%)	110 (83.33)	22 (75.86)	79 (84.04)	7 (100)	2 (66.67)
Source of referral, n (%)						
	Self	96 (72.18)	23 (79.31)	63 (67.02)	7 (100)	3 (100)
	GP	27 (20.30)	3 (10.34)	24 (25.53)	0 (0.00)	0 (0.00)
	OOH GP	6 (4.51)	3 (10.34)	3 (3.19)	0 (0.00)	0 (0.00)
	Injury Unit	3 (2.26)	0 (0.00)	3 (3.19)	0 (0.00)	0 (0.00)
	Other	1 (0.75)	0 (0.00)	1 (1.06)	0 (0.00)	0 (0.00)
Mode of arrival, n (%)						
	Private	42 (31.58)	4 (13.79)	36 (38.30)	2 (28.57)	0 (0)
	Ambulance	91 (68.42)	25 (86.21)	58(61.70)	5 (71.42)	3 (100)
Number of medications, mean ± SD		8.16 (3.58)	7.38 (3.45)	8.19 (3.62)	10.67(2.50)	9.00(5.66)
ISAR, median (IQR)		2.00 (1.00)	2.00 (1.00)	2.00 (1.00)	2.00 (1.00)	2.00 (0.50)
CCI, mean ± SD		3.02 (1.49)	3.00 (1.54)	3.05 (1.49)	3.14(1.35)	2.00 (1.73)

BI, mean ± SD	15.87 (3.43)	13.93 (4.04)	16.60 (2.92)	15.86 (2.91)	12.00 (5.00)
CFS, median (IQR)	5.00 (1.00)	5.00 (1.00)	4.50 (1.00)	4.00 (1.00)	4.00 (1.00)
Cognitive Impairment (4AT 1–3*), Yes, N (%)**	40 (30.08)	9 (31.03)	30 (31.91)	1 (14.29)	0 (0.00)
EQ-5D-5L mean ± SD					
Mobility	2.60 (0.92)	3.14 (1.06)	2.36 (0.74)	2.86 (0.90)	4.33 (0.58)
Self-care	2.14 (0.84)	2.52 (0.99)	1.96 (0.68)	2.29 (1.13)	3.67 (0.58)
Usual activities	2.59 (0.92)	3.00 (1.95)	2.30 (0.74)	2.71 (0.76)	4.00 (0.00)
Pain/discomfort	2.37 (0.87)	2.59 (1.02)	2.26 (0.75)	2.57 (1.27)	3.33 (1.16)
Anxiety/depression	1.56 (0.70)	1.79 (0.77)	1.47 (0.65)	1.57 (0.98)	2.00 (0.00)
EQ-5D-5L Index Value mean ± SD	0.626 (0.252)	0.479 (0.330)	0.698(0.162)	0.536 (0.303)	0.055 (0.219)
ED length of stay (hours), median (IQR)	15.14 (14.47)	25.21 (23.83)	11.83 (12.77)	17.32 (14.26)	21.01(21.52)
PSQ-18 mean ± SD	49.98 (4.06)	49.50 (3.73)	50.15 (4.30)	48.67 (2.50)	52 (1.00)

SD, Standard deviation; GP, General Practitioner; OOH GP, Out-of-Hours General Practitioner; ISAR, Identification of Seniors at Risk; IQR, interquartile range; CCI, Charlson Comorbidity Index; BI, Barthel Index; CFS, Clinical Frailty Scale; EQ-5D-5L, EuroQoL 5-dimension 5-level; VAS, Visual Analogue Scale; ED, emergency department; PSQ-18, Patient Satisfaction Questionnaire-18.

* *n* = 1 discharged against medical advice

** ‘Other’ residential status refers to living arrangements not fitting existing categories (e.g., living with others, not family members)

****n* = 1 scored 4 or above indicating possible delirium +/- cognitive impairment

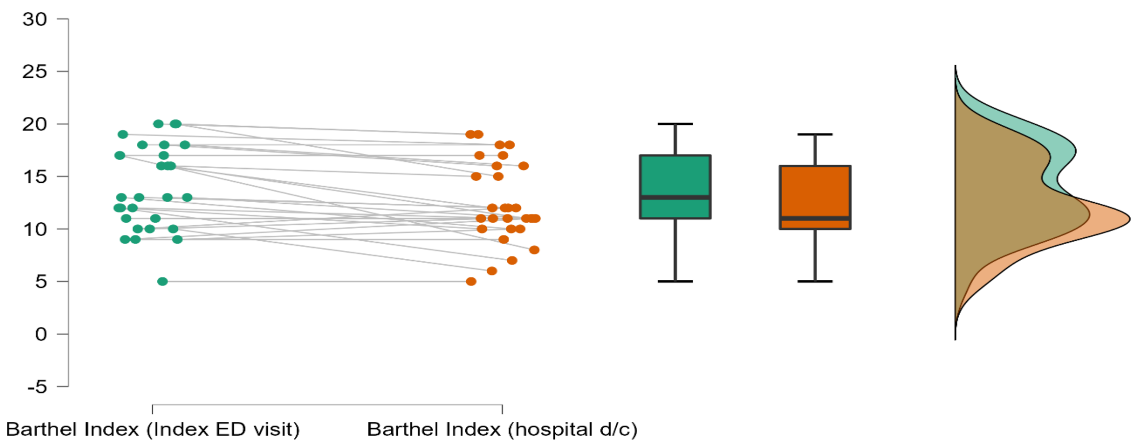
Outcomes at 30-days

At 30-day follow up, data on process measures (unscheduled ED re-attendance, unscheduled hospital admissions, and NH admissions) were available for all participants; two participants died during this timeframe. Data on function were unavailable for two additional participants (*n* = 1 lost to follow-up and *n* = 1 declined), and data on EQ-5D dimensions were unavailable for four participants (*n* = 1 lost to follow-up and *n* = 3 declined).

In terms of process outcomes, 10.5% participants (*n* = 14) experienced an unscheduled ED re-attendance, 7.5% (*n* = 10) experienced an unscheduled hospital admission, and 13.5% (*n* = 18) of participants were admitted to a NH facility within 30-days after their index ED attendance. Of note, 7/18 participants were discharged to a NH facility for a period of convalescence post index ED attendance and all seven transitioned back home after that period. Incidence of functional decline across the entire cohort was reported at 30.8% (*n* = 41) with 24.1% (*n* = 32) of participants maintaining their functional ability at 30-day follow-up as measured via the BI. Increasing age was a significant predictor of higher primary care (PC) service use OR 1.11 [1.00, 1.23] (Table 6.2).

Separate logistic regression models were estimated to explore if the outcome at the index ED attendance (hospital admission or discharge home) predicted the aforementioned binary controlling for variables known to influence outcomes at 30-and 180-day follow-up based on the previous regression models (Appendix 14). At 30-day follow-up, the control variable was age. Findings showed that outcome at the index ED attendance i.e., discharge home was a significant predictor in NH admission OR 0.13 [0.04, 0.43], Community Specialist Team Older People (CST OP) use OR 25.02 [3.24, 193.40], and PC service use OR 7.55 [2.23, 25.55] suggesting those who were discharged home had lower odds of NH admission and higher odds of CST OP and PC service use 30 days after the index ED attendance. Moreover, the admitted group (M_{BI} = 13.82, SD_{BI} = 3.93; $M_{EQ\text{-}5D\ index}$ = 0.650, $SD_{EQ\text{-}5D\ index}$ = 0.330; $M_{EQ\ VAS}$ = 62.31, $SD_{EQ\ VAS}$ = 21.64) had significantly lower 30-day BI (U = 778.50 p = 0.002), EQ-5D index value (U = 898.00, p = 0.040), and EQ VAS (U = 834.00, p = 0.035) scores when compared to the discharged group (M_{BI} = 16.38, SD_{BI} = 3.52; $M_{EQ\text{-}5D\ index}$ = 0.768, $SD_{EQ\text{-}5D\ index}$ = 0.229; $M_{EQ\ VAS}$ = 71.65, $SD_{EQ\ VAS}$ = 19.35).

Figure 6.1. Functional decline at hospital discharge



Colour key: Green = Index ED attendance; Orange = Hospital discharge

Abbreviations: ED, emergency department

Outcomes at 180-days

At 180-day follow up, data on process measures (unscheduled ED re-attendance, unscheduled hospital admissions, NH admissions) were available for all participants; nine participants died during this timeframe. Data on function were unavailable for four participants (*n* = 2 lost to follow-up and *n* = 2 declined), and data on EQ-5D dimensions were unavailable for four participants (*n* = 2 lost to follow-up and *n* = 2 declined).

In terms of process outcomes, 24.8% participants (*n* = 33) experienced an unscheduled ED re-attendance, 24.8% (*n* = 33) experienced an unscheduled hospital admission, and 15.8% (*n* = 21) of participants were admitted to a NH facility within 180-days of the index ED attendance with 6.8% (*n* = 9) of the total cohort transitioning to long-term care residency. Incidence of functional decline was 32.8% (*n* = 43) with 15% (*n* = 18) of participants maintaining their functional ability at 180-day follow-up. Frailty was a significant predictor of hospital admission

OR 1.76 [1.00, 3.10] and NH admission OR 2.34 [1.20, 4.55] where higher CFS scores resulted in a greater probability of hospital and NH admission (Table 6.2).

The outcome at index ED attendance i.e., discharge home was a significant predictor in unscheduled ED re-attendance OR 0.29 [0.10, 0.84], hospital admission OR 0.22 [0.07, 0.67], and NH admission OR 0.25 [0.07, 0.88], suggesting those who were discharged home at the index ED attendance had significantly lower incidences of these outcomes at 180-day follow-up. It was also a significant predictor of CST OP service use OR 8.53 [1.05, 69.38], suggesting those discharged home at the index ED attendance had higher odds of this service use at 180-day follow-up. No significant differences were observed in BI (p = 0.34), EQ-5D-5L index value (p = 0.268), and EQ VAS (p = 0.08) scores comparing the admission versus discharge cohort.

Table 6.2. Total sample logistic regression models

	ED re-attendance	**Hospital admission**	**NH Admission**	**CST OP services**	**PC services**
			30 days		
Age, OR [CIs]	0.93 [0.83, 1.03]	0.94 [0.83, 1.05]	0.96 [0.88, 1.05]	0.98 [0.92, 1.05]	1.11* [1.00, 1.23]
Gender, OR [CIs]	2.53 [0.57, 9.42]	1.41 [0.32, 6.27]	0.14 [0.02, 1.12]	2.37 [0.98, 5.73]	0.99 [0.28, 3.59]
Polypharmacy, OR [CIs]	0.92 [-0.277, 0.099]	1.05 [0.86, 1.27]	1.06 [0.91, 1.24]	0.94[0.84, 1.06]	0.92 [0.79, 1.07]
Frailty, OR [CIs]	1.73 [0.79, 3.77]	1.83 [0.79, 4.25]	1.24 [0.66, 2.35]	1.46 [0.90, 2.37]	0.64 [0.33, 1.25]
Nagelkerke, R^2	0.094	0.069	0.117	0.073	0.122
Chi-Square	5.077	3.325	7.539	6.007	6.93
			180 days		
Age, OR [CIs]	0.97 [0.90, 1.05]	0.94 [0.86, 1.01]	0.99 [0.91, 1.08]	0.99 [0.92, 1.08]	1.04 [0.94, 1.14]

Gender, OR [CIs]	1.26 [0.48, 3.30]	1.60 [0.58, 4.43]	1.35 [0.40, 4.56]	0.78 [0.25, 2.40]	0.73 [0.20, 2.69]
Polypharmacy, OR [CIs]	1.08 [0.95, 1.22]	1.13 [0.99, 1.28]	0.98 [0.83, 1.15]	0.98 [0.85, 1.13]	1.05 [0.88, 1.26]
Frailty, OR [CIs]	1.04 [0.62, 1.76]	1.76* [1.00, 3.10]	2.24* [1.20, 4.55]	1.17 [0.67, 2.04]	0.94 [0.46, 1.91]
Nagelkerke, R^2	0.036	0.143	0.111	0.009	0.019
Chi-Square	2.625	10.734*	7.173	0.597	0.972

ED, emergency department; NH, nursing home; CST OP, community specialist team older people, PC, primary care, OR, odds ratio; CI, confidence interval

* $p<0.05$

6.6 Discussion

This prospective cohort study explored the process, clinical, and patient-reported outcomes of older adults who received CGA in the ED of a university teaching hospital in Ireland over a period of six months after their initial ED attendance.

Our findings pertaining to the primary outcome of interest i.e., incidence of admission following the index ED attendance draw parallels with those reported in a systematic review that assessed whether consultant geriatrician led CGA in the ED can reduce admission rates (Jay *et al*. 2017). All five studies included in the review (four pre-post analyses, one prospective non-randomised study) reported a statistically significant reduction in admission rates (ranging between 2.5 and 19.7%). However, no pooled statistical analysis was provided, and given the variation in the magnitude of the results and intervention methods employed across studies, the authors highlighted difficulties in generalising the results due to uncertainty related to the clinical and economic benefits of the intervention. Furthermore, given that our study was observational, it is difficult to draw inferences on the true reduction in admission rate and causal links between exposure to the interdisciplinary team and outcomes measured.

Unequivocal evidence indicates that acute hospitalisation among older adults accelerates functional decline (Brown *et al.* 2020), a phenomenon more commonly referred to in the literature as HAD (Covinsky *et al*. 2011). In line with the international evidence base, our study reported a 62% incidence of functional decline among the cohort of older adults admitted to hospital (*n* = 29) following the index ED attendance. Participants had a mean BI score of 13.93 (SD = 4.04) on admission to hospital, indicating a requirement for assistance across a number of the 10 ADLs contained in the measure, at that time-point. Identification of inpatient risk factors and availability of interventions aimed at reducing the incidence of HAD was beyond the scope of our study. Our findings contrast those reported in a meta-analysis of 15 studies that determined the combined prevalence of HAD among hospitalised older adults aged ≥65 years on acute medical and surgical units as 30% (95% CI, 24% to 33%) (Loyd *et al*. 2020). However, a number of clinical and methodological differences exist between our prospective cohort study and this meta-analysis. Firstly, there was notable heterogeneity across populations of interest. Apart from mean age, Loyd *et al.* did not profile the baseline health characteristics of the study sample e.g., comorbidity index, frailty, polypharmacy etc. Secondly, two studies included older adults on speciality units i.e., psychiatry, cardiology and neurology units as well as two community-based cohorts i.e., participants were recruited from the community and followed over multiple years during which time acute care hospitalisation data was collected. Thirdly, of the hospital-based studies, there was variation in the timing of assessment of function, eight studies assessed functional status two weeks prior to admission to hospital discharge, one assessed functional status two weeks prior to admission to one-week post-discharge, three assessed functional status from admission to discharge, and one assessed functional status from admission to 3 months post-discharge. Finally, the authors highlighted the lack of standardised methods for assessing function among hospitalised older adults observed in the meta-analysis. This outcome heterogeneity has implications for reviewing research evidence and for generating policy recommendations. Therefore, there is a need for a robustly developed Core Outcome Set (COS) for studies involving older adults in the ED and across all healthcare settings, which will enhance transparency and availability of comparable data nationally and internationally.

A central tenet of the CGA process is identification of multifactorial needs and formulation of an integrated and coordinated plan for follow-up (Rubenstein *et al.* 1991). A forthcoming qualitative systematic review and meta-ethnography on stakeholders' experiences of CGA in an inpatient hospital setting found that while HCPs, older adults, and caregivers' values and ambitions related to CGA broadly align, their experiences often differ (O'Shaughnessy *et al.* 2023). HCPs experience CGA as enhancing holistic care, enabling involvement of older adults and caregivers in relational aspects of care and improving continuity of care following hospital discharge. However, the predominant experience of older adults and caregivers is lack of clarity about what CGA is, insufficient involvement in care planning, care discontinuity, and unmet healthcare needs following hospital discharge. In this prospective cohort study, the interdisciplinary team engaged in individualised care planning and shared decision making with older adults and those important to them. This involved engaging in bidirectional communication regarding the outcome of CGA and ED discharge plan and referring older adults to specialist geriatric ambulatory care pathways and community-based services as an alternative to hospital admission, where appropriate. Outcomes at 180-day follow-up highlighted that older adults who were discharged home following the index ED attendance, experienced lower rates of unscheduled ED re-attendance, unscheduled hospital admission, NH admission, and higher rates of CST OP. These findings align with international evidence, suggesting that CGA in the ED may improve outcomes by mitigating against the adverse effects of potentially avoidable hospital admissions (Conroy *et al.* 2010) and focusing on a left-shift and integration of services across the healthcare system (Department of Health 2021).

Consideration of patient care as a continuum rather than episodic encounters has the potential to identify an integrated approach at the primary-secondary care interface. This longitudinal approach to healthcare delivery is further illuminated in the findings of a recent review of reviews (15 reviews describing 83 primary studies), which summarised evidence on interventions to improve outcomes for older adults attending the ED (Preston *et al*. 2020). The authors concluded that no individual intervention was found to be more beneficial, but interventions initiated in the ED and continued into other settings resulted in more favourable outcomes.

Implications for Research and Practice

Given that CGA in the ED is a resource-intensive intervention, it is important to risk stratify a patient cohort who will derive greatest benefit. Frailty identification and assessment affords an understanding of complexity as well as informing clinical decisions and identification of a target cohort for CGA in the ED (Boucher *et al*. 2023). Findings from a recent retrospective cohort study found that assessing frailty status at ED triage using the CFS might assist clinicians with immediate clinical decision making and realistic goal setting (Elliott *et al.* 2021). The authors also highlighted that where the decision is for admission, higher levels of frailty can assist channel the older adult to age-attuned ward environments where CGA is available. In our study, the ISAR tool (McCusker *et al.* 1999) was included in our pre-defined inclusion criteria to stratify a cohort of older adults at risk of adverse outcomes and to focus resource-allocation of CGA to those in greatest need. Acknowledging the challenges imposed by time-based targets in the ED environment, clinicians and researchers should be guided by pragmatic and feasibility factors related to the use of frailty screening tools in the ED (Elliott *et al*. 2017).

Future research focused on CGA in the ED should be underpinned by an RCT methodology as it is the most appropriate study design to answer a research question related to a complex intervention (Skivington *et al.* 2021). The Cochrane review by Ellis *et al.* (2017) on the effectiveness of CGA for older adults admitted to hospital should serve as the reference standard when describing the core team and components of CGA in future research studies. In their review, they outline the following components: clinical leadership; structured assessment; multidisciplinary team meetings; goal setting; involving patients and carers in goal setting; outpatient follow-up; ward environment; adequate time; specialty knowledge; experience and competence; and tailoring treatment plans to the individual. Application of this reporting template will serve as a roadmap for successful implementation of similar models of care in the future and will enhance transparency of reporting CGA studies.

Strengths and Limitations

The study adopted a longitudinal approach to exploring older adults' outcomes following index ED attendance and in doing so explored the interface between primary-secondary care. The model of CGA was well described and we included a comprehensive range of key outcome measures, which explored the impact of CGA in the ED at both the patient and process level. In particular, the study was strengthened by the use of PROMs, and, to the best of our knowledge, this is the first evaluation of CGA in the ED to incorporate a person-centred perspective rather than focusing on process measures only. Furthermore, our low attrition rate at 30- and 180-day follow-up adds to our confidence in findings.

However, there are limitations to observational studies of this type. The lack of randomisation and comparison data in the form of a control group is an inherent limitation of observational studies (Kingston and Jagger 2018). While our analyses controlled and adjusted for a number of confounding factors, the interplay of such factors and the true effect of the exposure and outcomes cannot be out ruled. Participants were recruited during the operational hours (08:00–17:00) of the interdisciplinary team on a Monday–Friday basis, which presents limitations with respect to a representative sample of the target population whereby older adults who presented out-of-hours were excluded from recruitment. Finally, the study was conducted at a single-centre tertiary hospital, which may constrain the generalisability of findings to international healthcare systems.

6.7 Conclusion

CGA in the ED may improve outcomes by mitigating against the adverse effects of potentially avoidable hospital admissions and focusing on integration of services across the continuum of care. The outcome at the index ED attendance was a significant predictor of adverse outcomes whereby those who were discharged home had significantly lower odds of multiple adverse outcomes at 30- and 180-day follow-up. Two out of three older adults experienced functional decline during the course of hospitalisation. However, older adults who were admitted to hospital following the index ED attendance had lower levels of functional ability as measured via the BI compared to those who were discharged home at index. One out of four older adults experienced an unscheduled ED re-attendance and hospital admission at 180-day follow-up; higher levels of frailty as measured via the CFS resulted in a greater probability of unscheduled hospital and NH admission at this time-point. Future research on CGA in the ED should be underpinned by an RCT methodology.

Ethics

This study adheres to the Declaration of Helsinki and received ethics approval from the Research Ethics Committee, Quality and Safety Department, University of Limerick Hospital Group (Ref: 107/2021).

Funding

This research is funded through the Health Research Board of Ireland (Health Research Board, Grattan House 67-72 Lower Mount Street, Dublin 2, D02 H638 under the HRB Research Leader Award RL-2020-010). The funder had no role in this study.

Conflicts of Interest

None to declare

6.8 References

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Chapter 7: Establishing the Core Elements of a Frailty at the Front Door Model of Care using a Modified Real-Time Delphi Technique

Status: Published *BMC Emergency Medicine* 2023

Citation: O'Shaughnessy, Í., Fitzgerald, C., Whiston, A., Harnett, P., Whitty, H., Mulligan, D., Mullaney, M., Devaney, C., Lang, D., Hardimann, J, Condon, B., Hayes, C., Holmes, A., Barry, L., McCormack, C., Bounds, M., Robinson, K., O'Connor, M., Ryan, D., Shchetkovsky, D., Steed, F., Carey, L., Ahern, E. and Galvin, R. (2023) 'Establishing the core elements of a frailty at the front door model of care using a modified real-time Delphi technique', *BMC Emergency Medicine*, 23(1): 123.

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7.1 Candidate's Contribution: The candidate was lead author on this study and was responsible for co-development and design of methodology, project administration, PPI collaboration, co-facilitation of advisory group fora, data curation, analysis, visualisation and presentation. The candidate led on development and refinement of manuscript drafts, management of journal submission, and dissemination of the findings at national and international conferences.

7.2 Abstract

Background: This study aimed to develop a set of expert consensus-based statements underpinning operational design, outcome measurement, and evaluation of a Frailty at the Front Door (FFD) model of care for older adults within an Irish context.

Methods: A modified real-time Delphi method was used. Facilitation of World Café focus groups with an expert panel of 86 members and separate advisory groups with a PPI advisory group comprising older adults and those important to them and members of the Irish Association of Emergency Medicine generated a series of statements on the core elements of the FFD model of care. Statements were analysed thematically and incorporated into a real-time Delphi survey, which was emailed to members of the expert panel. Members were asked to rank 70 statements across nine domains using a 9-point Likert scale. Consensus criteria were defined a priori and guided by previous research using 9-point rating scales.

Results: Fifty members responded to the survey representing an overall response rate of 58%. Following analyses of the survey responses, the research team reviewed statements for content overlap and refined a final list of statements across the following domains aims and objectives of the FFD model of care; target population; screening and assessment; interventions; technology; integration of care; evaluation and metrics; and research.

Conclusion: Development of a consensus derived FFD model of care represents an important step in generating national standards, implementation of a service model as intended, and enhances opportunities for scientific impact. Future research should focus on the development of a core outcome set for studies involving older adults in the ED.

7.3 Background

The significant growth in ED attendances is an international public health issue posing a major risk to population health (Pines and Griffey 2015). ED crowding affects the quality and safety of patient care and the association with a higher risk of adverse outcomes (Carter *et al*. 2014; Fogarty *et al*. 2014) and increased mortality rates are well-documented (Jones *et al*. 2022; Guttmann *et al*. 2011). As conceptualised within the Input-Throughput-Output model (Asplin *et al*. 2003), the causes and consequences of ED crowding are complex and multifaceted (Morley *et al*. 2018). The most potent input factor driving ED crowding is population ageing (Kawano *et al*. 2014). Although frailty is not synonymous with age, international evidence reflects a disproportionate level of ED attendance amongst older adults aged ≥65 relative to the demographic trajectory (Ukkonen *et al*. 2019). The ED has long been recognised as a challenging environment to deliver effective care to older adults living with frailty (Baum and Rubenstein 1987). EM has traditionally emphasised time-based targets and protocolised care for disease-specific presentations like stroke, trauma, and sepsis (Mooijaart *et al*. 2022; Hommick *et al*. 2016). However, the multi-complexity of older adults' presentations may pose challenges to emergency care (Conroy and Turpin 2016) and investment in additional time and resources are indicated to complete a holistic assessment across multiple domains (Limpawattana *et al*. 2016). Innovations in models of care for older adults living with frailty presenting to the ED have therefore become a key priority for clinicians, researchers, and policymakers (Mooijaart *et al*. 2022).

Unifying all evidence-based changes to enhance health services delivery for older adults living with frailty is CGA (Rubenstein *et al*. 1991), which is defined as a *"multidimensional diagnostic and therapeutic process focussed on determining a frail older person's medical, psychological and functional capability in order to develop a coordinated and integrated plan for treatment and follow-up"* (Parker *et al*. 2018, p.150). CGA has been shown to improve a range of outcomes in hospitalised older adults (Ellis *et al*. 2017); however, despite serving as the main portal of entry to inpatient care, limited high-quality evidence exists to support the effectiveness of CGA in the ED (Harding 2020). A recent scoping review of the literature synthesised the evidence on models of care for older adults living with frailty presenting to the ED (Huang *et al*. 2023). Findings showed that the 13 studies included in the review were heterogeneous in nature with respect to use of screening and assessment tools to identity frailty and support decision making, team composition, and outcomes reported. The authors concluded that critical analysis of existing policies, guidelines, and models of care is required before implementing new service models for older adults living with frailty in the ED.

In Ireland, substantial investment has been provided by the national HSE, in the form of a FFD model of care. The FFD model of care is underpinned by the principles of CGA whereby an interdisciplinary team of HCPs proactively identify complex and multifactorial needs in older adults through completion of a holistic assessment and initiation of a tailored treatment plan. FFD teams reflect a component of an integrated model of care developed by the NCPOP and give practical expression to implementing bespoke pathways for older adults living with frailty. However, while scale up of the FFD model of care is at an advanced stage, variations have emerged in terms of design, fidelity of approach, implementation, and evaluation of impact. Consequently, the lack of homogeneity, underpinned by evidence, has implications for the optimum operating model and stakeholder expectations.

Our study aims to develop a set of expert consensus-based statements on the core elements underpinning the operational delivery, outcome measurement, and evaluation of the FFD model of care for older adults within an Irish context.

7.4 Methods

The Delphi technique is a well-established method used to achieve consensus among experts on a particular topic in a systematic manner (Jones and Hunter 1996; Dalkey 1963). There are many variations of the classic Delphi method, with the option for researchers to modify the approach to reflect research aims (Varndell *et al*. 2021). The current study utilised a modified real-time Delphi method to develop consensus on the core elements of the FFD model of care (Gordon *et al*. 2006). The real-time Delphi method comprises a round-less approach, continuously calculating and updating aggregated responses in real-time until the end of study timeframe (Zipfinger 2007). Iteration can be incorporated by email prompts providing participants with the opportunity to re-visit and re-respond to survey questions based on group responses and possible changes in consensus (Quirke *et al*. 2021).

Expert Panel Selection and Recruitment

A purposive sampling strategy was used to form a national panel of FFD experts. Several definitions of 'expert' exist in the literature ranging from someone who has knowledge about a specific topic, considered a specialist in the field, to an informed individual (Keeney *et al*. 2001). In the context of this study, an expert was defined as a senior clinician working on a FFD team or a manager of the FFD service model. All 24 FFD teams nationally were contacted through NCPOP, and each site was asked to nominate between 3–5 expert members to participate in the process of consensus building. An overview of the range of HCPs participating in the expert panel (N = 86) is outlined in Table 7.1. To incorporate an experiential element to the study, a PPI advisory group of older adults and those important to them were also invited to contribute as research partners. The PPI advisory group provided insights and guidance to the process, ensuring meaningful representation of a lived-experience perspective when identifying priorities of the FFD model of care (Bagley *et al*. 2016; Domecq *et al*. 2014).

The PPI advisory group were recruited from a subsample of older adults and those important to them (N = 6) who had recent experience of CGA in the ED as part of a prospective cohort study (O'Shaughnessy *et al*. 2022).

Preparation for the Delphi Process

This qualitative study employed a participatory design approach to data collection when exploring the FFD model of care for older adults (Jagosh *et al*. 2012). The first element of the Delphi preparatory process was the facilitation of World Café focus groups (http://www.theworldcafe.com/key-concepts-resources/world-cafe-method/). Focus groups were conducted with members of the expert panel (N = 86), enabling collective knowledge and sharing of rich and diverse insights in an inclusive environment (Brown 2010; Fouché and Light 2011). The World Café procedure adhered to in this study is presented in Appendix 15. For the purposes of focus group facilitation, the FFD model of care was categorised into nine domains across two pillars: (1) operational delivery and (2) measurement. Members of the research team (RG, PH, EA, DM, HW, MM, DL, CD, JH, BC, CH, AH, LB, MB, and CMcC) facilitated focus groups and invited expert panel members to brainstorm and discuss specific aspects of each pillar through use of broad questions. An independent facilitator acted as a notetaker with 20–25 members in each group. World Café group notes were transcribed and NVivo 12 Pro was utilised to assist with data management. A reflexive thematic approach to analysis was employed using the six steps of thematic analysis as described by Braun and Clarke (2021). This approach was used as a guide to facilitate the generation of knowledge embedded in the insights and experiences of the multi-level participant group. Phase 1 included familiarisation with study data, while phase 2 involved more in-depth engagement with data and extraction of initial codes. Phases 3 and 4 resulted in the generation of initial themes and refinement of these themes by reviewing the link between the themes and the original dataset.

In phases 5 and 6, themes were agreed following review and consultation between study investigators. These themes mapped to the nine focus areas in relation to aims and objectives of the FFD model of care, target population, screening and assessment, interventions, technology, integration of care, evaluation and metrics and research.

Following the World Café, the PPI advisory group comprising four older adults and two caregivers was facilitated by two members of the research team (ÍO'S & CF). The PPI advisory group ensured older adults and those important to them perceptions and experiences of healthcare utilisation specific to the FFD model of care were explored and represented when ascertaining core elements of the service model. Further information on the structure and format of the PPI advisory group is outlined in Appendix 16.

Upon completion of both fora outlined above, two members of the research team (ÍO'S & CF) met with members of the Irish Association of Emergency Medicine (IAEM) at their annual scientific meeting, pre-conference workshop (https://iaem.ie/professional/asm2022/). The purpose of this workshop was to ensure representation of the EM voice in the Delphi process, when exploring key aspects of the FFD model and to corroborate data saturation with respect to generation of themes.

The Delphi Process

Survey Design

The real-time Delphi survey was developed using the Qualtrics online survey tool and emailed to expert panel members who had previously taken part in the World Café focus groups. Statements incorporated into the survey were developed on the basis of themes that were produced from the World Café focus groups, PPI advisory group, and IAEM pre-conference workshop. Survey participants were asked to rank 70 statements using a 9-point Likert scale (1 = not important to 9 = very important) across the following domains: aims and objectives of the FFD model of care; target population; screening and assessment; interventions; technology; integration of care; evaluation and metrics; and research. A full list of statements contained in the survey are outlined in Appendix 17. Space was made available at the end of the survey for free text comments.

Participation was asynchronous and members were able to re-visit the survey portal, view other members' responses in real-time and re-rank their responses at any time point between 14th November and 19th December 2022 (a total of 36 days). Reminder emails were sent to all members at week two, four, and five after initial contact.

Table 7.1. Overview of healthcare professionals participating in expert panel

Profession	N
Registered nurse	26
Physician (N = 16 Consultant Geriatrician, N = 1 Emergency Medicine Consultant	17
Physiotherapist	17
Occupational Therapist	17
Speech and Language Therapist	4
Pharmacist	2
Dietitian	2
Social Worker	1

Data Analysis

Survey responses were analysed using JASP statistical software. Descriptive and frequency statistics were calculated for each scale item within each domain. Consensus criteria for the 9-point Likert scale items were defined a priori and based on previous research (De Meyer *et al.* 2019). Data analysis focused on examining each statement against the following criteria: (1) ≥70% of the sample ranked the item in the 7–9 range, (2) mean item rank in the 7–9 range, and (3) median item rank in the 7–9 range with an IQR <3. Final consensus criteria were defined by applying the strictest of the three consensus criteria outlined above i.e., median 7–9, IQR <3. Descriptive and frequency statistics were then developed into tabular form.

7.5 Results

Fifty members of the expert panel responded and completed the real-time Delphi survey representing an overall response rate of 58%. Expert panel members from each of the eight professions completed the survey with members from physiotherapy (26%), nursing (22%), and consultant physicians (22%) representing the highest respondents. The first list of statements, based on the three criteria are outlined in Appendix 18. Following analyses of the survey responses, members of the research team reviewed statements for content overlap and refined a final list of statements against the strictest consensus criteria i.e., median 7–9, IQR <3. The final list is reported below and presented in tabular form in Appendix 19.

All deidentified data files and data dictionary, and no analytic code are available as of 07/2023/05 at the Open Science Framework (OSF) repository at the following link: OSF | Frailty at the Front Door

Aims of the FFD Model of Care

Consensus on statements that described the aims of the FFD model of care included to improve the experience and outcomes of older adults living with frailty who present to the ED and to promote the age-attuning of the ED environment through bespoke pathways, processes, and an interdisciplinary approach to care.

Objectives

Consensus on statements that described the objectives of the FFD model of care included to embed CGA in the ED through early assessment and intervention of medical, functional, cognitive, and psychosocial abilities, and to facilitate timely and supported patient discharge from the ED through initiation of referrals to appropriate community and inpatient services. Reduction in length of stay of older adults living with frailty admitted to hospital following ED attendance also reached consensus. Reduction in incidence of NH admission did not research consensus.

Target Population

Consensus on statements that described the target population included older adults identified as frail with multiple complex co-morbidities. Statements that did not reach consensus included use of the ≥65-year age criterion and results of frailty screening to assist in refining the target population.

Screening and Assessment

Consensus on statements that described the screening and assessment process included commencement of CGA to incorporate a standardised biopsychosocial assessment of frailty, co-morbidity, polypharmacy, cognition, function and mobility, continence, nutrition, psychological, and social status and use of an interdisciplinary assessment proforma as the basis to inform the intervention plan.

Interventions

Consensus on statements that described core interventions delivered by FFD teams included provision of information to older adults and those important to them on the outcome of CGA and ED discharge plan and completion of timely handover to community based or inpatient services following ED discharge. Completion of medication reconciliation, provision of education on delirium risk reduction strategies, self-management strategies, and nutritional education and advice, as appropriate, all reached consensus. Statements that did not reach consensus included provision of in-reach interventions to inpatient wards following admission to hospital.

Role of Technology

Consensus on statements that described the role of technology to support FFD teams included a requirement for greater Information and Communications Technology (ICT) resources, development of electronic referral pathways, and a shared e-proforma across primary and secondary care services. The role of current ICT systems effectively supporting the FFD model of care did not reach consensus.

Integration of Care

Consensus on statements that described elements to support the integration of care included development of shared protocols for the FFD model of care, standardisation of core aims, objectives and team composition, structured clinical governance regarding initiation/completion of CGA in the ED and decision making related to the CGA generated management plan. Statements that did not reach consensus included development and implementation of a national assessment proforma by FFD teams and structured operational governance regarding onward referral to community based integrated care services.

Evaluation and Metrics

Consensus on statements that described evaluation and metrics of FFD impact included the importance of measurement and evaluation of patient experience and outcomes as well as staff experience. A requirement for greater resources and training to enhance understanding and value of FFD evaluation, an UpToDate feedback system for FFD teams reporting to local governance structures, and inclusion of a measure of patient experience, clinical and process outcomes as part of the evaluation process all reached consensus. Statements that did not reach consensus included reporting of quarterly or biannual FFD metrics to the HSE Acute Hospitals Division and reporting of process outcomes only as part of the evaluation process.

Research

Consensus on statements that described research priorities included research as a key component of the FFD model of care, alignment of the FFD research agenda with the NCPOP research strategy, and greater efforts are required to enhance understanding and value of research. Statements that did not reach consensus included research is valued and seen as a priority by FFD teams and postgraduate education specific to care of the older adult is a requisite for FFD team members.

7.6 Discussion

Summary

Through a modified real-time Delphi process, a national panel of experts reached consensus on the core elements of a FFD model of care within an Irish context. The final list of statements reflects the desired elements and standards as endorsed by the NCPOP and provides clinicians with a guiding framework to ensure homogeneity with respect to implementation and evaluation of the service model.

Older adults in the ED are clinically heterogeneous; therefore, identification of a target population for individualised assessment and interventions by FFD teams can pose challenges. While a plethora of international evidence exists to support the diagnostic and predictive accuracy of a number of frailty screening tools in the ED (O'Caoimh *et al*. 2022; Jørgensen and Bradrand 2017), no single tool is recommended by experts to screen for frailty in the ED (Apóstolo *et al*. 2017). A recent prospective cohort study examined the predictive ability of commonly used frailty screening tools in the ED including the ISAR, CFS, Programme on Research for Integrating Services for the Maintenance of Autonomy-seven item questionnaire (PRISMA-7), and InterRAI-ED. Findings demonstrated that older adults who screened positive for frailty were at significantly increased risk of adverse outcomes including ED re-attendance, hospital readmission, functional decline, NH admission, and death at 30 days and 6 months, regardless of screening tool used (Leahy *et al*. 2023). Accordingly, our consensus-based statements in relation to the population of interest included older adults identified as frail, without a specific focus on a single frailty screening tool.

Our consensus-based statements focused on biopsychosocial assessment and intervention domains as part of CGA in the ED as well as mechanisms to support an integrated and longitudinal approach to care. Given the high rates of adverse outcomes experienced by older adults following ED attendance (Giroux *et al*. 2021; Nagurney *et al*. 2017; Samaras *et al*. 2010), evidence-based interventions to support care transitions from the ED are a key priority for researchers and policymakers. A recent review of reviews, which summarised evidence on interventions to improve outcomes for older adults attending the ED, revealed no individual intervention was found to be more beneficial, but interventions initiated in the ED and continued into other settings resulted in more favourable patient and process outcomes (Preston *et al*. 2020). The FFD model of care represents an integrated and coordinated approach to healthcare delivery between primary and secondary care services; homogeneity in implementation of the service model will enable robust reporting and evaluation of efficacy and effectiveness.

Quality of emergency care for older adults has historically been reported using process measures such as length of ED stay and early re-attendance rate (Burkett *et al*. 2017). While useful for managers, these measures may not capture what older adults consider meaningful. Application of patient-reported outcome and experience measures are increasingly recognised as valid approaches to measure the quality and impact of care by clinicians, funders and policymakers (van Oppen *et al.* 2020). In keeping with this paradigm shift to outcome measurement, our consensus-based statements reflect inclusion of measures of patient experience, clinical, and process outcomes as part of the evaluation process.

The majority of statements that did not reach consensus related to the domain of research. Findings from the survey revealed that while members of the expert panel considered research to be a key component of the FFD model of care, it was not valued or seen as a priority. Given that limited high quality evidence currently exists to support the effectiveness of CGA in the ED (Harding 2020; Jay *et al.* 2017; Conroy *et al*. 2011), development of this consensus derived FFD model of care represents an important step in generating national standards for the optimum operating model thereby increasing opportunities for scientific impact.

Implications for Research and Practice

Appraisal of older adults' experiences and outcomes from emergency care are central tenets of the FFD model of care. Our consensus-based statements pertaining to the aims and objectives of the FFD model of care draw parallels with findings from a systematic review, which focused on evaluating the expectations and preferred outcomes from ED care among older adults (van Oppen *et al*. 2019). However, despite a proliferation of intervention studies involving older adults in the ED, significant heterogeneity exists with respect to outcome measurement and use of validated tools (Berning *et al*. 2020; Cassarino *et al*. 2019; Lowthian *et al.* 2015). This outcome heterogeneity has implications for reviewing research evidence and for generating policy recommendations. Therefore, there is a need for a robustly developed COS for studies involving older adults in the ED to enhance transparency and availability of comparable data nationally and internationally, and to ensure outcomes measured align with 'what matters most' to older adults.

Our consensus-based FFD model of care provides clinicians with an overarching framework that can be locally adapted and expands on the principles of CGA in emergency care settings. Development of a CGA generated management plan is a core element of the FFD model of care. The consolidated '5Ms' conceptual framework is grounded in the same principles and considers each older adult holistically in terms of mobility, mentation, medication, multi-complexity, and what matters most (Fulmer *et al*. 2018; Tinetti *et al*. 2017). Application of this framework has the potential to assist clinicians with operationalising the core elements of the FFD model of care. In keeping with its focus on cultivating an age-friendly health system (Institute for Healthcare Improvement, online) use of this framework facilitates the age-attuning of the ED and is therefore important for clinicians to consider when addressing the complex and interrelated needs of older adults both in the ED and across the continuum of care.

Strengths and Limitations

The strengths of this study lie in its robust methodological design and extensive stakeholder engagement. Formation of an expert panel, which was representative of FFD teams nationally augments external validity and generalisability to other healthcare systems. Involvement of the PPI advisory group of older adults and those important to them provided an important viewpoint in terms of how best to represent their priorities and preferences thereby ensuring the FFD model of care remains person-centred.

A potential limitation of the Delphi technique is researcher influence on the formulation of the statements for inclusion in the survey. However, to minimise this risk we based our statements on themes that emerged from the World Café focus groups, PPI advisory group, and IAEM pre-conference workshop. Use of the real-time Delphi process mitigated against a prolonged study timeframe and potential high attrition rates, which are limitations of the classic Delphi technique. Another general limitation of the Delphi technique is the choice of consensus criterion can be arbitrary and subject to bias. To reduce risk of bias, we combined three recommended consensus thresholds covering distinct criterion: proportions within restricted ranges (≥ 70% scoring 7–9), central tendency within specific ranges (mean 7–9), and a decrease in variance (median 7–9, IQR < 3).

7.7 Conclusion

Innovations in models of care for older adults living with frailty presenting to the ED are a key priority for clinicians, researchers, and policymakers. Through a modified real-time Delphi process, a national panel of experts reached consensus on the core elements underpinning operational design, outcome measurement, and evaluation of the FFD model of care within an Irish context. Development of a consensus-based FFD model of care represents an important step in generating national standards, implementation of a service model as intended, and enhances opportunities for scientific impact. Future research should focus on the development of a core outcome set for studies involving older adults in the ED.

Ethics

This study adheres to the Declaration of Helsinki and received ethics approval by the University of Limerick Faculty of Education and Health Sciences Research Ethics Committee (2022_04_15_EHS).

Funding

This research is funded through the Health Research Board of Ireland (Health Research Board, Grattan House 67-72 Lower Mount Street, Dublin 2, D02 H638 under the HRB Research Leader Award RL-2020-010). The funder had no role in this study.

Conflicts of Interest

None to declare

7.8 References

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Chapter 8: Discussion

8.1 Introduction

This thesis aimed to advance CGA models of care in emergency and acute care settings using an evidence-based and stakeholder-informed approach. Study 1 updated and synthesised the totality of evidence regarding the effectiveness of AGU care among older adults admitted to hospital with acute medical complaints through conduct of a systematic review and meta-analysis. In Study 2, a qualitative systematic review and meta-ethnography was undertaken to synthesise stakeholders' experiences of CGA in an inpatient hospital setting and to develop novel insights and interpretations reflective of all stakeholders' experiences. Study 3 explored the longitudinal outcomes of older adults who received CGA in the ED of a university teaching hospital in Ireland through conduct of a prospective cohort study. Finally, Study 4 developed a set of expert consensus-based statements on the core elements underpinning the operational delivery, outcome measurement, and evaluation of the FFD model of care for older adults within an Irish context using a modified real-time Delphi technique.

8.2 Frameworks Underpinning the Research

This thesis adopted the capability approach (Sen 1993) to inform the programme of research studies contained within it and was underpinned by the principles of PPI (Hayes *et al*. 2012). Adoption of the capability approach guided the development and overarching aims of studies, in particular Studies 1 and 2 i.e., functional decline was chosen as the primary outcome of interest in Study 1 on the basis of it being an important determinant of QoL for older adults; the qualitative evidence synthesis ensured older adults' experiences and perspectives of inpatient CGA were represented. In essence, the capability approach is based on a broad, multidimensional, and flexible notion of wellbeing that constructs inclusive identities for older adults (Mitra and Brucker 2020). This holistic approach has similarities to CGA, which addresses the biopsychosocial and multidimensional needs of older adults living with frailty. PPI was central to ensuring the lived experiences of older adults and those important to them were explored and represented in this thesis. The adoption and integration of PPI was chosen on the basis of its reported benefits and positive impact on health and social care research (Tomlinson *et al*. 2019). PPI ensures a focus on topics that are relevant and important to health service users (Crowe *et al.* 2015; Brett *et al.* 2014) and empowers them to contribute to society by sharing their experiences in an effort to influence change (Staley and Barron 2019; Hanson and Hanson 2017). To this end, a proactive approach was taken when completing participant follow-up as part of Study 3, which involved exploring older adults' outcomes and experiences of CGA in the ED. A PPI advisory group comprising four older adults and two family caregivers was subsequently established from this cohort and members were invited as researcher partners to Study 4, where their judicious involvement and experiential expertise was instrumental when establishing the core elements of the FFD model of care.

8.3 Unique Contributions

Studies 1 and 2 contributed to identifying and updating the current international evidence base on inpatient CGA, while studies 3 and 4 contributed to the development of new evidence related to CGA in the ED. An overview of the unique contributions of each study are presented in Table 8.1.

Table 8.1 Overview of unique contributions of each study

Study	**Study Title**	**Unique contributions**
1	Effectiveness of acute geriatric unit care on functional decline, clinical, and process outcomes among hospitalised older adults with acute medical complaints: a systematic review and meta-analysis	– 11 trials recruiting 7,496 older adults, across three countries were included – Patient selection criteria to an AGU was largely based on age and the presence of an acute

		medical complaint that did not require admission to a speciality unit – AGU care decreases the probability that hospitalised older adults with acute medical complaints will experience functional decline at six-month follow-up and are more likely to be living at home at three-month follow-up – PROMs and PREMs were not routinely included across trials
2	Stakeholders' experiences of comprehensive geriatric assessment in an inpatient hospital setting: a qualitative systematic review and meta-ethnography	– 11 studies reporting on the experiences of 153 HCPs, 91 older adults, and 57 caregivers were included – HCPs described a personalised and multidimensional approach to CGA underpinned by collaborative work practices, older adults and caregivers described heterogenous experiences of CGA – Findings underscore the importance of engaging in shared decision making as part of the delivery of CGA and its accompanying interventions
3	Comprehensive geriatric assessment in the emergency department: a prospective cohort study of process, clinical and patient-reported outcomes	– 133 participants (mean age 82.43 years, SD = 6.89 years; 71.4% female) were recruited – 21.8 % of the cohort were admitted to hospital following the index ED attendance – 62% of older adults experienced functional decline during the course of hospitalisation – The outcome at the index ED attendance was a significant predictor of adverse outcomes whereby those who were discharged home had significantly lower odds of multiple adverse outcomes at follow-up
4	Establishing the core elements of a frailty at the front door model of care	– Facilitation of World Café focus groups with an expert panel (n = 86) and a PPI advisory group (n =

	using a modified real-time Delphi technique	6) generated a series of 45 statements on the core elements of the FFD model of care – Statements were categorised into nine domains across two pillars: (1) operational delivery and (2) measurement reached consensus – Development of a consensus derived FFD model of care represents an important step in generating national standards for an optimum operating model thereby increasing opportunities for scientific impact

The findings and unique contributions arising from this thesis can be brought together as of series of broad recommendations, based on Studies 1–4, that aim to inspire the design and delivery of evidence-based CGA models of care. In particular, the discussion will focus on identifying the optimum beneficiaries of CGA, operational models of CGA and core intervention components, and outcomes of interest.

8.4 Population of Interest

The heterogeneity that is a hallmark of ageing was contextualised throughout this thesis. Each of the four studies outlined eligibility criteria, inclusive of populations of interest, and were unified by CGA, which is the core evidence base for geriatric medicine (Ellis *et al.* 2017). However, risk stratifying and identifying the optimum target population of CGA in emergency and acute care settings remains an ongoing area of enquiry. Over the past 2–3 decades, the 'Silver Tsunami' concept has been replaced by a more dynamic discourse grounded in the recognition that population ageing is diverse and the association between chronological age and health status is remarkably variable (Romero-Ortuno and O'Shea 2013; Lloyd-Sherlock *et al.* 2012). Central to this discourse is the construct of frailty, which was introduced to the literature of geriatric medicine over two decades ago to enhance our understanding of the evolving and heterogenous health status of older adults (Fried *et al.* 2001; Mitnitski *et al*. 2001).

Frailty is a well-established construct and is characterised as a state of increased vulnerability to poor resolution of homoeostasis after a stressor event, which increases the risk of adverse outcomes, including hospitalisation, long inpatient stay, falls, delirium, and disability (Gilbert *et al.* 2018; Rockwood and Howlett 2018; Clegg 2013). Recent meta-analytic evidence found that 47% of hospitalised older adults aged ≥65 years are living with frailty (Doody *et al.* 2022). However, it is important the label ‘frail’ does not lead to unintended ageism (Mudge and Hubbard 2018) and demographic stereotyping (Warmoth *et al.* 2016), but instead frailty assessment is operationalised as a method of risk stratification and identification of older adults who are at the highest risk of experiencing adverse outcomes and whose needs may be best suited to frailty-attuned care and interventions rather than disease-specific pathways. It is now feasible to identify and grade frailty by use of quick and reliable tools, such as the CFS (Rockwood and Theou 2020), which result in more focused allocation of time, personnel, and resources for those older adults who will derive greatest benefit (Hogervorst *et al.* 2021). Study 3 operationalised use of the ISAR tool (McCusker *et al.* 1999) to stratify a cohort of older adults at risk of adverse outcomes and to focus resource-allocation of CGA in the ED. The ISAR tool was chosen based on findings from contemporary research conducted in an Irish ED setting, which suggest it is the most sensitive tool for prediction of multiple adverse outcomes among older adults at 30 days and six months, when compared to the CFS, PRSIMA-7, and interRAI-ED (Leahy *et al.* 2023). In Study 4, the expert panel did not reach consensus with respect to FFD teams use of frailty screening tools to assist with refining a target population for focused assessment and intervention in the ED. Exploration of variables resulting in statements not reaching consensus was beyond the scope of the study.

There is broad agreement across international healthcare systems that reconfiguration of health and social care services is required to ensure an age-attuned integrated approach to care for older adults living with frailty (British Geriatrics Society 2023). Historically, research studies selected older adults on the basis of age and not frailty criterion (Melady 2018). Moreover, only 7% of RCTs were specifically designed for older adults (Broekhuizen *et al.* 2015) with evidence suggesting that the external validity of RCTs was constrained by underreporting the heterogeneity of included older participants (van Deudekom *et al.* 2017). These findings draw parallels with Study 1, where only three of the 11 trials operated frailty criterion through use of screening tools when selecting older adults for admission to an AGU. However, it must be noted that those trials, which primarily operated age-based criterion for selection dated from 1985–2012 and our knowledge of frailty and its typical accompaniments has undoubtedly advanced over the past decade. In Study 2, only two of the six studies exploring older adults' experiences of inpatient CGA included older adults with co-existing cognitive impairment. Given that up to 40% of hospitalised older adults have some form of cognitive impairment (Reynish *et al*. 2017), and dementia, in and of itself is a geriatric syndrome (Conroy *et al.* 2021), healthcare systems must systematically identify and deliver frailty-attuned care and interventions to this patient cohort to ensure their specific needs are met.

The evidence is unequivocal – frailty is a pressing matter at all levels of healthcare (Han *et al.* 2019). Thus, it is imperative that clinicians, researchers, and policymakers adopt a whole systems approach related to frailty identification and risk stratification in order to best serve the multidimensional needs of older adults, across the continuum of care.

8.5 Models of CGA and Intervention Components

CGA is the core evidence base for geriatric medicine and is substantiated by compelling meta-analytic data pertaining to an inpatient hospital setting (O'Shaughnessy *et al*. 2022; Ellis *et al.* 2017; van Craen et al. 2010; Stuck *et al.* 1993). Findings from the 2017 Cochrane Review (Ellis *et al.* 2017) suggest there are more commonalities than differences in the core components and interventions underpinning the delivery of CGA, but some variation exists in the way the intervention is implemented, for example, specialist geriatric intervention and liaison for at risk older adults at the point of discharge from an acute assessment unit (Edmans *et al.* 2013). In Study 1, the core components of CGA within an AGU were mapped onto the reporting template devised by Ellis and colleagues. Though variability in reporting was observed, several distinct components emerged across all 11 trials included in the review, which were critical to the favourable outcomes reported. Findings from Study 2 highlighted the heterogenous experiences and contrasting perceptions of inpatient CGA across stakeholder groups. While HCPs described an individualised and multidimensional approach to CGA underpinned by collaborative practices, older adults and those important to them predominantly reported insufficient involvement in relational aspects of CGA such as care planning, care discontinuity, and unmet healthcare needs following hospital discharge. Qualitative research and synthesis are well placed to inform health-related policy and practice (Mays *et al*. 2005). In this context, older adults' reported experiences of inpatient CGA underscore the importance of considering 'what matters most' to the patient and those important to them, which is a fundamental pillar of geriatric medicine and the capability approach. This was corroborated in Study 4, where a desire for a person-centred approach to care characterised by the need to feel heard and understood, and concerns adequately acknowledged was echoed in the voices of PPI advisory group members when describing their previous experiences of emergency care and prospective priorities of the FFD model of care.

Models of CGA have continued to evolve across the wider hospital setting in response to an increase in demand for resources, leading to the concept of 'hospital wide' CGA (Harding *et al.* 2020; Kocman *et al.* 2019; Conroy *et al.* 2019; Parker *et al.* 2017; Jay *et al.* 2017). This concept builds on the international evidence and embraces the belief that all hospitalised older adults living with frailty who may benefit from CGA, should be able to receive it. CGA is considered the gold standard approach to improving a range of outcomes for older adults living with frailty in acute hospitals – older adults who receive CGA are more likely to be alive and in their own homes after an emergency admission to hospital and are less likely to be admitted to a NH at discharge or at three to 12 months' follow-up (Ellis *et al.* 2017). Outside of the traditional ward-based environment, much of the attention focuses on the ED – the interface between primary and secondary care. While there is emerging evidence that innovative models to integrate services across care transitions are developing (Conneely *et al.* 2022; Preston *et al.* 2021), CGA in the ED has not yet been extensively evaluated (Harding *et al.* 2020; Jay *et al.* 2017). However, the logistical challenges posed by implementing CGA in the ED cannot be under-estimated. EDs are fast-paced settings and often a barometer for system-wide pressures (van Oppen and Conroy 2022). Study 3 contributed to the development of the international evidence base with findings suggesting CGA in the ED may improve outcomes by mitigating against the adverse effects of potentially avoidable hospital admissions and focusing on integration of care at the primary-secondary care interface. The core team and intervention components were reported in line with the template devised by Ellis *et al.* (2017). Application of this reporting template should serve as a roadmap for successful implementation of models of CGA in the future and will enhance transparency and availability of data.

Underpinning all models of CGA and intervention components is the process of shared decision making. Shared decision making requires a shift in the approach to practice, from a biomedical focus to a more biopsychosocial or person-centred focus. It involves patients, proxies, and HCPs collaboratively assessing treatment and care options to respect the patient's preferences, priorities, and right to self-determination (Bunn *et al.* 2018; Elwyn *et al*. 2017). Application of shared decision making to CGA practices and processes ensures the preferred health outcomes of older adults living with frailty are explored and addressed in the context of the whole person. This aligns with the Multiple Chronic Conditions guiding principles and action framework developed for the care of older adults, that emphasises opening the healthcare communication with identifying and communicating the patient's preferences and priorities (Boyd *et al.* 2019). Paramount to shared decision making is a supportive healthcare system that is underscored by a value-based approach to care (Pel-Little *et al.* 2020) and facilitates care to be designed around the needs of the patient, rather than those of HCPs and systems.

8.6 Outcomes of Interest

This thesis has illuminated the heterogenous application of patient-orientated outcomes and experiences in the delivery of CGA at a micro (i.e., interaction between older adult and HCP) and meso (service) level. In Study 1, PROMs and PREMs were not routinely included across trials, instead inclusion of process outcomes (e.g., length of hospital stay, hospital re-admission, or institutionalisation) predominated and were the primary foci for evaluating the effectiveness of AGU care. Findings from study 2 highlighted the disparate stakeholder experiences of CGA in an inpatient hospital setting; while HCPs, older adults and caregivers' values and ambitions related to CGA broadly aligned, their experiences often differed. Taken together, these quantitative and qualitative findings highlight the importance of delivering person-centred care orientated towards outcomes that older adults consider meaningful. Furthermore, focusing on outcomes that matter to older adults enables healthcare systems improve the quality of care delivered and may lead to more optimal results for services and systems overall (Akpan *et al.* 2018).

In the context of a proliferation of research studies involving older adults in emergency and acute care settings, variation in outcome measurement has implications for system-wide innovations that translate evidence into policy and practice. For example, a recent systematic review of interventions to improve older adults' ED experience was limited by the significant heterogeneity in the tools used to measure patient experience and the use of non-validated questionnaires (Berning *et al*. 2020). Another review evaluating the effectiveness of ED-community transition strategies aimed at reducing adverse outcomes among older adults, noted the imperative for consensus in future research regarding outcomes that should be measured and at what time periods, to elucidate the true effects of future interventions (Lowthain *et al.* 2015). Furthermore, an umbrella review reporting key elements, principal outcome measures, and characteristics of the main beneficiaries of inpatient CGA across 13 systematic reviews found ADL ability (13/13 reviews), mortality (12/13 reviews), hospital re-admission (12/13 reviews), institutionalisation (12/13 reviews), and length of hospital stay (11/13 reviews) were the key outcomes reported (Parker *et al.* 2018). Resource use and costs were considered in four reviews and only two reviews included PROMs or PREMs. While process and clinical outcomes are relevant and easily generated, they are narrow in focus and do not always capture the complexity of goal-oriented care or older adults' perspectives and preferences (Conroy and van Oppen 2023). Study 3 aimed to resolve this research gap through inclusion of a patient-reported outcome, EQ-5D-5L (Rabin and de Charro 2001), when exploring longitudinal outcomes of older adults who received an interdisciplinary CGA in the ED.

Qualitative research has consistently reported the holistic and sensitive nature of emergency and acute healthcare outcome goals among older adults living with frailty (Phelps *et al.* 2022; Regen *et al.* 2022; Gettel *et al.* 2022; van Oppen *et al*. 2019) and has classified these outcomes under the themes of 'functioning' (physical, psychosocial, and symptom relief) and 'autonomy' (information, security, and control) (van Oppen *et al.* 2022). These findings resonate with insights provided by the PPI advisory group of older adults and those important them in Study 4, which were sought when establishing the core components and priorities of a FFD model of care within an Irish context. A systematic review aimed at identifying PROM instruments potentially suitable for use in this patient population found that instruments primarily measured 'functioning' constructs, with limited consideration for 'autonomy' (van Oppen *et al.* 2022). Contemporary research has therefore focused on the co-creation of a PROM to measure autonomy for older adults living with frailty in receipt of emergency and acute care (van Oppen *et al.* 2023). This preliminary 7-item instrument, PROM-OPAC, is intended for administration alongside a measure of function with the aim of capturing meaningful acute healthcare outcome goals. Given that the principles of holistic and person-centred care form the basis of CGA, implementation of PROMs and PREMs have the potential to positively impact outcomes relevant to older adults.

8.7 Implications for Practice

In addition to the recommendations outlined about and in keeping with the core underpinnings of both the capability approach and PPI, there are a number of best practice principles clinicians can adopt to ensure the benefits of CGA are realised.

The complexities of evaluating the multidimensional needs and, often non-specific complaints of older adults in the fast-paced emergency environment cannot be underestimated (Karakoumis *et al.* 2015) and raises the question "*How comprehensive is comprehensive enough?*" (Arendts 2017). Policy and guidance documents, such as Silver Book II outline best practice principles for an interdisciplinary team-based approach to the care of older adults, in the first 72 hours of an emergency care episode (Conroy *et al.* 2021). It illustrates how frailty, CGA, and shared decision making can be locally adapted to align with national practice and policy, and places emphasises on making holistic care the standard for all older adults in emergency and acute care settings. As an overarching framework, Silver Book II highlights the importance of embracing a whole systems strategy and focuses on every clinicians ability to meaningfully contribute to CGA, embracing the concept of effective interdisciplinary care from the front door of the ED to the acute care environment. Hullick *et al.* (2021) postulate that although the training needs and professional expertise may differ for clinicians assessing older adults in emergency and acute care settings, the approach is universal – early frailty identification and risk stratification is essential to guide clinical decision making and to focus allocation of resources for CGA to older adults with greatest potential benefit. A brief and targeted CGA in the ED may be a useful method to triage complex older adults for hospital admission to a frailty-attuned ward environment (Elliott *et al*. 2021). In essence, adoption of Silver Book II should serve as a blueprint to guide clinicians in the delivery of evidence-based care for older adults living with frailty.

In keeping with a whole systems strategy through the lens of frailty, a quality improvement collaborative, the Acute Frailty Network (AFN),was established in England in 2015 with the aim of supporting the adoption and provision of best practice in the acute care context for older adults living with frailty (van Oppen *et al.* 2019). Similar to Silver Book II, the AFN sets out 10 best practice principles of CGA and supports hospitals in reconfiguring and redesigning services to minimise unwarranted clinical variation and to ensure a person-centred approach to care. The intention of this quality improvement collaborative was that AFN membership and adoption of best practice principles would lead to reductions in length of hospital stay, in-hospital mortality, institutionalisation, and hospital re-admission. In spite of its aims, findings from a recent staggered difference-in-difference panel event study, which accounted for differential phasing of hospital sites entry into the AFN, found no significant effects for any of the four outcomes outlined above or for any individual cohort (Street *et al.* 2023). However, findings should be interpreted with caution with the authors concluding that in order for the aims of the AFN to be realised, better resourced interventions and implementation strategies inclusive of adequate staffing, age-attuned environments, and access to early supported discharge service are required to improve outcomes among hospitalised older adults living with frailty.

8.8 Implications for Research

The four studies embedded within this thesis raise important implications for future research.

CGA is considered a complex intervention based on the properties of the intervention itself, such as the components involved; the range of outcomes targeted; expertise and skills required to deliver the intervention; the target population; and the environment in which it is delivered (Skivington *et al*. 2021). While findings from this thesis have established a number of important considerations to inform the design and delivery of evidence-based CGA models of care, prospective research studies should include process evaluations to provide in-depth and practical insights on the fidelity of CGA interventions (Moore *et al.* 2015). RCTs are considered the highest level of evidence; however, the effect sizes do not provide policymakers with information on mechanisms of impact including operational and relational factors, or contextual factors associated with variation in outcomes (Carroll *et al.* 2007; Hawe *et al.* 2004). Process evaluations are instrumental in investigating how an intervention was delivered as well as providing clinicians with information about how it might be replicated (Montgomery *et al.* 2013). In the context of CGA and the rapidly evolving evidence, inclusion of process evaluations in research studies will ensure quantitative and qualitative analyses build on one another (e.g., qualitative data can be used to contextualise quantitative findings) (Cassarino *et* *al.* 2022; Kahan *et al.* 2016) and will provide information on implementation and context to support real world decision making.

With regard to outcome heterogeneity, having established the lack of standardisation in data collection and variation in outcome measurement, use of a COS should be considered. The concept of a COS has been championed by the Core Outcome Measures in Effectiveness Trials initiative and demonstrates the benefits of standardising outcome measures across research (Prisnen *et al.* 2016). A COS is defined as "*an agreed standardized collection of outcomes that should be measured and reported for a specific area of health*" (Clarke and Williamson 2016, p.1). This strategy comprises a minimal set of outcomes that can be routinely recorded and does not preclude researchers from including additional measures, if required. Academic geriatric medicine clinicians across the United Kingdom recently conducted a modified Delphi process to establish measures to be included within core and extended datasets for geriatric medicine research (Welch *et al.* 2023). The final core consensus domains contained within the dataset include demographics (age, gender, ethnicity, socioeconomic status); specified multiple long-term conditions; functional ability (Barthel and/or Nottingham Extended Activities of Daily Living); frailty assessment (CFS); cognition; and patient-reported outcome measures (dependent on research question). Adoption of this core dataset in all prospectively conducted research focused on CGA in emergency and acute care settings will enable datasets to be combined for individual patient data meta-analyses, or secondary data analyses, and will mitigate against waste in research (Glasziou *et al.* 2014).

Future research should continue to focus on operationalising effective PPI. The benefits of PPI in health services research are well-documented – conversations between PPI members and researchers promotes learning for both parties (Staley and Barron 2019) and enhances understanding of patients' experiences while gaining a greater appreciation of the problems they face (Shen *et al.* 2017). In order to facilitate PPI from the outset of the research process, researchers should consider approaching an existing patient group that relates to their research area of interest e.g., a local support group, or formation of an advisory group similar to Study 4. Early engagement with PPI members will serve as a springboard for future study design and development (Tomlinson *et al*. 2019). PPI integrated into data analysis enriches the credibility of findings by providing insightful interpretations of data (Shippee *et al.* 2015). Thus, integration of PPI should be considered when conducting primary data analysis, or literature reviews synthesis, which will enable members to add their unique perspectives to study findings, thereby improving its relevance and representation of patients' experiences.

8.9 Strengths and Limitations

The strengths and limitations of all four studies have been articulated within the relevant chapters; this section focuses on the thesis as a whole.

Strengths

Through a combined quantitative and qualitative underpinning, this thesis identified and developed the evidence base related to CGA models of care in emergency and acute care settings. A key strength of this thesis was its systematic and rigorous adherence to reporting guidelines, which ensured transparent and robust reporting using explicit methodologies. Studies 1–3 adhered to the PRISMA (Page *et al*. 2021), eMERGE (France *et al*. 2019), and STROBE (Von Elm *et al.* 2007) guidelines, respectively. Transparency of reporting in line with the investigators' initial aims and objectives was further enhanced by publication of study protocols and registration on relevant databases. Both the quantitative and qualitative systematic reviews were registered on PROSPERO database with a protocol for the quantitative review also published in *BMJ Open*. The prospective cohort study was registered in a public trials registry, Clinicaltrials.gov, before participant recruitment commenced and the protocol for the study was also published in *HRB Open Research*. Furthermore, the peer review process of all four studies and two protocols undoubtedly adds rigour to these methods and ensures the publication of high-quality research.

A critique levelled at health services research is the dearth of evidence for evaluating the involvement and impact of older adults in the research process (Conneely *et al.* 2020; Wicks *et al*. 2018). To counter this concern, this thesis placed a significant focus on PPI whereby older adults and those important to them were central to design and development of the evidence base. PPI is described as most effective when people with the lived experience of a condition being researched are involved (Boivin *et al.* 2018). To this end, a PPI advisory group of older adults and those important to them who had recent experience of CGA in the ED was established during study 3, and their involvement as research partners was integrated into Study 4. A proactive approach whereby the judicious involvement of the PPI advisory group ensured their experiential expertise was represented when exploring the core elements of the FFD model of care before development and dissemination of the real-time Delphi survey.

This thesis was strengthened by interprofessional collaborations both within the supervisory team and externally with clinical partners at a local and national level. Collaborations were developed across a number of disciplines and specialities within the research team itself, namely, occupational therapy, physiotherapy, nursing, emergency medicine, geriatric medicine, as well as from researchers experienced in quantitative and qualitative research. Clinical collaborations were key to the successful completion of Study 3 and enabled the integration of services and subsequent exploration of longitudinal patient outcomes. Study 4 was strengthened by extensive national collaborations. Clinical leadership and involvement of the NCPOP as key stakeholders in the design, conduct, and dissemination of the research enhanced external validity of the study as a whole.

Limitations

Notwithstanding the strengths outlined above, there were also overarching methodological limitations noted within the thesis. While the quantitative systematic review and meta-analysis produced a comprehensive overview of outcomes and core components of CGA in an AGU, the limitation of conducting analyses across heterogeneous trials is acknowledged. The lack of standardised methods and tools for measuring clinical and patient-reported outcomes had implications for pooling data, and apart from functional decline, conclusions cannot be drawn on the effectiveness of AGU care on relevant outcomes beyond three months following hospital discharge. Study 2 resolved a gap in the international evidence by identifying and synthesising qualitative studies reporting multiple stakeholders' experiences of inpatient CGA. Given that only 11 primary studies, which reported on the experiences of 153 HCPs, 91 older adults, and 57 caregivers were included, underdeveloped themes and/or concepts may have been a feature. However, there is currently no consensus on what constitutes too few or too many studies in a meta-ethnographic synthesis (Campbell *et al*. 2011).

The methodological limitations related to the prospective cohort study design in Study 3 cannot be overlooked. The lack of randomisation and comparison data in the form of a control group is an inherent limitation of observational studies (Kingston and Jagger 2018). In our context, while analyses controlled and adjusted for a number of confounding factors, it is difficult to draw inferences on the true reduction in admission rate following index ED attendance and causal links between exposure to the interdisciplinary team and outcomes observed. However, within the scope of this PhD, an observational study was deemed pragmatic and enabled profiling of characteristics and outcomes of the cohort as well as exploration of predictors of adverse outcomes at follow-up. Taken together, the findings will inform the design of future robust trials of CGA in the ED.

As previously referenced, establishment and involvement of a PPI advisory group was a strength of this thesis; however, there was scope to incorporate additional PPI activities in Study 4. While the PPI advisory group were empowered and given a voice when establishing the consensus statements contained in the Delphi survey, they were not involved in the ranking process using the online survey tool or subsequent data analyses. Evidence suggests that when older adults are involved in data analysis, "*they make sense of the findings using their own perspectives*" (Ellins *et al.* 2012, p.32). Involvement of the PPI advisory group in the dissemination of study findings may have resulted in more creative methods of dissemination outside of the traditional academic audience (Wilson *et al.* 2015). To this end, active engagement of the PPI advisory group across all stages of the research process in Study 4, i.e., design, development, data analysis, dissemination, would have further enhanced the methodological rigor of the study as a whole. Furthermore, during the time period that this PhD was conducted, there has been growing evidence on the benefits, challenges, and best practices for PPI in evidence syntheses and quantitative research (Agyei-Manu *et al.* 2023). Involvement of older adults and those important to them from the outset of this PhD had the potential to refine (or re-define) research questions, particularly in Studies 1 and 2, to ensure relevance and interpretation of findings using their own unique perspectives.

8.10 Conclusion

This thesis identified and developed the evidence base related to CGA models of care in emergency and acute care settings. Study 1 identified that AGU care decreases the probability that hospitalised older adults with acute medical complaints will experience functional decline at six-month follow-up and are more likely to be living at home at three-month follow-up. Study 2 addressed a gap in the international evidence and synthesised stakeholders' experiences of inpatient CGA. Findings illustrated a reciprocal and refutational synthesis, reflective of the disparate experiences of CGA across stakeholder groups. Study 3 contributed to the development of the international evidence and explored the longitudinal outcomes of older adults who received CGA in the ED. Findings suggested CGA delivered by an interdisciplinary team may improve outcomes by mitigating against the adverse effects of potentially avoidable hospital admissions and focusing on integration of care at the primary-secondary care interface. Finally, Study 4 developed a set of expert consensus-based statements on the core elements underpinning the operational delivery, outcome measurement, and evaluation of the FFD model of care for older adults within an Irish context.

The findings and unique contributions arising from this thesis aim to inspire the design and delivery of evidence-based CGA models of care with a particular focus on identifying the optimum target population, operational models of CGA, core intervention components, and outcomes of interest.

8.11 References

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Chapter 9: Appendices

Appendix 1: PRISMA-P Checklist

Section and topic	Item No	Checklist item	Location where item is reported
ADMINISTRATIVE INFORMATION			
Title:			
Identification	1a	Identify the report as a protocol of a systematic review	Page 38
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	Page 39
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	Page 40
Authors:			
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	Page 38
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	Page 38
Amendments	4	If the protocol represents an amendment of a previously completed OR published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	N/A
Support:			
Sources	5a	Indicate sources of financial OR other support for the review	Page 50
Sponsor	5b	Provide name for the review funder and/or sponsor	N/A
Role of sponsor OR funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	N/A
INTRODUCTION			
Rationale	6	Describe the rationale for the review in the context of what is already known	Page 41–43
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	Page 41
METHODS			
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	Page 45 & 46
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers OR other grey literature sources) with planned dates of coverage	Page 44

Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	Appendix 2 Page 208 & 209
Study records:			
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	Page 45
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	Page 38 & 39
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	Page 39
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	Page 46 & 47
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	Page 46
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome OR study level, OR both; state how this information will be used in data synthesis	Page 48
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised	Page 47
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I^2, Kendall's τ)	Page 47 & 48
	15c	Describe any proposed additional analyses (such as sensitivity OR subgroup analyses, meta-regression)	Page 47 & 48
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	Page 47 & 48
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	Page 48
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	Page 48

Appendix 2: MEDLINE in Ebsco Search Strategy

1. exp Aged/
2. exp Aging/
3. (older adults OR elderly OR geriatric* OR aging OR senior* OR older people OR aged 65 OR 65+). ti,ab.
4. (1. OR 2. OR 3.)
5. exp Geriatric Assessment/
6. Geriatric Assessment .ti,ab.
7. exp Health Services for the Aged/
8. exp Comprehensive Health Care/
9. (5. OR 6. OR 7. OR 8.)
10. (geriatric unit OR specialist geriatric OR acute geriatric) .ti,ab.
11. ((elder* OR older OR geriatric* OR aged) adj3 (unit or ward)) .ti,ab.
12. ((unit* OR ward*) adj3 (geriatric* OR elder* OR aged OR older)) .ti,ab.
13. acute care for elder* .ti,ab.
14. Geriatric* acute care .ti,ab.
15. (10. OR 11. OR 12. OR 13. OR 14.)
16. 4 AND 9 AND 15
17. (randomi#ed controlled trial OR controlled clinical trial) .pt.
18. (randomized OR randomised OR randomization OR randomisation) .ti,ab.
19. placebo .ti,ab.
20. random* .ti,ab.
21. trial .ti,ab.
22. Group* .ti,ab.
23. (comparative study OR clinical trial) .pt.

24. clinical trial* .ti,ab.
25. intervention stud* .ti,ab.
26. follow up .ti,ab.
27. comparative stud* .ti,ab.
28. (nonrandom OR non-random) .ti,ab.
29. (nonrandomized OR nonrandomised OR non-randomised) .ti,ab.
30. quasiexperiment* .ti,ab.
31. (quasi-random* OR quasirandom*) .ti,ab.
32. (quasi-control* OR quasicontrol*) .ti,ab.
33. ((controlled) AND (trial OR study)) .ti,ab.
34. (pre-test OR pretest OR post-test OR posttest) .ti,ab.
35. OR/16-33
36. S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR 34
37. 16 AND 36

Appendix 3: PRISMA Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Page 54
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Page 55
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Page 56 & 57
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Page 57
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Page 58 & 59
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Page 58
Search strategy	7	Present the full search strategies for all databases, registers, and websites, including any filters and limits used.	Appendix 2
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Page 60
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Page 60
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Page 59
	10b	List and define all other variables for which data were sought (e.g., participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Page 61
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Page 60
Effect measures	12	Specify for each outcome the effect measure(s) (e.g., risk ratio, mean difference) used in the synthesis or presentation of results.	Page 60 & 61
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g., tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Page 60
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Page 60 & 61
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Page 60 & 61
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Page 60 & 61
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g., subgroup analysis, meta-regression).	Page 61
	13f	Describe any sensitivity analyses conducted to assess robustness of the	Page 61

Section and Topic	Item #	Checklist item	Location where item is reported
		synthesized results.	
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Page 61
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Page 60
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Page 61 & 62
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Page 66 (Figure 3.1)
Study characteristics	17	Cite each included study and present its characteristics.	Page 62, 63, 69–74
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Page 64
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Page 64, 65, 67, 76–79 Appendix 6
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Page 64 & Appendix 4
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Page 64, 65, 67, 68, 76–79
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Appendix 5
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	Page 79
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Page 79
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Appendix 5
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Page 79 & 80
	23b	Discuss any limitations of the evidence included in the review.	Page 79 & 80
	23c	Discuss any limitations of the review processes used.	Page 90
	23d	Discuss implications of the results for practice, policy, and future research.	Page 81 & 82
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Page 57
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Page 57
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Page 49
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Page 83
Competing interests	26	Declare any competing interests of review authors.	Page 83
Availability of data, code, and other materials	27	Report which of the following are publicly available and where they can be found template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	N/A

Appendix 4: Cochrane Risk of Bias 2 Summary

Outcome: Functional decline

Study	Time of measurement	R	D	Mi	Me	S	O
Landefeld 1995	Discharge	+	?	+	+	?	?
Counsell 2000	Discharge	+	+	+	+	?	?
	3-month follow-up	+	+	?	+	?	?
	6-month follow-up	+	+	?	+	?	?
Zelada 2009	Discharge	-	?	?	-	?	-
Barnes 2012	Discharge	+	?	-	+	?	-
Ekerstad 2017	3-month follow-up	-	+	-	-	?	-
Westgard 2020	6-month follow-up	+	+	+	+	+	+

Risk of bias legend

R Bias arising from the randomisation process
D Bias due to deviations from intended interventions
Mi Bias due to missing outcome data
Me Bias in measurement of the outcome
S Bias in selection of the reported result
O Overall risk of bias

- = high risk

? = some concerns

+ = low risk

Outcome: Length of hospital stay

Study	Time of measurement	R	D	Mi	Me	S	O
Harris 1991	Discharge	-	?	+	+	?	-
Covinsky 1997	Discharge	+	?	+	+	?	?
Asplund 2000	Discharge	+	+	+	+	?	?
Counsell 2000	Discharge	+	+	+	+	?	?
Zelada 2009	Discharge	-	?	+	+	?	-
Wald 2011	Discharge	-	?	+	+	?	-
Barnes 2012	Discharge	+	?	+	+	?	?
Borenstein 2016	Discharge	+	+	+	+	?	?
Ekerstad 2018	Discharge	-	+	+	+	?	-

Outcome: Cost of index admission

Study	Measure Time	R	D	Mi	Me	S	O
Covinsky 1997	Discharge	+	?	+	+	?	?
Asplund 2000	Discharge	+	+	+	+	?	?
Counsell 2000	Discharge	+	+	?	+	?	?
Wald 2011	Discharge	-	?	+	+	?	-
Barnes 2012	Discharge	+	?	+	+	?	?
Ekerstad 2018	Discharge	-	+	+	+	?	-

Outcome: Living at home

Study	Time of measurement	R	D	Mi	Me	S	O
Collard 1985	Discharge	+	-	+	+	?	-
Harris 1991	Discharge	-	?	?	+	?	-
	3-month follow-up	-	?	?	+	?	-
Landefeld 1995	Discharge	+	?	+	+	?	?
	3-month follow-up	+	?	+	+	?	?
Asplund 2000	Discharge	+	+	+	+	?	?
	3-month follow-up	+	+	?	+	?	?
Counsell 2000	Discharge	+	+	?	+	?	?
	3-month follow-up	+	+	?	+	?	?
Wald 2011	Discharge	-	?	+	+	?	-
Barnes 2012	Discharge	+	?	?	+	?	?
Borenstein 2016	Discharge	+	+	+	+	?	?

Outcome: Nursing home admission

Study	Time of measurement	R	D	Mi	Me	S	O
Collard 1985	Discharge	+	-	+	+	?	-
Landefeld 1995	Discharge	+	?	+	+	?	?
	3-month follow-up	+	?	+	+	?	?
Asplund 2000	Discharge	+	+	+	+	?	?
	3-month follow-up	+	+	?	+	?	?
Counsell 2000	Discharge	+	+	?	+	?	?
	3-month follow-up	+	+	?	+	?	?
Wald 2011	Discharge	-	?	+	+	?	-
Borenstein 2016	Discharge	+	+	+	+	?	?

Outcome: Mortality

Study	Time of measurement	R	D	Mi	Me	S	O
Collard 1985	In-hospital	+	-	+	+	?	-
Harris 1991	In-hospital	-	?	+	+	?	-
	3-month follow-up	-	?	+	+	?	-
Landefeld 1995	In-hospital	+	?	+	+	?	?
	3-month follow-up	+	?	+	+	?	?
Asplund 2000	In-hospital	+	+	+	+	?	?
	3-month follow-up	+	+	+	+	?	?
Counsell 2000	In-hospital	+	+	+	+	?	?
	3-month follow-up	+	+	+	+	?	?
Barnes 2012	In-hospital	+	?	+	+	?	+
Borenstein 2016	In-hospital	+	+	+	+	?	?
Ekerstad 2017	In-hospital	-	+	+	+	?	-
	3-month follow-up	-	+	+	+	?	-

Outcome: Hospital re-admission

Study	Time of measurement	R	D	Mi	Me	S	O
Landefeld 1995	3-month follow-up	+	?	+	+	?	?
Asplund 2000	3-month follow-up	+	+	+	+	?	?
Counsell 2000	1-month follow-up	+	+	+	+	?	?
Wald 2011	1-month follow-up	-	?	+	+	?	-
Barnes 2012	3-month follow-up	+	?	-	+	?	+
Borenstein 2016	1-month follow-up	+	+	+	+	?	?
Ekerstad 2017	1-month follow-up	-	+	+	+	?	-
	3-month follow-up	-	+	+	+	?	-

Outcome: Cognitive function

Study	Time of measurement	R	D	Mi	Me	S	O
Landefeld 1995	Discharge	+	?	?	+	?	?
Aspulnd 2000	3-month follow-up	+	+	?	+	?	?
Zelada 2009	Discharge	-	?	?	-	?	-

Outcome: Patient satisfaction

Study	Time of measurement	R	D	Mi	Me	S	O
Counsell 2000	1-month follow-up	+	+	+	+	?	?
Westgard 2020	1-month follow-up	+	+	+	+	+	+

Appendix 5: GRADE Assessment for the Certainty of Evidence

Outcome	Study design/ measurement instrument	Risk of bias	Inconsistency	Indirectness	Imprecision	Estimate of effect (95% CI)	Quality
Functional decline at discharge	3 RCTs and 1 quasi-RCT; 3,957 participants; Katz ADL index	Serious	Serious	Not serious	Not serious	RR 0.89, 95% CI 0.75 to 1.04	**Low certainty**
Comment: 2/4 trials rated overall "high risk" of bias and provided 42% of model weight. Removal of both trials resulted in a change in the effect estimate; therefore, risk of bias was downgraded. Inconsistency was downgraded as heterogeneity remained unexplained (I^2 = 55%) after completion of subgroup analysis i.e., removal of trials conducted in the previous version of the review and in a fixed-effects model as a form of sensitivity analysis.							
Functional decline at three-month follow-up	1 RCT and 1 quasi-RCT; 1939 participants; Katz ADL index and ADL staircase	Serious	Very serious	Not serious	Serious	RR 0.49, 95% CI 0.12 to 1.91	**Very low certainty**
Comment:1/2 trials providing 21% of model weight was rated "high risk" of bias across three domains; therefore, risk of bias was downgraded. Heterogeneity remained high at I^2 = 97% in both random and fixed-effects models; inconsistency was downgraded accordingly. Subgroup analyses were not feasible as only two trials were included in the meta-analysis for this outcome. A RR of 0.49 includes both appreciable benefit or harm and therefore was downgraded for imprecision.							
Functional decline at six-month follow-up	2 RCTs; 1686 participants; Katz ADL index and ADL staircase	Not serious	Not serious	Not serious	Serious	RR 0.79, 95% CI 0.66 to 0.93	**Moderate certainty**
Comment: 0/2 trials were rated "high risk" of bias in any domain. 1/2 trial had an effect estimate (RR 0.74), which includes both appreciable benefit or harm and therefore was downgraded for imprecision.							
Length of hospital stay	5 RCTs, 3 quasi-RCTs, and 1 cluster-RCT; 6646 participants; number of days	Serious	Very serious	Not serious	Not serious	MD -0.36, 95% CI -0.99 to 0.26	**Low certainty**
Comment: 4/9 trials were rated "high risk" in the randomisation process and provided 35% of model weight. Sensitivity analysis resulted in a change in the effect estimate after removal of all 4 trials therefore, risk of bias was downgraded. Inconsistency remained high i.e. I^2 >70% and unexplained after completion of subgroup and sensitivity analysis; inconsistency was downgraded accordingly.							
Cost of index admission	4 RCTs and 2 quasi-RCTs; 4851 participants; US dollar	Serious	Not serious	Not serious	Serious	MD -123.79USD, 95% CI -567.80USD to 320.22USD	**Low certainty**
Comment: 2/6 trials rated "high risk" of bias in the randomisation process and provided 18% of model weight. Sensitivity analysis resulted in a change in the effect estimate after removal of the 2 trials; therefore, risk of bias was downgraded. Subgroup or sensitivity analysis i.e., application of a fixed-effects model did not alter heterogeneity. Imprecision was downgraded due to the width of the 95% CI.							
Living at home at discharge	6 RCTs, 1 quasi-RCT, and 1 cluster-RCT; 6790 participants	Not serious	Not serious	Not serious	Not serious	RR 1.03, 95% CI 0.99 to 1.07	**High certainty**
Comment: 3/8 trials rated overall "high risk" of bias and provided 21% of model weight. Removal of the trials did not change the effect estimate; therefore, risk of bias was not downgraded. Subgroup and/or sensitivity analysis did not alter heterogeneity or the effect estimate.							
Living at home at three-month follow-up	4 RCTs; 2862 participants	Not serious	Not serious	Not serious	Not serious	RR 1.06, 95% CI 0.99 to 1.13	**High certainty**
Comment: 1/4 trials rated overall "high risk" of bias but only provided 12.7% of model weight; therefore, risk of bias was not downgraded. Sensitivity analysis did not alter the effect estimate or heterogeneity. Subgroup analysis was not feasible as all included trials for this outcome were conducted in the previous version of the review.							
Institutionalisation at discharge	4 RCTs, 1 quasi-RCT, and 1 cluster-RCT; 4,891 participants	Not serious	Serious	Not serious	Very serious	RR 1.01, 95% CI 0.78 to 1.30	**Low certainty**
Comment: 2/6 trials rated overall "high risk" of bias and provided 34% of model weight. Removal of both trials did not change the effect estimate; therefore, risk of bias was not downgraded. Subgroup and/or sensitivity analysis did not alter heterogeneity. 3/5 trials had an effect estimate (RR under 0.75 or over 1.25), which includes both appreciable benefit or harm; imprecision was downgraded accordingly.							
Institutionalisation at three-month follow-up	3 RCTs; 2696 participants	Not serious	Not serious	Not serious	Serious	RR 0.88, 95% CI 0.72 to 1.09	**Moderate certainty**

Comment: 0/3 trials rated overall "high risk" of bias. Subgroup analysis was not feasible as all included trials for this outcome were conducted in the previous version of the review. 1/3 trials had an effect estimate (RR 0.74), which includes both appreciable benefit or harm and therefore was downgraded for imprecision.							
Mortality during index admission	6 RCTs, 1 quasi-RCT, and 1 cluster-RCT; 6981 participants	Not serious	Not serious	Not serious	Very serious	RR 0.89, 95% CI 0.68 to 1.17	**Low certainty**
Comment: 3/8 trials had an overall rating of "high risk" of bias and provided 26% of model weight. Removal of the trials did not change the effect estimate; therefore, risk of bias was not downgraded. 5/8 trials had an effect estimate (RR under 0.75 or over 1.25), which includes both appreciable benefit or harm; imprecision was downgraded accordingly. The incidence of mortality varied from 4.1% (AGU) to 4.9% (usual care) during index admission, which also suggests that the optimal information size was not reached.							
Mortality at three-month follow-up	4 RCTs and 1 quasi-RCT; 3270 participants	Not serious	Not serious	Not serious	Very serious	RR 0.93, 95% CI 0.79 to 1.09	**Low certainty**
Comment: 2/5 trials were rated "high risk" of bias in the randomisation process and provided 21% of model weight. Removal of both trial did not change the effect estimate; therefore, risk of bias was not downgraded. 3/5 trials had an effect estimate (RR under 0.75 or over 1.25), which includes both appreciable benefit or harm; imprecision was downgraded accordingly.							
Hospital re-admission at one-month follow-up	1 RCT, 2 quasi-RCTs, & 1 cluster-RCT ; 3540 participants	Serious	Serious	Not serious	Serious	RR 1.01, 95% CI 0.80 to 1.28	**Low certainty**
Comment: 2/4 trials were rated "high risk" in the randomisation process and provided 31% of model weight. Sensitivity analysis resulted in a change in the effect estimate after removal of both trials; therefore, risk of bias was downgraded. Subgroup analysis or applying a fixed-effects model as a form of sensitivity analysis did not alter or explain heterogeneity i.e. $I^2 > 50\%$. One trial had an effect estimate (RR 0.70), which includes both appreciable benefit or harm; therefore, imprecision was downgraded.							
Hospital re-admission at three-month follow-up	3 RCTs and 1 quasi-RCT; 3104 participants	Serious	Not serious	Not serious	Not serious	RR 0.95, 95% CI 0.82 to 1.09	**Moderate certainty**
Comment: 2/4 trials had an overall rating of "high risk" of bias and provided 49% of the model weight; therefore, risk of bias was downgraded. Subgroup and/or sensitivity analysis did not alter heterogeneity or the effect estimate.							

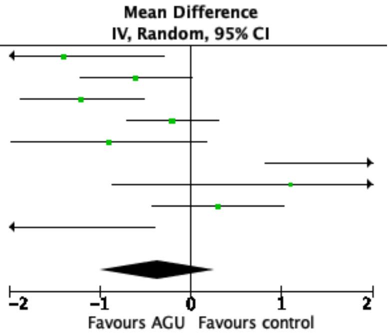
GRADE Working Group grades of evidence
High quality: We are very confident that the true effect lies close to that of the estimate of the effect.
Moderate quality: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low quality: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect.
Very low quality: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect.

Appendix 6: Forest Plots for Outcomes Reported in Meta-Analysis

Length of hospital stay (days)*

Study or Subgroup	AGU Mean	AGU SD	AGU Total	Control Mean	Control SD	Control Total	Weight	Mean Difference IV, Random, 95% CI
Asplund 2000	5.9	5.7	190	7.3	5.7	223	10.9%	−1.40 [−2.50, −0.30]
Barnes 2012	6.7	6.2	858	7.3	6.43	774	14.1%	−0.60 [−1.21, 0.01]
Borenstein 2016	5.4	5.1	792	6.6	7.2	592	13.7%	−1.20 [−1.88, −0.52]
Counsell 2000	6.1	4.7	767	6.3	5.36	764	14.8%	−0.20 [−0.71, 0.31]
Covinsky 1997	7.5	6.1	327	8.4	7.74	324	11.1%	−0.90 [−1.97, 0.17]
Ekerstad 2018	10.4	6.2	206	8.3	7	202	9.7%	2.10 [0.82, 3.38]
Harris 1991	10.9	7.88	97	9.8	7.82	170	6.3%	1.10 [−0.86, 3.06]
Wald 2011	3.4	2.7	122	3.1	2.7	95	13.4%	0.30 [−0.42, 1.02]
Zelada 2009	7.5	4.3	68	9.92	7.74	75	6.0%	−2.42 [−4.45, −0.39]
Total (95% CI)			3427			3219	100.0%	−0.36 [−0.99, 0.26]

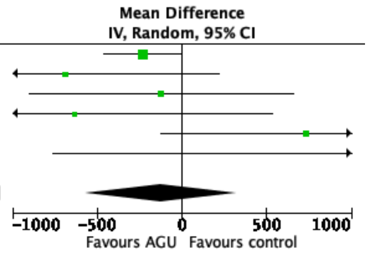
Heterogeneity: $Tau^2 = 0.63$; $Chi^2 = 34.53$, df = 8 ($P < 0.0001$); $I^2 = 77\%$
Test for overall effect: Z = 1.13 (P = 0.26)



Cost of index admission

Study or Subgroup	Experimental Mean	Experimental SD	Experimental Total	Control Mean	Control SD	Control Total	Weight	Mean Difference IV, Random, 95% CI
Asplund 2000	1,242	1,213	190	1,472	1,138	223	38.0%	−230.00 [−458.16, −1.84]
Barnes 2012	6,920	9,673	858	7,607	8,980	774	15.3%	−687.00 [−1592.07, 218.07]
Counsell 2000	6,017	7,193	767	6,139	8,327	764	18.3%	−122.00 [−901.60, 657.60]
Covinsky 1997	6,608	6,551	326	7,240	8,504	324	10.8%	−632.00 [−1799.53, 535.53]
Ekerstad 2018	6,449	4,014	206	5,715	4,811	202	16.3%	734.00 [−126.59, 1594.59]
Wald 2011	24,617	15,828	122	21,488	13,407	95	1.3%	3129.00 [−764.17, 7022.17]
Total (95% CI)			2469			2382	100.0%	−123.79 [−567.80, 320.22]

Heterogeneity: $Tau^2 = 121593.54$; $Chi^2 = 9.07$, df = 5 ($P = 0.11$); $I^2 = 45\%$
Test for overall effect: Z = 0.55 (P = 0.58)



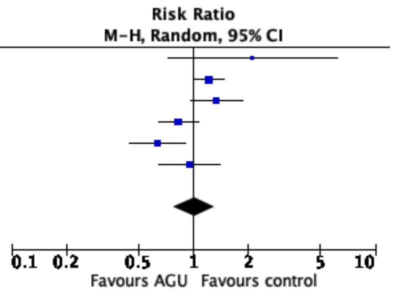
* Length of hospital stay and cost data reported by Collard *et al.* [38] were excluded from meta-analyses as the reported standard errors were deemed erroneous

Admission to a long-term care institution

Hospital discharge

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Risk Ratio M-H, Random, 95% CI
Asplund 2000	9	190	5	223	4.6%	2.11 [0.72, 6.20]
Borenstein 2016	223	792	136	592	22.8%	1.23 [1.02, 1.47]
Collard 1985	46	218	75	477	18.1%	1.34 [0.96, 1.87]
Counsell 2000	99	767	119	764	20.9%	0.83 [0.65, 1.06]
Landefeld 1995	43	327	67	324	17.4%	0.64 [0.45, 0.90]
Wald 2011	38	122	31	95	16.1%	0.95 [0.65, 1.41]
Total (95% CI)		2416		2475	100.0%	1.01 [0.78, 1.30]
Total events	458		433			

Heterogeneity: $Tau^2 = 0.07$; $Chi^2 = 17.99$, df = 5 ($P = 0.003$); $I^2 = 72\%$
Test for overall effect: Z = 0.07 (P = 0.95)

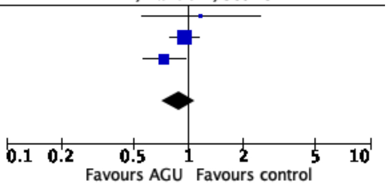


Three-month follow-up

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Risk Ratio M-H, Random, 95% CI
Asplund 2000	11	190	16	324	7.2%	1.17 [0.56, 2.47]
Counsell 2000	167	767	174	764	56.3%	0.96 [0.79, 1.15]
Landefeld 1995	67	327	90	324	36.5%	0.74 [0.56, 0.97]
Total (95% CI)		1284		1412	100.0%	0.88 [0.72, 1.09]
Total events	245		280			

Heterogeneity: Tau² = 0.01; Chi² = 2.86, df = 2 (P = 0.24); I² = 30%
Test for overall effect: Z = 1.18 (P = 0.24)

Risk Ratio M-H, Random, 95% CI



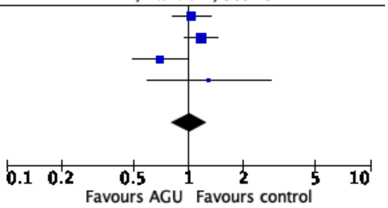
Hospital re-admission

One-month follow-up

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Risk Ratio M-H, Random, 95% CI
Borenstein 2016	127	792	91	592	32.5%	1.04 [0.81, 1.34]
Counsell 2000	157	767	133	764	36.4%	1.18 [0.95, 1.45]
Ekerstad 2017	40	206	56	202	23.4%	0.70 [0.49, 1.00]
Wald 2011	15	122	9	95	7.7%	1.30 [0.59, 2.84]
Total (95% CI)		1887		1653	100.0%	1.01 [0.80, 1.28]
Total events	339		289			

Heterogeneity: Tau² = 0.03; Chi² = 6.37, df = 3 (P = 0.09); I² = 53%
Test for overall effect: Z = 0.08 (P = 0.94)

Risk Ratio M-H, Random, 95% CI

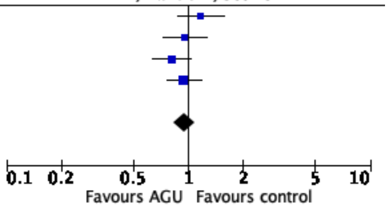


Three-month follow-up

Study or Subgroup	Favours AGU Events	Favours AGU Total	Control Events	Control Total	Weight	Risk Ratio M-H, Random, 95% CI
Asplund 2000	61	190	61	223	19.3%	1.17 [0.87, 1.58]
Barnes 2012	88	858	83	774	21.0%	0.96 [0.72, 1.27]
Ekerstad 2017	73	206	88	202	27.5%	0.81 [0.64, 1.04]
Landefeld 1995	104	327	109	324	32.1%	0.95 [0.76, 1.18]
Total (95% CI)		1581		1523	100.0%	0.95 [0.82, 1.09]
Total events	326		341			

Heterogeneity: Tau² = 0.00; Chi² = 3.53, df = 3 (P = 0.32); I² = 15%
Test for overall effect: Z = 0.75 (P = 0.45)

Risk Ratio M-H, Random, 95% CI



Appendix 7: eMERGe Reporting Guidelines

No	Criteria Headings	Reporting Criteria	Location where item is located
Phase 1—Selecting meta-ethnography and getting started			
Introduction			
1	Rationale and context for the meta-ethnography	Describe the gap in research or knowledge to be filled by the meta-ethnography, and the wider context of the meta-ethnography	Page 90 & 91
2	Aim(s) of the meta-ethnography	Describe the meta-ethnography aim(s)	Page 91
3	Focus of the meta-ethnography	Describe the meta-ethnography review question(s) (or objectives)	Page 91
4	Rationale for using meta-ethnography	Explain why meta-ethnography was considered the most appropriate qualitative synthesis methodology	Page 90 & 91
Phase 2—Deciding what is relevant			
Methods			
5	Search strategy	Describe the rationale for the literature search strategy	Page 92
6	Search processes	Describe how the literature searching was carried out and by whom	Page 92 & 93
7	Selecting primary studies	Describe the process of study screening and selection, and who was involved	Page 93
Findings			
8	Outcome of study selection	Describe the results of study searches and screening	Page 94 & 95
Phase 3—Reading included studies			
Methods			
9	Reading and data extraction approach	Describe the reading and data extraction method and processes	Page 93 & 94
Findings			

10	Presenting characteristics of included studies	Describe characteristics of the included studies	Page 95 & 96
Phase 4—Determining how studies are related			
Methods			
11	Process for determining how studies are related	Describe the methods and processes for determining how the included studies are related: - Which aspects of studies were compared AND - How the studies were compared	Page 93 & 94
Findings			
12	Outcome of relating studies	Describe how studies relate to each other	Pages 100–112
Phase 5—Translating studies into one another			
Methods			
13	Process of translating studies	Describe the methods of translation: -Describe steps taken to preserve the context and meaning of the relationships between concepts within and across studies -Describe how the reciprocal and refutational translations were conducted -Describe how potential alternative interpretations or explanations were considered in the translations	Page 93 & 94
Findings			
14	Outcome of translation	Describe the interpretive findings of the translation.	Page 112 & 113
Phase 6—Synthesizing translations			
Methods			

15	Synthesis process	Describe the methods used to develop overarching concepts ("synthesised translations")Describe how potential alternative interpretations or explanations were considered in the synthesis	Page 93 & 94
Findings			
16	Outcome of synthesis process	Describe the new theory, conceptual framework, model, configuration, or interpretation of data developed from the synthesis	Page 112 & 113
Phase 7—Expressing the synthesis			
Discussion			
17	Summary of findings	Summarize the main interpretive findings of the translation and synthesis and compare them to existing literature	Pages 113–115
18	Strengths, limitations, and reflexivity	Reflect on and describe the strengths and limitations of the synthesis: - Methodological aspects—for example, describe how the synthesis findings were influenced by the nature of the included studies and how the meta-ethnography was conducted. -Reflexivity—for example, the impact of the research team on the synthesis findings	Page 117
19	Recommendations and conclusions	Describe the implications of the synthesis	Page 115 & 116

Appendix 8: Search String for Qualitative Systematic Review and Meta-Ethnography

S1	CGA OR Geriatric Assessment OR comprehensive geriatric assessment OR geriatric evaluation OR Geriatric consultation OR multidisciplinary assess* OR multi-disciplinary assess*
S2	Qualitative OR Experience* OR Perspective* OR case stud* OR interview* OR focus group* OR participant observation OR Naturalistic observation OR ethnograph* OR phenomenol* OR lived experience OR grounded-theor* OR thematic analysis OR Narrative analysis OR Discourse analy* OR field-notes
S3	S1 AND S2

Appendix 9: Descriptive Characteristics of Included Studies in Qualitative Systematic Review and Meta-Ethnography

Citation and setting	Population	Sample	Research aim(s)	Methodology (refers to overall design in studies with multiple phases, data collection and analysis)	Description of the CGA process	Team composition
Åberg *et al.* 2017 Sweden	Healthcare professionals working across four geriatric wards (69 beds) providing care to older adults aged ≥65 years.	Total sample: 32 Occupational therapist (n=3) Dietitian (n=1) Social worker (n=3) Physician (n=8) Physiotherapist (n=4) Registered nurse (n=7) Assistant nurse (n=6)	To study the perceptions of health care professionals on factors that may facilitate or hinder the quality of hospital-based geriatric care from an interdisciplinary team perspective.	Qualitative Focus group interview Thematic framework approach	Interdisciplinary CGA led by a geriatrician. Assessment and care was proactive and goal-oriented with a focus on systematic preventive care processes. Specific team members were responsible for the care of each patient, which influenced the care procedures.	Geriatrician-led team inclusive of registered nurses, nurse assistants, physiotherapists, occupational therapists, social workers with access to a dietician and speech therapist, as indicated.
Busetto *et al.* 2017 Germany	Healthcare professionals working in a 150-bed geriatric hospital providing care to older adults aged ≥65 years with a range of diagnoses.	Total sample: n=15 Medical doctor (n=4) Occupational therapist (n=4) Neuropsychologist (n=3) Physical therapist (n=2) Registered nurse (n=2)	(1)To describe the implementation of an integrated geriatric care intervention at a German geriatric hospital, and (2) to explore whether the application of an integrated geriatric care model provides insights into when and why beneficial outcomes can be achieved.	Qualitative Semi-structured interview CMO (context-mechanisms-outcomes)-based model	Multidisciplinary CGA with a focus on standardised assessments and weekly team meetings. Assessment findings formed the basis of discussions at team meetings and further care planning.	Geriatrician-led team inclusive of occupational therapists, neuropsychologists, physical therapists, nurses, speech therapists and social workers.
Charalambous *et al.* 2016 United Kingdom	Registered nurses working on acute medical healthcare of the older person wards in a large acute hospital trust in England.	Total sample: n=8 Registered nurse (n=8)	To understand how documentation may affect the quality of care in one acute hospital trust in England by understanding the experiences of registered nurses towards the documentation used while working in older person care in acute hospitals wards.	Qualitative Semi-structured interview Thematic content analysis	The CGA process specific to the study site not reported.	Team composition not reported.
Darby *et al.* 2020 United Kingdom	Older adults and their informal caregivers discharged	Total sample: n=24 Older adult (n=18) Caregiver (n=6)	To gain an in-depth understanding of the older patient and informal carer experience of an acute	Mixed methods Constructivist epistemology Semi-structured interview Thematic analysis	CGA delivered by a geriatrician who aimed to coordinate the delivery of additional immediate care or	Specialist geriatric medical assessment (either senior trainees or fully qualified

	directly home from an acute medical unit within 72 hours of attending hospital.		medical unit stay and their experience of receiving the additional intervention from geriatricians.		aftercare they deemed necessary. Such care could include a review of diagnoses; a drug review; further assessment at home or in a clinic or by recommending admission rather than discharge; advance care planning; or liaison with primary care, intermediate care, and specialist community services. The geriatricians liaised with hospital and community health professionals with the aim of enabling the CGA process to be delivered across the interface between the acute medical unit and the community.	specialists) in addition to the treatment routinely provided by the units' consultant physicians and medical team. Patients were referred to a multidisciplinary team (physiotherapist, occupational therapist), as indicated.
de Vos *et al* 2017 Netherlands	Healthcare professionals working in 450-bed regional hospital with a 22-bed geriatric unit for older adults aged ≥70 years	Total sample: n=10 Geriatric nurse (n=2) Transfer nurse (n=2) Team leader (n=5) Internist (n=1)	To identify factors impacting on the effectiveness of the implementation of a novel program, the Prevention and Reactivation Care Program (PReCaP), which targets hospital-related functional decline and geriatric care 'as usual' without use of an explicit program.	Mixed methods Semi-structured interview Thematic analysis	The PReCaP offers a bundle of goal-oriented interventions aimed at the physical, social and psychological domains of functional decline including identification of patient at risk within 48 hours after admission, assessment of risk factors for functional decline, consultation with patient and relatives to discuss vulnerability and risk factors, biweekly multidisciplinary meeting and provision of support and treatment to informal caregiver.	Geriatrician, nursing home physician, nurses trained in geriatric care, nurse practitioners, social workers, transfer nurses, case managers, psychiatrists, psychologists, physiotherapists, occupational therapists, and dieticians, as indicated.

Gardner *et al.* 2019 United Kingdom	(1) Older adults and their informal caregivers admitted to Older Person's Acute Assessment Unit or a rehabilitation ward in a 48-bed community hospital, and (2) Healthcare professionals delivering CGA across varying service models (hospital inpatient and hospital-at-home).	Total sample: n=31* Older adult (n=12) Caregiver (n=10) Healthcare professional (n=9) *Sample pertains to inpatient hospital cohort only	To define and describe the structure, content and delivery of the CGA as practised in hospital and hospital-at-home based settings, from the perspective of healthcare professionals who deliver it and patients and caregivers who experience this type of health care.	Mixed methods Comparative case study Semi-structured interview Framework method	Older People's Assessment Unit: the team identify patients from an accident and emergency department and a medical assessment unit to provide a timely, comprehensive assessment and plan of care for older patients, thereby contributing to decision making about the appropriate 'place of care' at or near the beginning of the acute health event. The acute assessment is distributed across MDT members throughout the admission, with an average length of stay in the unit of 1.5 days. Community hospital: The team complete discipline-specific assessments within shared multidisciplinary ward notes. A standardised CGA document is not in use.	Older Person's Acute Assessment Unit: Geriatrician-led team inclusive of registered nurses, (including a mental health nurse with experience of working with older people), physiotherapists, occupational therapists and Age UK staff. Community hospital: The rehabilitation ward was under the care of a consultant geriatrician with a frailty team based in the hospital. Composition of frailty team not reported.
Harvey et al 2017 [36] Australia	(1) Older adults and their informal caregivers admitted to a 32-bed purpose-built Older Persons Evaluation, Rehabilitation and Assessment (OPERA) unit, and (2) Healthcare professionals working across hospital and primary care settings delivering care to older adults.	Total sample: n=61 Older adult (n=19) Caregiver (n=19) Healthcare professional (n=23)	(1) To identify ways to enhance the Geriatric Evaluation and Management (GEM) model of care, and (2) to describe the care transition experiences of older adults who transfer between subacute and primary care.	Exploratory, longitudinal case study design Semi-structured and focus group interview Thematic analysis	Delivered in a dedicated ward environment the multidisciplinary CGA focused on medical, psychosocial and rehabilitative care tailored to the older adult's specific needs and promoted coordinated discharge planning.	Geriatrician-led team inclusive of registered nurses, nurse assistants, physiotherapists, occupational therapists and social workers.

Mäkelä *et al.* 2020 United Kingdom	Older adults aged ≥65 years and their informal caregivers admitted to an acute care of the elderly ward or geriatrician-led care on a medical ward or community hospital.	Total sample: n=36* Older adult (n=19) Caregiver (n=17) *Sample pertains to inpatient hospital cohort only	(1) To explore the work of patients and caregivers at the time of an acute health event, the interface with health professionals in hospital and hospital at home, and (2) how their experiences related to the principles that underpin CGA.	Mixed methods Semi-structured interview Normalisation process theory	The CGA process specific to the study sites not reported.	Team composition not reported.
Ribbink *et al.* 2021 The Netherlands	Older adults aged ≥65 years and their informal care givers admitted to a 23-bed intermediate care facility in an acute geriatric community hospital.	Total sample: n=18 Older adult (n=13) Caregiver (n=5)	To evaluate the patient experience and satisfaction with care at an acute geriatric community hospital.	Mixed methods Semi-structured interview Thematic analysis	The CGA was conducted on admission and provided an overview of all medical, functional, psychological and social problems. The CGA was discussed during multidisciplinary team meetings and used to formulate a care plan for each patient with a focus on early mobilisation and rehabilitation.	Geriatrician-led team inclusive of nurses trained in geriatric care, nurse assistants and physiotherapists.
Sifer-Rivière *et al.* 2011 France	Healthcare professionals working in French Oncogeriatric Coordination Units providing care to cancer patients aged >75 years	Total sample: n=32* Geriatrician (n=6) Surgeon (n=5) Radiotherapist (n=5) Oncologist (n=5) Palliative care physician (n=2) Emergency physician (n=2) Anaesthetist (n=2) Representatives from the French National Cancer Institute (n=2) *Three interviewees asked not to be recorded	To identify physicians' views on the role of geriatric and oncologic tools in the organisation and management of medical oncogeriatric activities.	Qualitative Semi-structured interview Grounded theory analysis	The geriatric assessment focuses on evaluating the elderly patient's general condition (vulnerability or very fragility) and to orient the search for signs of dependency or geriatric syndromes. The assessment procedures are perceived as complementary for medical decision making based on other criteria such as autonomy, physiological reserves and cognitive capacity, etc. Variable levels of participation by geriatricians at multidisciplinary consulting meetings.	Team composition not reported.

Westgård *et al.* 2019 Sweden	Older adults aged ≥75 years admitted to an acute geriatric medical ward.	Total sample: n=10 Older adult (n=10)	To explore how frail older adults experienced receiving CGA on an acute geriatric medical ward	Mixed methods Semi-structured interview Conventional content analysis	The CGA was person-centred and delivered by a multidisciplinary team to address the frail older adults' multiple needs related to physical health, functional ability, psychological state, cognition, and social-environmental circumstances. Findings from the CGA were used to tailor individualised treatment and rehabilitation plans for the older adult.	The team consisted of medical doctors trained in geriatric medicine, nurses, nurse assistants, occupational therapists and physical therapists with access to a social worker and nutritionist, as indicated.

Appendix 10: Participant Information Leaflet

PARTCIPANT INFORMATION LEAFLET

Comprehensive geriatric assessment in the emergency department: a prospective cohort study of clinical and process outcomes

Dear Prospective Participant,

A team of researchers at the University of Limerick and University Hospital Limerick are conducting a study to explore the benefits of comprehensive assessment for older adults aged ≥65 years who present to the emergency department at University Hospital Limerick.

For this study, comprehensive assessment includes assessment and intervention by a dedicated team of specialists including medical, nursing, occupational therapy, physiotherapy, and medical social work.

What is the study about?

The study examines whether comprehensive assessment and intervention for older adults by a dedicated team of healthcare professionals in the emergency department, improves care and health outcomes. We collect data on patients aged ≥ 65 years related to their health and demographic status. We then assess health status and whether the patient has required further medical care at 1-month and 6-month follow-up through a telephone call.

What will I have to do?

If you consent to participate in this study, a Research Nurse will access your medical notes to gain some medical information relevant to your admission. The Research Nurse will also ask you for permission to contact you via phone 1 month and 6 months after your discharge from the ED to assess how you feel and whether you have required further medical care.

What are the benefits?

The findings of the study will help to determine whether implementing this type of comprehensive assessment for older adults in the emergency department will improve their care and health outcomes.

What are the risks?

We do not envisage any risks associated with taking part in the study.

What if I do not want to take part?

Participation in this study is voluntary and you can choose not to take part or to stop your involvement in this study at any time without giving reason and without negative consequences for you. There is no financial reimbursement for participation in the research. You will receive standard care in the emergency department regardless of whether you participate in the study.

What happens to the information?

The information that is collected will be kept confidential and stored securely and safely on a password-protected computer at University of Limerick. Only the Research Team will have access to the information collected and General Data Protection Regulation will apply. Your name will not appear on any report or publication arising from this study. The information that is gathered in the study will be kept for seven years. After this time, it will be destroyed. University Hospital Limerick staff will not be informed of your participation or non-participation in this study. The results of the study will be shared in aggregated and anonymised form through reporting, publications and at conferences. If you wish to be informed of the study findings this information will be made available to you.

Who else is taking part?

Adults aged 65 years or older who present to the emergency department between now and the end of July 2022 will be invited to participate if they are medically fit to do so.

What if something goes wrong?

In the very unlikely event that something goes wrong during the study, the medical team responsible for your care will be informed and appropriate action taken.

What happens at the end of the study?

At the end of the study all data gathered from the research will be stored securely and safely by the researchers in the University of Limerick, the data will be analysed. All data will be stored for 7 years and then securely destroyed.

What if I have more questions or do not understand something?

If you have any questions about the study, you may contact either of the researchers listed below. It is important that you feel that all your questions have been answered.

What happens if I change my mind during the study?

At any stage should you feel that you want to stop taking part in the study, you are free to stop and take no further part. There are no consequences for changing your mind about being in the study.

IF YOU ARE INTERESTED IN TAKING PART OR WANT TO FIND OUT MORE, PLEASE CONTACT:

Gillian Corey, Research Nurse

Emergency Department,

University Hospital Limerick

Tel: 086 0489346

Thank you for taking the time to read this. I would be grateful if you would consider participating in this study.

Yours sincerely,

____

Íde O'Shaughnessy

Principal Investigator

PhD Candidate

School of Allied Health,

University of Limerick,

Tel (061) 234149

Email: Ide.OShaughnessy@ul.ie

Appendix 11: Participant Consent Form

PARTICIPANT CONSENT FORM

Title of study: Comprehensive geriatric assessment in the emergency department: a prospective cohort study of clinical and process outcomes

Should you agree to participate in this study please read the statements below and if you agree to them, please sign the consent form.

☐ I have read and understood the participant information sheet.

☐ The information has been fully explained to me and I have been able to ask questions, all of which have been answered to my satisfaction.

☐ I understand what the study is about, and what the results will be used for.

☐ I understand that what the researchers find out in this study may be shared with others but that my name will not be given to anyone in any written material developed.

☐ I understand that the results of this study may be used in future research.

☐ I am fully aware of what I will have to do, and of any risks and benefits of the study.

☐ I know that my participation in the study is voluntary and that I can withdraw at any stage without giving any reason to the researchers and without negative consequences for me.

I agree to the statements above and I consent to taking part in this research study.

Name: (please print): ___________________________

Signature: ____________________________________ Date: ______________

Investigator's Signature _________________________ Date: ______________

Appendix 12: STROBE Reporting Guidelines

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Page 137
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	Page 138
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Page130 & 140
Objectives	3	State specific objectives, including any prespecified hypotheses	Page 140
Methods			
Study design	4	Present key elements of study design early in the paper	Page 141
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Page 141 & 143
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	Pages 141–144
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	N/A
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Page 143 & 144
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Page 143 & 144
Bias	9	Describe any efforts to address potential sources of bias	144
Study size	10	Explain how the study size was arrived at	144
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	144 & 145
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	144 & 145
		(*b*) Describe any methods used to examine subgroups and interactions	144 & 145
		(*c*) Explain how missing data were addressed	N/A
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	N/A
		(*e*) Describe any sensitivity analyses	N/A

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—e.g., numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Page 136–141
		(b) Give reasons for non-participation at each stage	N/A

		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (e.g., demographic, clinical, social) and information on exposures and potential confounders	Page 147 &148 (Table 6.1)
		(b) Indicate number of participants with missing data for each variable of interest	Page 146, 148–150
		(c) *Cohort study*—Summarise follow-up time (e.g., average and total amount)	Page 146, 148–150
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	Page 146, 148–150
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	N/A
		Cross-sectional study—Report numbers of outcome events or summary measures	N/A
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Page 151 (Table 6.2)
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	Appendix 14
Discussion			
Key results	18	Summarise key results with reference to study objectives	151–154
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	155 & 156
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	151–154
Generalisability	21	Discuss the generalisability (external validity) of the study results	154 & 155
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	157

Appendix 13: Components of Comprehensive Geriatric Assessment

Elements of CGA	**Yes/No**
Clinical leadership	Yes
Structured assessment	Yes
Multidisciplinary team meetings	No
Goal setting	Yes
Involving patients and carers in goal setting	Yes
Outpatient follow-up	Yes
Ward environment	No
Adequate time	Yes
Speciality knowledge, experience, competence	Yes
Tailoring treatment plans to the individual	Yes

Appendix 14: Outcome at index ED Attendance Logistic Regression Models

	ED Revisit	**Hospital Admission**	**NH Admission**	**CST OP Services**	**PC Services**
30 Days					
Outcome at Index (2)	2.18 [0.45, 10.64]	3.52 [0.41, 30.35]	0.13*** [0.04, 0.43]	25.02** [3.24, 193.40]	7.55** [2.23, 25.55]
Age	0.95 [0.87, 1.04]	0.93 [0.84, 1.03]	0.96 [0.89, 1.05]	0.98 [0.92, 1.05]	1.06 [0.98, 1.16]
Nagelkerke, R^2	0.017	0.033	0.183	0.236	0.220
Chi-Square	1.061	1.730	11.644***	22.540***	14.355 ***
180 Days					
Outcome at Index (2)	0.29* [0.10, 0.84]	0.22** [0.07, 0.67]	0.25* [0.07, 0.88]	8.53* [1.05, 69.38]	3.13 [0.02, 24.35]
Polypharmacy, OR[CIs]	1.17 [1.02, 1.34]	1.23** [1.06, 1.43]	0.98 [0.82, 1.18]	0.95 [0.81, 1.11]	1.05 [0.86, 1.28]
Frailty, OR[CIs]	0.928 [0.55, 1.57]	1.40 [0.80, 2.46]	2.26* [1.12, 4.53]	1.36 [0.77, 2.42]	1.31 [0.64, 2.69]
Nagelkerke, R^2	0.077	0.109	0.085	0.108	0.057
Chi-Square	5.272 *	7.230**	4.622*	6.727**	2.735

*p<0.05, **p<0.01, ***p<0.001; Outcome at index (2), reference group – discharge home

Appendix 15: World Café Procedure

The World Café principles and guidelines emphasise the importance of creating a hospitable environment (i.e., a café-style ambience) where individual and collective knowledge and ideas can be shared. The facilitators set the context to the event by describing the aim of the meeting and provided an overview of the Frailty at the Front Door (FFD) model of care. The venue of the event was set up with breakout sessions, which focused on specific domains of the FFD model of care. Facilitators discussed the principles and ground rules for participation before inviting participants to brainstorm and discuss specific aspects of each domain through use of broad questions. Individual worksheets, outlined below, were also provided, which enabled less confident participants to write down their contribution and thoughts regarding the core underpinnings of the FFD domain under discussion.

Each domain was discussed for 30-45 minutes and participants rotated across breakout sessions with approximately 20 participants per session. An independent notetaker not linked to the FFD service model recorded group discussions. After all domains were discussed across breakout sessions, the World Café facilitators summarised and shared knowledge from all the discussions with the full participant group using a visual summary on a flipchart. All participants had the option of commenting on the visual summary ensuring co-analysis of responses.

Frailty Front Door Model Design Workshop – Consensus Building Day

23rd June, University of Limerick

Worksheet

WORKSHOP FOCUS

- ✓ to consider details and definitions of the FFD pathway components
- ✓ to agree a set of evidence-based core elements and recommendations to inform key changes and improvements using consensus building, *fig 1*. (*Dore et al 2010)*
- ✓ to build consensus around FFD service interventions to ensure consistency of design and standardisation of model and implementation nationally.

DESIGN CONSIDERATIONS PER PATHWAY COMPONENT

- Support exploration and definitions for FFD model
- Identify what good looks like per component
- Develop an understanding of what already has been achieved
- Develop an understanding of what areas need to be addressed as a priority
- What are the key enablers to make this work
- What are the risks/challenges we should be aware of?
- Evidence/data to show what works

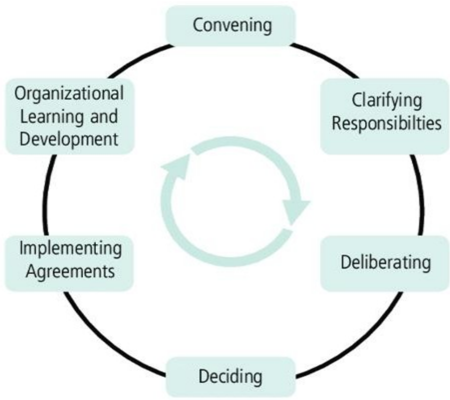


Figure 1, Consensus Building (Dore eta al 2010)

The below table and prompts aim to trigger group discussions per component and tease out recommendations:

Pillar 1- Facilitated group discussions on role and function of the FFD team

Pathway component	Group Prompts	Key Recommendations for National Standardisation
1. Aims and objectives of FFD Teams	1. State your understanding of the key aims/objectives of a FFD team? 2. What works well? 3. What needs to be adopted(spread)?	
2. Screening and Assessment (who and how)	1. What screening tools are in use? 2. What works well? 3. What should be adopted?	
3. Intervention (inc. role of technology) - (who and what)	1. What interventions are undertaken? 2. What works well? 3. What should be adopted?	
4. Interdisciplinary working and integration of care	1. What is your understanding/experience of interdisciplinary and integrated working that have supported the FFD teams 2. What has worked well? 3. What could be improved on?	

Pillar 2 - Facilitated group discussions on FFD metrics and workforce development

Pathway stage	Group Prompts	Key Recommendations for National Standardisation
5. Evaluation of FFD Impact & Metrics (in use, proposed and required)	1. What is the current evaluation process? 2. What metrics are currently in use? 3. What metrics are required? 4. What should be adopted?	
6. Research Priorities	1. What research is currently active your service Re: FFD or older persons care pathways implementation? 2. What research would benefit development of FFD/older persons care pathways? 3. What should be adopted?	
7. Education and training needs	1. What training/staff development is available to supported FFD teams? 2. What training needs to be made available? (Flexible solutions to attain interdisciplinary/integrated care competencies, upskill for role)? 3. What should be adopted?	

Appendix 16: Public and Patient Involvement Advisory Group

An advisory group, which involved consultation between members of the research team and a PPI stakeholder panel of older adults and family caregivers who had recent experience of CGA in the ED (O'Shaughnessy *et al*. 2022) was facilitated. The PPI advisory group provided insights and guidance to the process, ensuring meaningful representation of a lived-experience perspective when identifying priorities of the FFD model of care. When preliminary analyses and initial theme development were complete, a 2-hour long meeting was scheduled with six older adults and family caregivers of the PPI advisory group. The meeting was facilitated by two members of the research team and involved a presentation in lay language of the research process and preliminary themes and consensus statements followed by a facilitated discussion on how the model of care aligns with what they consider meaningful. There was broad agreement that the researchers' interpretation and presentation of findings was in keeping with older adults and family caregivers' priorities of the service model.

Appendix 17: Consensus Statements contained in Delphi Survey

1. **Aim of Frailty at the Front Door model**

a) Reduce length of stay of older adults in the emergency department (ED)

b) Screen for presence and risk of frailty among older adults who present to the ED

c) Improve the experience and outcomes of older adults living with frailty who present to the ED

d) Enable early identification and assertive case management of older adults living with frailty to ensure appropriate plan of care

e) Promote the age attuning of the ED to meet the needs of older adults living with frailty through bespoke pathways, processes and an interdisciplinary approach to care

2. Objectives of Frailty at the Front Door model

a) Embed Comprehensive Geriatric Assessment (CGA) in the ED through early assessment and intervention of medical, functional, cognitive, and psychosocial abilities

b) Reduce the time from arrival to the ED to initial medical assessment and work-up for frail older adults

c) Facilitate timely and supported patient discharge from the ED through initiation of referrals to community-based integrated care services

d) Reduce the incidence of admission to hospital among older adults living with frailty who present to the ED

e) Actively support patient advocacy ensuring older adults living with frailty are admitted to appropriate in-patient setting

f) Reduce the length of stay for older adults living with frailty admitted to hospital following ED attendance

g) Reduce incidence of long-term care/nursing home admission following ED attendance

h) Promote a culture of proactive case management older adults living with frailty in the ED, ensuring clear communication on the outcome of assessments

i) Increase awareness of frailty and its presentations in the ED

3. Target population

a) Older adults who present to the ED with a fall as their index complaint

b) Older adults who present to the ED with mobility or functional deficits

c) Older adults on multiple medications perceived as vulnerable to side effects

d) Older adults with cognitive impairment/delirium or a known diagnosis of dementia

e) Older adults who have multiple complex co-morbidities indicative of frailty

f) All older adults aged ≥75 years who present to the ED during operational hours of the service

g) All older adults aged ≥65 years who present to the ED during operational hours of the service

h) All older adults who are identified as frail regardless of triage category

i) FFD team should use the results of frailty screening to assist with refining their target population for assessment and intervention in the ED

j) Incremental "assessment" from universal use of screening by ED team members to full assessment by FFD teams

k) FFD team should increase the operational hours of the service to ensure optimised and consistent provision of care

l) FFD team should operationalise a triage system and assessment area within the ED that is dedicated to older adults living with frailty

4. Screening and assessment

a) Screening for frailty should commence at triage and a positive frailty screen should signal the need for review by the FFD team
b) FFD and ED team members should commence early assessment after illness acuity has been determined at triage
c) FFD team should commence a CGA to incorporate a standardised biopsychosocial assessment of frailty, co-morbidity, polypharmacy, cognition, function and mobility, continence, nutrition, psychological and social status
d) FFD team should use an interdisciplinary assessment proforma as the basis to inform the intervention plan

5. Interventions

a) Assertive case management within the ED
b) Provide patient and family information on the outcome of CGA and ED discharge plan
c) Complete timely handover to Community Intervention Team/ Community Specialist Teams for Older Persons (CST OP)/Community Health Network following ED discharge
d) Provide in-reach to in-patient wards following admission to hospital from the ED
e) Provide patient and family with information on resources and supports available in the community
f) Prescribe enabling equipment to address unresolved functional deficits, as appropriate
g) Conduct medicine reconciliation, as appropriate
h) Provide home exercise/activity programmes, as appropriate
i) Provide family and/or caregiver education on delirium risk reduction strategies, as appropriate
j) Educate the patient and family on self-management strategies, as appropriate
k) Provide nutritional advice, as appropriate
l) Refer patients with continence issues to follow-up services in the community

m) Engage in person-centred care planning inclusive of initiation of out-of-hospital referral pathways such as CST OP

6. Use of technology

a) Current technology effectively supports FFD
b) Greater ICT resources are required to fully support FFD
c) Specific resources to support FFD should include electronic referral pathways to CST OP
d) Specific resources to support FFD should include a shared e-proforma across primary and secondary care

7. Integration of care

a) The development of shared protocols for the FFD model of care nationally would benefit service development and patient care
b) A national assessment proforma should be developed and implemented for use by FFD teams
c) The standardisation of FFD core aims objectives and team composition nationally would benefit service integration
d) Certain elements of FFD team composition and skillset should be site specific e.g., WTE allocation, competency framework
e) FFD team would benefit from a structured clinical governance approach regarding initiation/completion of CGA in the ED and decision making regarding disposition planning
f) FFD team would benefit from a structured operational governance approach regarding onward referral to integrated care services within the community

8. Evaluation and metrics

a) Evaluation of FFD is important to enhance patient experience and outcomes

b) Evaluation of FFD is important to enhance staff experience

c) Greater resources, education and training are required to fully enhance understanding and value of FFD evaluation by team members

d) Evaluation of FFD should include process outcomes only e.g., incidence of ED discharge

e) Evaluation of FFD should include both process and clinical outcomes e.g., incidence of 30-day unscheduled ED revisit and an ADL index measure

f) Evaluation of FFD should include a measure of patient experience

g) FFD team should report quarterly metrics to the HSE Acute Hospitals Division

h) FFD team should report biannual metrics to the HSE Acute Hospitals Division

i) There is a need for an UpToDate feedback system for teams reporting to local governance structures

9. Research

a) Research is a key component of the FFD model of care

b) Research is seen as a priority by FFD team

c) Research is valued in the FFD model of care

d) Greater efforts are required to enhance understanding and value of research

e) The FFD team research agenda needs to be framed by NCPOP research strategy

f) A national competency framework is required specific to FFD

g) All FFD team members should have completed postgraduate education in care of the older person

h) FFD team should engage in reporting metrics to national repository (e.g., HSE Acute Hospitals Division)

10. Additional comments

Appendix 18: List of Statements based on Three Consensus Criteria

Consensus Criteria					
	% scoring 7-9 (≥70)	**Median 7-9, (IQR < 3)**	**Mean 7-9**	**Rank (Based on Mean)**	**Consensus**
Aims of FFD					
Reduce length of stay of older adults in the ED	77.77%	8(2)	7.53	5	YES
Screen for presence and risk of frailty among older adults who present to the ED	91.84%	9(1)	8.31	3	YES
Improve the experience and outcomes of older adults living with frailty who present to the ED	97.95%	9(0)	8.76	1	YES
Enable early identification and assertive case management of older adults living with frailty to ensure appropriate plan of care	95.83%	9(1)	8.46	2	YES
Promote the age attuning of the ED to meet the needs of older adults living with frailty through bespoke pathways, processes and an interdisciplinary approach to care	87.5%	9(1)	8.13	4	YES
Objectives of FFD					
Embed Comprehensive Geriatric Assessment (CGA) in the ED through early assessment and intervention of medical, functional, cognitive, and psychosocial Abilities	84.85%	8(1)	7.96	4	YES
Reduce the time from arrival to the ED to initial medical assessment and work-up for older adults living with frailty	77.78%	8(2)	7.47	8	YES
Facilitate timely and supported patient discharge from the ED through initiation of referrals to appropriate community-based integrated care services	95.56%	9(1)	8.36	2	YES
Reduce the incidence of admission to hospital among older adults living with frailty who present to the ED	79.99%	8(2)	7.80	5	YES
Actively support patient advocacy ensuring older adults living with frailty are admitted to an appropriate in-patient setting	88.89%	8(2)	7.80	6	YES
Reduce the length of stay for older adults living with frailty admitted to hospital following ED attendance	77.78%	8(2)	7.53	7	YES
Reduce incidence of long-term care/nursing home admission following ED attendance	51.11%	7(4)	6.53	9	NO
Promote a culture of proactive case management of older adults living with frailty in the ED, ensuring clear	86.67%	9(1)	8.24	2	YES

communication on the outcome of assessments					
Increase awareness of frailty and its presentations in the ED	93.33	9(1)	8.38	1	YES
Target population					
Older adults who present to the ED with a fall as their index complaint	79.55%	8.5(2)	7.73	6	YES
Older adults who present to the ED with mobility or functional deficits	88.64%	8.5(2)	8.02	3	YES
Older adults on multiple medications perceived as vulnerable to side effects	88.63%	8(2)	7.82	5	YES
Older adults with cognitive impairment/delirium or a known diagnosis of dementia	83.72%	8(1.5)	7.98	4	YES
Older adults who have multiple complex co-morbidities indicative of frailty	90.90%	9(1)	8.30	1	YES
All older adults aged ≥75 years who present to the ED during the operational hours of the service	70.46%	8(2.25)	7.05	9	YES
All older adults aged ≥65 years who present to the ED during the operational hours of the service	23.26%	5(3.5)	4.65	12	NO
All older adults who are identified as frail regardless of triage category	67.44%	7(4)	6.81	11	NO
FFD team should use the results of frailty screening to assist with refining their target population for assessment and intervention in the ED	72.71%	8(3)	7.43	8	YES
Incremental “assessment” from universal use of screening by all ED workers to full assessment by FFD teams	65.91%	7.5(3)	7.00	10	NO
FFD team should increase the operational hours of the service to ensure optimised and consistent provision of care	79.07%	8(2)	7.63	7	YES
FFD team should operationalise a triage system and assessment area within the ED that is dedicated to older adults living with frailty	86.36%	9(1.25)	8.09	2	YES
Screening and assessment					
Screening for frailty should commence at triage and a positive frailty screen should signal the need for review by the FFD team	86.04%	9(1)	8.05	4	YES
FFD and ED team should commence early assessment after illness acuity has been determined at triage	90.7%	9(1)	8.23	3	YES
FFD team should commence a CGA to incorporate a standardised biopsychosocial assessment of frailty, co-morbidity, polypharmacy, cognition, function and	93.02%	9(1)	8.37	1	YES

mobility, continence, nutrition, psychological and social status					
FFD team should use an interdisciplinary assessment proforma as the basis to inform the intervention plan	93.03%	9(1)	8.35	2	YES
Interventions					
Assertive case management within the ED	92.85%	9(1)	8.29	6	YES
Provide patient and family information on the outcome of CGA and ED discharge plan	90.7%	9(1)	8.35	4	YES
Complete timely handover to Community Intervention Team/ Community Specialist Teams for Older Persons (CST OP) / Community Health Network following ED discharge	95.34%	9(1)	8.49	3	YES
Provide in-reach to in-patient wards following admission to hospital from the ED	65.11%	7(4)	6.65	13	NO
Provide patient and family with information on resources and supports available in the community	88.37%	9(1)	8.23	8	YES
Prescribe enabling equipment to address unresolved functional deficits, as appropriate	86.05%	9(2)	8.12	12	YES
Conduct medicine reconciliation, as appropriate	95.34%	9(1)	8.35	5	YES
Provide home exercise/activity programmes, as appropriate	88.37%	9(1)	8.16	10	YES
Provide family and/or caregiver education on delirium risk reduction strategies, as appropriate	95.35%	9(1)	8.56	1	YES
Educate the patient and family on self-management strategies, as appropriate	95.35%	9(1)	8.51	2	YES
Provide nutritional advice, as appropriate	86.05%	9(1)	8.21	9	YES
Refer patients with continence issues to follow up services in the community	90.70%	9(1)	8.23	7	YES
Engage in person-centred care planning inclusive of initiation of out-of-hospital referral pathways such as CST OP	90.70%	9(1)	8.16	11	YES
Technology					
Current technology effectively supports FFD	7.69%	3(3)	3.67	4	NO
Greater ICT resources are required to fully support FFD	92.86%	9(0)	8.62	1	YES
Specific resources to support FFD should include electronic referral pathways to CST OP	95.24%	9(1)	8.50	2	YES
Specific resources to support FFD should include a shared e-proforma across primary and secondary care	81.48%	9(1)	8.24	3	YES
Integration of care					

The development of shared protocols for the FFD model of care nationally would be beneficial in-service development and patient care	83.32%	9(2)	8.00	1	YES
A national assessment proforma should be developed and implemented for use by FFD teams	69.04%	8.5(3)	7.43	6	NO
The standardisation of FFD core aims objectives and team composition nationally would benefit service integration	85.71%	9(2)	7.90	2	YES
Certain elements of FFD team composition and skillset should be site specific e.g., WTE allocation, competency framework	78.57%	9(2)	7.62	4	YES
FFD team would benefit from a structured clinical governance approach regarding initiation/completion of CGA in the ED and decision making regarding disposition planning	78.05%	8(2)	7.71	3	YES
FFD team would benefit from a more structured operational governance approach regarding onward referral to integrated care services within the community	71.43%	8(3)	7.62	5	YES
Evaluation and metrics					
Evaluation of FFD is important to enhance patient experience and outcomes	95.12%	9(1)	8.44	1	YES
Evaluation of FFD is important to enhance staff experience	90.25%	9(1)	8.15	3	YES
Greater resources and training are required to fully enhance understanding and value of FFD evaluation by team members	87.8%	8(2)	7.85	4	YES
Evaluation of FFD should include process outcomes only e.g., incidence of ED discharge	38.46%	5(5.50)	5.46	9	NO
Evaluation of FFD should include both process and clinical outcomes e.g., incidence of 30-day unscheduled ED revisit and an ADL index measure	80.49%	8(2)	7.80	5	YES
Evaluation of FFD should include a measure of patient experience	90.25%	9(1)	8.29	2	YES
FFD team should report quarterly metrics to the HSE Acute Hospitals Division	63.41%	7(4)	6.78	7	NO
FFD team should report biannual metrics to the HSE Acute Hospitals Division	57.50%	7(3.25)	6.75	8	NO
There is a need for an UpToDate feedback system for teams reporting to local governance structures	78.04%	8(2)	7.58	6	YES
Research					
Is a key component of the FFD model of care	65.85%	8(2)	7.80	2	YES

Is seen as a priority by FFD team	47.5%	6(3.25)	6.18	8	NO
Is valued in the FFD model of care	62.5%	8(3)	7.40	4	NO
Greater efforts are required to enhance understanding and value of research	78.04	8(2)	7.63	3	YES
The FFD team research agenda needs to be framed by NCPOP research strategy	75.61%	8(2)	7.20	6	YES
A national competency framework is required specific to FFD	87.8%	8(2)	7.93	1	YES
All FFD team members should have completed postgraduate education in care of the older person	60.97%	7(3)	6.54	7	NO
FFD team members should engage in reporting metrics to national repository (e.g., HSE Acute Hospitals Division)	60.97%	7(3)	7.24	5	NO

Appendix 19: Final List of Consensus Statements based on Strictest Consensus Criteria and Content Overlap Review

Consensus Criteria			
	Median 7-9, (IQR < 3)	**Rank (Based on Mean)**	**Consensus**
Aims of FFD			
Improve the experience and outcomes of older adults living with frailty who present to the ED	9(0)	1	YES
Promote the age attuning of the ED to meet the needs of older adults living with frailty through bespoke pathways, processes and an interdisciplinary approach to care	9(1)	2	YES
Objectives of FFD			
Embed Comprehensive Geriatric Assessment (CGA) in the ED through early assessment and intervention of medical, functional, cognitive, and psychosocial abilities	8(1)	2	YES
Facilitate timely and supported patient discharge from the ED through initiation of referrals to appropriate community-based integrated care services	9(1)	1	YES
Reduce the length of stay for older adults living with admitted to hospital following ED attendance	8(2)	3	YES
Reduce incidence of long-term care/nursing home admission following ED attendance	7(4)	4	NO
Target population			
Older adults who have multiple complex co-morbidities indicative of frailty	9(1)	1	YES
All older adults aged ≥65 years who present to the ED during the operational hours of the service	5(3.5)	5	NO
All older adults who are identified as frail regardless of triage category	7(4)	4	NO
FFD team should use the results of frailty screening to assist with refining their target population for assessment and intervention in the ED	8(3)	2	NO
Incremental “assessment” from universal use of screening by all ED workers to full assessment by FFD teams	7.5(3)	3	NO
Screening and assessment			
FFD team should commence a CGA to incorporate a standardised biopsychosocial assessment of frailty, co-morbidity, polypharmacy, cognition, function and mobility, continence, nutrition, psychological and social status	9(1)	1	YES
FFD team should use an interdisciplinary assessment proforma as the basis to inform the intervention plan	9(1)	2	YES
Interventions			

Provide patient and family information on the outcome of CGA and ED discharge plan	9(1)	4	YES
Complete timely handover to Community Intervention Team/ Community Specialist Teams for Older Persons (CST OP) / Community Health Network following ED discharge	9(1)	3	YES
Provide in-reach to in-patient wards following admission to hospital from the ED	7(4)	7	NO
Conduct medicine reconciliation, as appropriate	9(1)	5	YES
Provide family and/or caregiver education on delirium risk reduction strategies, as appropriate	9(1)	1	YES
Educate the patient and family on self-management strategies, as appropriate	9(1)	2	YES
Provide nutritional advice, as appropriate	9(1)	6	YES
Technology			
Current technology effectively supports FFD	3(3)	4	NO
Greater ICT resources are required to fully support FFD	9(0)	1	YES
Specific resources to support FFD should include electronic referral pathways to CST OP	9(1)	2	YES
Specific resources to support FFD should include a shared e-proforma across primary and secondary care	9(1)	3	YES
Integration of care			
The development of shared protocols for the FFD model of care nationally would be beneficial in-service development and patient care	9(2)	1	YES
A national assessment proforma should be developed and implemented for use by FFD teams	8.5(3)	6	NO
The standardisation of FFD core aims objectives and team composition nationally would benefit service integration	9(2)	2	YES
Certain elements of FFD team composition and skillset should be site specific e.g., WTE allocation, competency framework	9(2)	4	YES
FFD team would benefit from a structured clinical governance approach regarding initiation/completion of CGA in the ED and decision making regarding disposition planning	8(2)	3	YES
FFD team would benefit from a more structured operational governance approach regarding onward referral to integrated care services within the community	8(3)	5	YES
Evaluation and metrics			
Evaluation of FFD is important to enhance patient experience and outcomes	9(1)	1	YES
Evaluation of FFD is important to enhance staff experience	9(1)	3	YES
Greater resources and training are required to fully enhance understanding and value of FFD evaluation by team members	8(2)	4	YES

Evaluation of FFD should include process outcomes only e.g., incidence of ED discharge	5(5.50)	9	NO
Evaluation of FFD should include both process and clinical outcomes e.g., incidence of 30-day unscheduled ED revisit and an ADL index measure	8(2)	5	YES
Evaluation of FFD should include a measure of patient experience	9(1)	2	YES
FFD team should report quarterly metrics to the HSE Acute Hospitals Division	7(4)	7	NO
FFD team should report biannual metrics to the HSE Acute Hospitals Division	7(3.25)	8	NO
There is a need for an UpToDate feedback system for teams reporting to local governance structures	8(2)	6	YES
Research			
Is a key component of the FFD model of care	8(2)	1	YES
Is seen as a priority by FFD team	6(3.25)	6	NO
Is valued in the FFD model of care	8(3)	3	NO
Greater efforts are required to enhance understanding and value of research	8(2)	2	YES
The FFD team research agenda needs to be framed by NCPOP research strategy	8(2)	4	YES
All FFD team members should have completed postgraduate education in care of the older person	7(3)	5	NO

Appendix 20: Participant Information Leaflet

Frailty at the Front Door: Developing a national consensus on a Frailty at the Front Door (FFD) model of care for older adults

INFORMATION LEAFLET

WHO I AM AND WHAT THIS STUDY IS ABOUT?

My name is Professor Rose Galvin and I based in the School of Allied Health, University of Limerick. The aim of this study is to explore the Frailty at the Front Door (FFD) model of care for older adults, providing insights into the development of national expert consensus on a service model for FFD.

WHAT WILL TAKING PART INVOLVE?

The World Café focus group will explore the development of a national consensus for an FFD model of care for older adults. Participation will be recorded and transcribed, with all information kept confidential and anonymised. All information will be stored securely for a period of 7 years in line with the University of Limerick's Record Management and Retention Policy 2014.

WHY HAVE YOU BEEN INVITED TO TAKE PART?

This research aims to explore the development of a national consensus for a FFD model of care for older adults. You have been identified by the research team as a key stakeholder in the provision of services forolder adults.

DO YOU HAVE TO TAKE PART?

This study is completely voluntary, and participation is your choice. Anyone who agrees to participate can refuse to answer any question(s) and withdraw at any time without any consequence. whatsoever.

WHAT ARE THE POSSIBLE BENEFITS AND RISKS ASSOCIATED WITH TAKING PART?

There are no risks associated with taking part. All information that is discussed in the sessions will remain confidential and will be anonymised. There is no chance of physical or psychological harm resulting from theresearch.

This research will explore the development of a national consensus for the FFD model of care for older adults. By gathering views on this, the themes and subthemes generated will provide a national picture of FFD in terms of service delivery, model of care and team composition.

WILL TAKING PART BE CONFIDENTIAL?

Taking part will be strictly confidential. You will be contacted by the researcher by telephone or email and reminded that your participation will be recorded. You can choose to stop the recording or participation at anytime. The group audio file will be anonymised (given a random number) and transcribed by the researcher. Thetranscript will remain confidential. The transcripts of all interviews will be analysed by the researcher. The participant will have to sign a consent form to allow the audio recordings to be collected, retained and transcribed. The participant will have the opportunity to review the transcript to correct any errors or misinterpretations.

HOW WILL INFORMATION YOU PROVIDE BE RECORDED STORED AND PROTECTED?

Participant's data will be anonymised and encrypted on receipt. All personal information that is stored will beGDPR compliant. All interview material will be confidential and will only be shared with the research team.

WHAT WILL HAPPEN TO THE RESULTS OF THE STUDY?

This research will explore the experiences from the perspectives of healthcare professionals' and older adultsin the development of a national consensus for the FFD model of care for older adults. By gathering views on this, the themes and subthemes generated will provide a national picture of FFD.

WHO SHOULD YOU CONTACT FOR FURTHER INFORMATION?

You can contact Professor Rose Galvin, School of Allied Health, University of Limerick – rose.galvin@ul.ie, if you have any queries about participating in this research

This research study has received Ethics approval from the Education and HealthSciences Research Ethics Committee (REF: 2022_04_15_EHS).
If you have any concerns about this study and wish to contact someone independent, you may contact:

Chair Education and Health Sciences Research Ethics Committee
EHS Faculty Office
University of Limerick
Tel (061) 23410

Appendix 21: Participant Consent Form

EHSREC No: ***2022_04_15_EHS***

PARTICIPANT CONSENT
FORM

Frailty at the Front Door: Developing a national consensus on a Frailty at the Front Door (FFD) model of care for older adults

Should you agree to participate in this study please respond yes or no to the following statements.

I ....voluntarily consent to take part in this research study.

Please tick yes/no to the following statements	**Yes**	**No**
I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.		
I understand that I can withdraw permission to use data from my group within two weeks after the interview, in which case the material will be deleted.		
I have had the purpose and nature of the study explained to me and I have had the opportunity to ask questions about the study.		
I understand that participation involves a semi-structured, recorded interview with the researcher.		
I understand that I will not benefit directly from participating in this research.		
I agree to my interview being audio-recorded.		
I understand that all information I provide for this study will be treated confidentially.		
I understand that in any report on the results of this research my identity will remain confidential. This will be done by allocation of a number or letter instead of using a name and disguising any details of my interview which may reveal my identity or the identity of people I speak about.		
I understand that disguised extracts from my group session may be quoted in the research paper produced as they are the basis for the research study		
I understand that if I inform the research that myself or someone else is at risk of harm or abuse, they may have to report this to the relevant authorities		
I understand that signed consent forms, original audio recordings, and their transcripts willbe retained until the research paper has been published		
I understand that under freedom of information legislation, I am entitled to access the information I have provided at any time.		
I understand that I am free to contact any of the people involved in the research to seek further clarification and information.		

Contact details of research team:

Professor Rose Galvin, Associate Professor in Physiotherapy, University of Limerick, academic supervisor. rose.galvin@ul.ie

Signature of participant *Date*

____________________ ____________________

I believe the participant is giving informed consent to participate in this study

Signature of researcher *Date*

____________________ ____________________