Improving Health Care and Outcomes for People Living with Multiple Long Term Conditions (Multimorbidity):

Final report of the HRB Collaborative Doctoral Award in Multimorbidity.

November 2025

Contents

Email for correspondence on "Improving Health Care and Outcomes for People Living with Multiple Long Term Conditions (Multimorbidity): Final report of the HRB Collaborative Doctoral Award in Multimorbidity 2025".

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Foreword by Dr Annalisa Montesante, Programme Manager, Health Research Board

The Health Research Board (HRB) strong focus on building capacity and capability in health research in Ireland is a key pillar of its strategic plans. Over the last decade, the HRB has strategically invested in research leadership and cultivating a dynamic community of health and social care researchers. These researchers come from different professions, backgrounds and research interests, and operate across a broad spectrum of settings including universities and technical universities, hospitals as well as primary, community and social care settings.

In alignment with this commitment the HRB has successfully run three rounds of the Collaborative Doctoral Awards for Patient-focused Research (CDA) scheme, which aims to support excellent doctoral training programmes for health and social care researchers. The focus is on patient-focused research that equip researchers with expertise to advance, apply, and transfer knowledge from research into clinical application. Ultimately, the ambition is to cultivate a new generation of health researchers able to improve patient care and health outcomes.

According to feedback from an international interim review panel, these CDA Programmes in general are contributing to several outcomes, including:

- The development of a skilled, cross disciplinary cohort of researchers to support and/or lead Patient-focused Research.
- The enhancement of collaborative, cross disciplinary and inter-sectoral teams and networks.
- The advancement of knowledge with potential to create tangible impact on health and patient care nationally and/or internationally.
- The strengthening of public and patient involvement (PPI) within the Irish research ecosystem.

The CDA Programme in multi-morbidity was one of the first four to be awarded in 2018 to Professor Smith and Professor Murphy. This programme addressed a particularly important research area which is the key challenge in current health care and an area which has relatively little current research and aligns completely with the HRB strategy. Furthermore, the international interim review Panel described the programme as PhD researchers-centred with their voices embedded at the heart of the projects as well as being training focused, both of which they welcomed. They also commended the peer learning within the programme and described the leadership as strong, inclusive and dynamic, able to deal well with the challenges presented by Covid-19. One of the strengths of the research programme was the PPI integration in all the research projects.

Executive Summary by Professor Susan Smith

Improving Multimorbidity Care for people living with Multiple Long Term Conditions (Multimorbidity) in Ireland: Evidence from a HRB Collaborative Doctoral Award Programme

Background

Multimorbidity refers to the experience of living with two or more chronic conditions. It has been identified as a global health challenge due to its significant impact on patient health outcomes and on health systems. The HRB Collaborative Doctoral Award (CDA) in Multimorbidity supported, from 2018-2024, a national cohort of four PhD Scholars to generate practical, evidence-based solutions.

Multimorbidity has a wide range of effects due to its links with medicines, the financial burden it can cause for patients and the need for interventions to support patients managing with multimorbidity. The four PhD Scholars worked across these areas, generating evidence that informed recommendations for clinical practice and health policy. These recommendation cover supports for medication adherence; reducing financial burden and considering cost-of-care conversation; strengthening social prescribing and the need for longer targeted supports for people with multimorbidity and integrating pharmacists into GP practices to support medicines management.

Recommendations were also identified to support research and health systems. These included the need to address health inequalities and reduce treatment burden; to ensure meaningful Public and Patient Involvement (PPI) at all research stages; to use diverse, fit-for-purpose study designs for complex issues; to adopt standardised outcomes for comparison and synthesis and to support multiple PhD cohorts in future CDA programmes to build scale and peer learning.

In addition to these recommendations, the programme produced 21 publications, 17 oral conference presentations and 18 poster presentations, and engagements with policy makers in medicines management, social prescribing and delivery of primary care services. All four PhD Scholars directly informed an ongoing national trial of interventions for multimorbidity adding further to the much needed evidence on delivery of cost effective care, with ongoing input from our dedicated PPI panel.

In conclusion, the HRB CDA in Multimorbidity has developed a skilled cohort of researchers producing high-impact, patient-centred evidence. This programme strengthens the foundation for better multimorbidity care and informs policy with practical, real-world solutions. Continued investment in collaborative, cross-sectoral research is key to delivering equitable, effective, and sustainable care for people living with multiple long-term conditions. Such approaches will undoubtedly impact on individual and population health.

Prof Susan Smith and Prof Andrew W Murphy

Case Study

Mary (72) is a widow, living alone. She has diabetes, **high blood pressure, poor kidney function and arthritis.** She sees three different specialists and takes **12 regular medicines** (but doesn't know what they are for). She finds it **hard to coordinate all her appointments and follow all the advice she is given by the different healthcare providers she sees.** Her main concern is the back and joint pain from her arthritis, which prevents her from exercising and controlling her weight. She has two adult children one living nearby and the other working abroad and they find it **difficult to support her healthcare and worry about her.** She sees them regularly and talks to them on Skype but she often feels lonely. Every time she sees her GP and practice nurse, they seem to be checking her diabetes and blood pressure but don't usually talk about her **back pain and low mood.** Mary sometimes feels her care focuses more on her conditions and she would prefer to have her GP's support to **address her own priorities.** She would like to be able to **manage her own health problems better but doesn't know where to start.** She also regularly attends other healthcare providers, such as her community pharmacist, who do not always have the most current information on her care, which limits their ability to provide her with advice on some of her symptoms.

Mary's GP, Dr Jones sometimes **feels overwhelmed** when Mary attends as there is so much to do in their 10-15 minute appointment. Dr Jones **reviews her lists of medicines** to try and make sure there are no interactions or monitoring tests needed. Mary mentions her back pain but can't be prescribed more pain killers due to potential kidney side effects. Dr Jones recommends swimming for the back pain but Mary doesn't want to go alone and this leads to a conversation about her social isolation and low mood. Dr Jones knows there is a local community group that could help but can't find the information about it. Mary's GP **needs some structured support to help manage Mary's medicines and to find information about easy referral pathways for non-medical sources of community supports.**

Project Background

Over 60% of adults in Ireland are living with multiple long-term conditions, which is referred to as multimorbidity. This has been recognised as one of the key health challenges globally. Patients living with multimorbidity have poorer quality of life, poorer health outcomes and higher healthcare costs. They report challenges managing their conditions day-to-day and often have to manage multiple medicines, along with attending different doctors and other health professionals. In 2017, our research team consulted with patients about their healthcare experiences and needs. These patients supported us in making a successful application to the Health Research Board Collaborative Doctoral Awards scheme, to study multimorbidity. The HRB CDA, which was awarded in 2018, led to funding for four PhD students over a four-year period. The PhD thesis topics were designed to support people managing multimorbidity and improve their health outcomes.

The HRB funds Collaborative Doctoral Awards (CDAs) in Patient-focused Research are designed to support excellent PhD training programmes for individuals from a range of health-related disciplines with an emphasis on patient-focused research. The aim is to develop a cohort of researchers who will develop their skills and generate research evidence that advances knowledge and impacts on patient health and care. Each CDA provides support for the training and the research projects of four to five PhD candidates.

Our HRB CDA Award in Multimorbidity supported a structured training programme for four PhD students with a range of clinical and research backgrounds and brought together a consortium of international, experienced senior researchers and PhD educators to support this programme. The CDA in Multimorbidity programme supported the development of patient-focused research, designed to generate evidence for improved care and outcomes for people living with multimorbidity. The four PhD students were equipped with skills for academic, clinical and policy settings. The programme was supported by a specially convened Patient and Public Involvement Panel to ensure a clear focus on patient priorities.

This final report of the HRB CDA in Multimorbidity showcases the range of work that the four PhD students have completed, supported by a team of Supervisors from RCSI, University of Galway, Trinity College Dublin, Croí, and HIQA and an international panel of leading researchers in the field of multimorbidity. This report presents a novel approach to public and patient involvement in PhD training and presents each PhD project, summarising the research completed and the key recommendations arising to inform clinical practice and healthcare policy.

Collaborative Doctoral Award in Multimorbidity
Project outline

PhD Research Topic 1

"Medication adherence among people living with multimorbidity: prevalence, predictors & intervention options". Dr Louise Foley (University of Galway).

PhD Supervisors. Professor Gerry Molloy, University of Galway, Professor Andrew Murphy, University of Galway and Dr Lisa Hynes, Croí.

PhD Research Topic 2

"Financial Burden: The burden of financial costs of healthcare for people with multimorbidity." Dr James Larkin, Royal College of Surgeons in Ireland.

PhD Supervisors - Professor Susan Smith, Trinity College Dublin, Dr Barbara Clyne, Royal College of Surgeons in Ireland, Dr Patricia Harrington, Health Information and Quality Authority.

PhD Research Topic 3

"Link workers and Social Prescribing." Dr Bridget Kiely, Royal College of Surgeons in Ireland.

PhD Supervisors -Professor Susan Smith, Trinity College Dublin, Professor Deirdre Connolly, Trinity College Dublin, Professor Eamon O'Shea, University of Galway.

PhD Research Topic 4

"GP-based Pharmacists supporting medicines management in multimorbidity: Dr Aisling Croke, Royal College of Surgeons in Ireland.

PhD Supervisors - Dr Barbara Clyne, Professor Frank Moriarty, Royal College of Surgeons in Ireland, Professor Susan Smith, Trinity College Dublin.

PhD Research Topics 1-4 - Patient and Public Involvement

PhD Research Topics 1-4 - Patient and Public Involvement

Objectives of PPI Panel

Patient and Public Involvement (PPI) has been a cornerstone of the CDA in Multimorbidity since its inception. Despite how many people are living with multiple long-term conditions, approaching PPI in the context of multimorbidity is challenging given the variety of conditions and age groups of those affected, and the lack of any unifying pre-existing patient support group or organisations. During the funding application stage, the applicant team consulted with the HRB Primary Care Clinical Trials Network Ireland's PPI Panel, which was a broad-based panel representing issues that relate to primary care, the setting in which most multimorbidity management takes place. This meeting provided the foundational ideas for the underlying focus on patient experiences and the need to reduce treatment burden that featured across the four PhD projects. The PPI experts spoke about their experiences trying to coordinate care for themselves or their family members and raised the issue of the financial burden that this can involve, for example, taking time off work to give lifts to multiple appointments. The consultation with the primary care PPI panel shaped the design of the PhD programme. To maintain this emphasis on patient involvement throughout the programme, our PPI lead co-applicant, Edel Murphy, conducted training with the four PhD Scholars during their first year. This foundational training supported the scholars to take the lead on establishing a PPI panel specifically for the PhD programme, who then collaborated throughout the projects. This was the first time in Ireland that a PPI panel had been convened specifically to support a PhD programme.

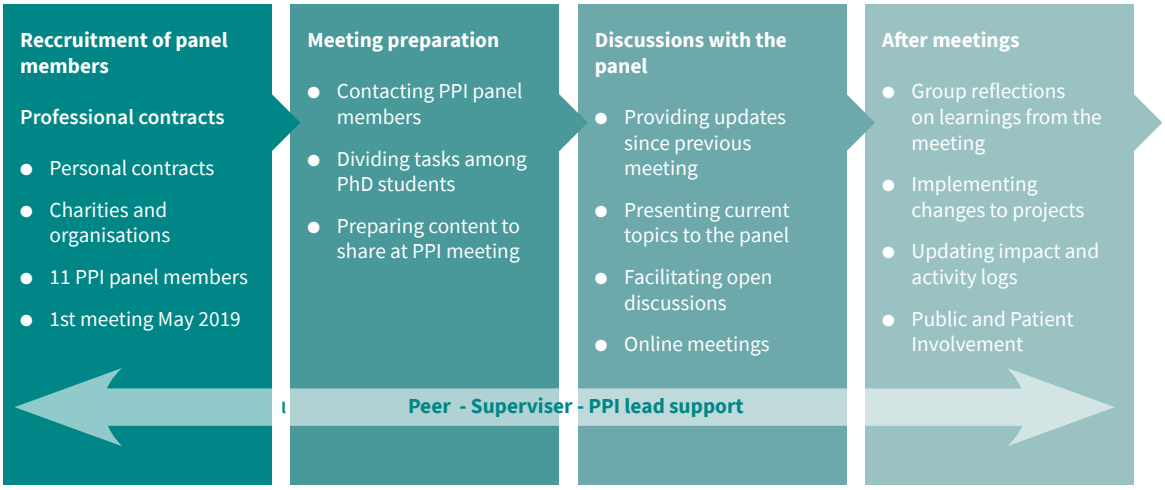
PPI panel and PhD students in Year 1 of Collaborative Doctoral Award (CDA) in Multimorbidity Project.

Bottom row from left Karen Egan, Declan Keeley, Gity Shahin, Karen Cowap, Bríd Nolan

Top Row: Paddy O'Neill, Thomas Bergin, Nuala Baker, James Larkin, Bridget Kiely, Aisling Croke, Louise Foley

PPI panel development and working structures

PhD Research Topics 1-4 Patient and Public Involvement provides detail of the panel development and working structures:

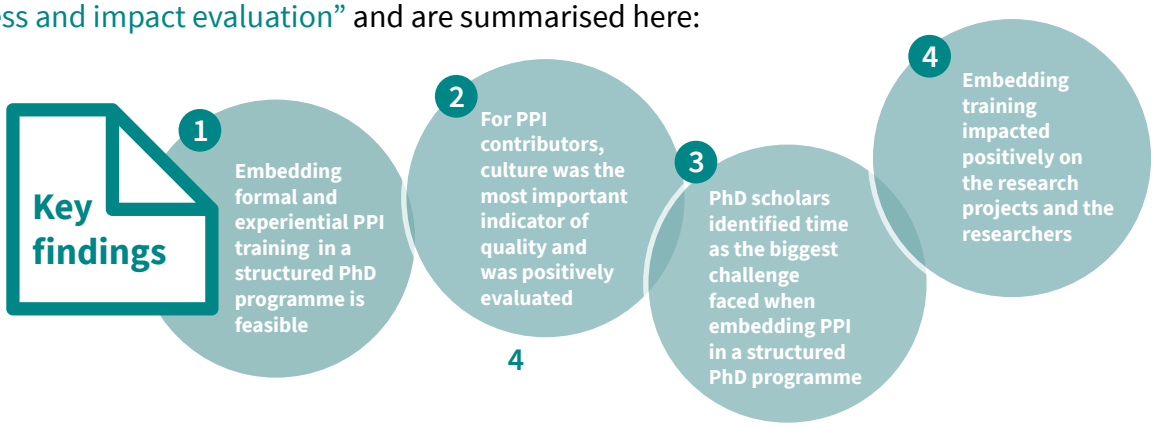


Using a range of methods including examination of the group reflections and activity logs, as well as qualitative interviews of all involved, we conducted an evaluation of the process and impacts of PPI training during a PhD programme, with the following research questions:

- How **feasible** is formal and experiential PPI training within a doctoral programme?
- What are the **experiences** and **perspectives** of the PPI contributors?
- What are the **processes** and **perceived impacts?**
- What is the **impact** on the design and conduct of the research projects as well as on the overall PhD programme?

PPI panel findings

The findings from the PPI evaluation are available in the paper "Embedding formal and experiential public and patient involvement training in a structured PhD programme: process and impact evaluation" and are summarised here:



PhD Research Topic 1 – "Medication adherence among people living with multimorbidity: prevalence, predictors & intervention options".

PhD Student: Dr Louise Foley (University of Galway).

PhD Supervisors. Professor Gerry Molloy, University of Galway, Professor Andrew Murphy, University of Galway and Dr Lisa Hynes, Croí.

Study Background

Medication adherence refers to taking medicines as agreed with a healthcare provider. Non-adherence to medicines has been described extensively in the literature; however, the focus has largely been on single-condition populations. Multimorbidity adds complexity to the clinical- and self-management of ongoing conditions, including the use of medicines, and may influence the beliefs and behaviours people hold about their prescribed treatments. An evidence base outlining medication non-adherence in this population is therefore needed. This PhD project has four aims:

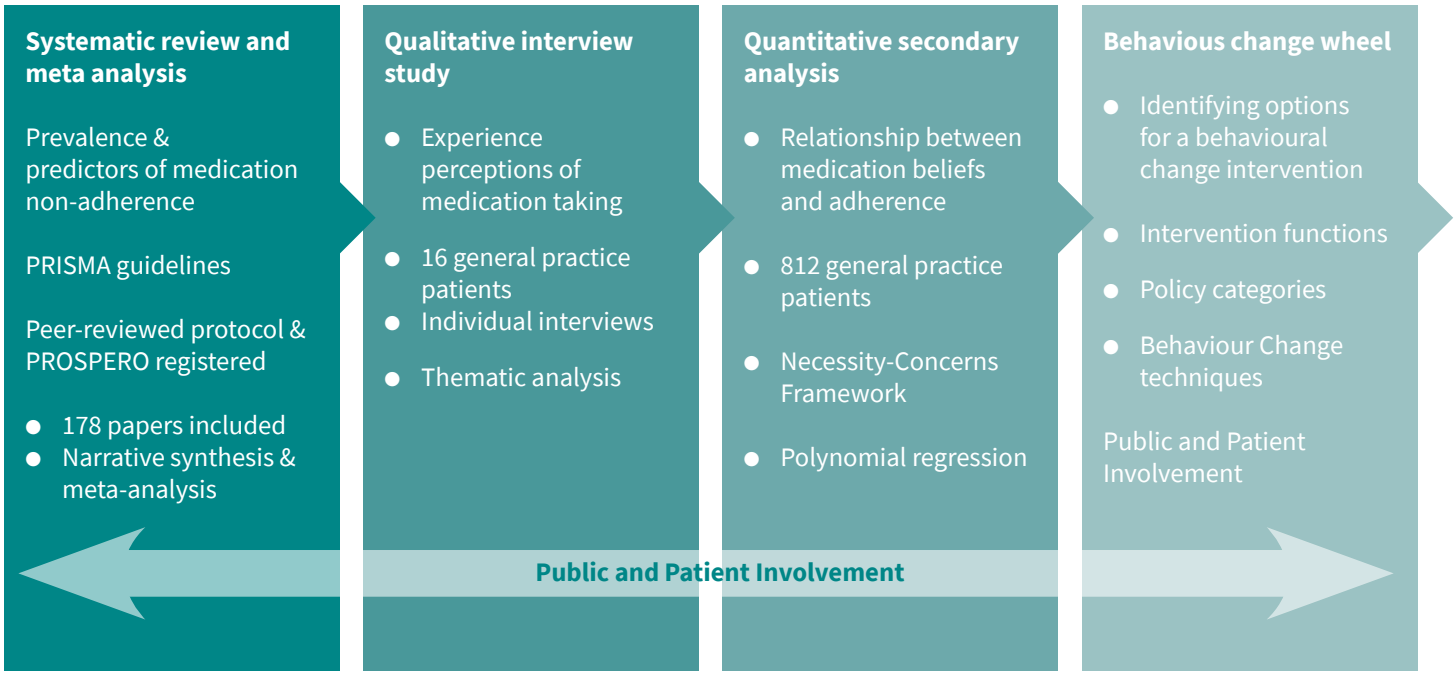
(1) synthesise the reported prevalence and predictors of medication non-adherence among people living with multimorbidity,
(2) explore the experiences and perceptions of people taking medicines for multiple co-occurring conditions,
(3) examine how an existing framework of medication beliefs relates to non-adherence in the context of multimorbidity, and
(4) systematically identify options for a behaviour change intervention to support adherence to medications prescribed for multimorbidity.

Overview of methods

Four studies were conducted to address these aims. The Public and Patient Involvement contributors were engaged with throughout the research. Study 1 involved a systematic review and meta-analysis to synthesise the existing quantitative evidence reporting the prevalence and predictors of non-adherence to medications among people living with multimorbidity.

Study 2 applied thematic analysis to explore the qualitative experiences and perceptions of taking medicines for multimorbidity. Data was derived from semi-structured interviews with 16 people recruited in the general practice setting. Study 3 involved a quantitative analysis using a novel statistical approach, polynomial regression, to examine the multidimensional relationship between medication beliefs and adherence. Secondary data from a general practice cohort of 800+ people living with multimorbidity was used. Study 4 involved selecting options for a behavioural intervention to support adherence to medications, bringing together evidence produced in the empirical studies and wider literature.

Overview of methodology



Summary of research findings

Finding 1

A total of 178 studies were identified in the systematic review. The prevalence of non-adherence among people living with multimorbidity was estimated to be approximately 43% in a meta-analysis of eight studies. Treatment- and illness-related beliefs, memory performance, and the quality of relationships with healthcare providers were some of the previously reported correlates of medication non-adherence. Several reviewed studies suggested that adherence could vary between conditions within individuals living with multimorbidity.

Finding 1
Systematic review & interview study
Medication non-adherence is common but varying

43% **non-adherence to medications**

Non-adherence ranged widely across the literature (7%-83.5%)

Number of conditions/ medications was not a consistant predictor.

Not simply a linear additive product of number of conditions

Other factors to consider:

- **Regimen characteristics**
- **Treatment burden**
- **Priorisation**

Finding 2

Findings from the qualitative interview study highlighted that multimorbidity can lead to an amplified burden for some people, for example through an accumulation of conditions and associated treatments over time. Participants in this study sought to relieve the burden by resigning to their need for medications, prioritising among their multiple conditions, or using tangible supports such as reminders and pill boxes. Such strategies may influence adherence to varying extents. For example, prioritisation may lead to variation in adherence between a person's several conditions, while resignation may result in enduring concerns about medicines, albeit in the presence of high levels of adherence.

Finding 2
Interview study
Multimorbidity intensifies the burden of medication taking

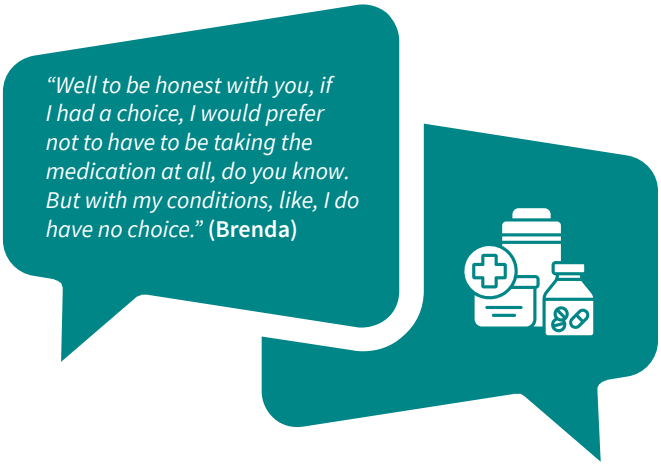
- **Work of medicines management is amplified**
- **A cycle of acquiring further symptoms and medications**
- **Different levels of involvement in regiment changes**

Finding 3

The polynomial regression analysis supported this finding, as adherence was higher when beliefs about the necessity of medicines were high in combination with high levels of concern about medicines, compared to when beliefs about the necessity of medicines were low in combination with low levels of concern about medicines. These findings together highlight the complex beliefs and behaviours experienced by several people living with multimorbidity. The identification of intervention options using the Behaviour Change Wheel attempted address this complexity by identifying cognitive- and behaviourally-focussed techniques to address both perceptual and practical barriers to medication adherence.

Finding 3
Interview study & quantitative analysis
Complex beliefs about medicines

Adherence was highest among those who believe medicines are necessary and who have few concerns about their medicines. Results also point to a group of people with multimorbidity who believe medicines are necessary but have concerns about them, and are nonetheless adherent.



Study Recommendations - PhD Research Topic 1

Recommendation 1

Individualise involvement in medication decisions

Evidence from the PhD indcates potential absence from decision making, as well as adherence to medications despite concerns

Consider capacity to take part in medication decisions to avoid adding futher treatement burden

The research conducted as part of this project produced several recommendations. From a practice perspective, the first recommendation is to individualise involvement in medication taking decisions. The evidence generated from the qualitative interviews highlighted the potential for patients to be absent from decision making about medicines. Combined with findings from the secondary data analysis, results also suggest a potential to be adherent to medications despite the presence of concerns, reflecting a possible disengagement from healthcare decisions to minimise the complexities of multimorbidity. Together this suggests that greater effort is needed to involve people living with multimorbidity in shared decision making and to address any medication-related concerns through active discussion. Previous evidence suggests that participation in such decisions increases as patient expertise develops. This may be challenged in the context of multiple conditions with changing regimens and multiple healthcare providers, and GPs report reduced involvement in decision making as complexity increases. Therefore, it will be necessary that the level of involvement in medication-related decisions is tailored to individuals by discussing their capacity to take part, to avoid adding further to treatment burden. Reducing fragmentation of healthcare and ensuring continuity of care could support more involvement in decision making while alleviating existing treatment burden.

Recommendation 2 and 3

Integrate adherence discussions into routine practise

Evidence from the PhD suggests people living with multimorbidity value and trust healthcare providers in the general practice setting

Structural Chronic Disease Management programme may offer a key context for implementation of adherence supports.

The second recommendation, relating to practice and policy, suggests integrating adherence discussions into routine practice. The behaviour change wheel process identified Guidelines and Service Provision as two potential policy avenues for implementing adherence supports. Both the systematic review and qualitative interview study emphasised the role of healthcare providers in adherence behaviour, with those working in the general practice setting identified as trusted and valued overseers of medicines. This was further emphasised in discussions with the PPI panel, who proposed both general practitioners and practice-based nurses and pharmacists as providers who would be well placed to prompt such adherence discussions. From a policy perspective, the existing Structured Chronic Disease Management Programme offers a key context for implementation, particularly in terms of self-management support, providing dedicated opportunities to discuss changing priorities, perceptions, and behaviours related to medications for multimorbidity. Integrating adherence discussions within the self-management supports would offer a key avenue to identify challenges and concerns.

The third recommendation relates to practice and research and suggests using a variety of strategies to support adherence to medications in the context of multiple long-term conditions. Considering the complexity of this behaviour and the variety of known practical and perceptual barriers to adherence, a range of supports may be needed to support behaviour change. Options for addressing both types of barriers were identified in the behaviour change wheel process. For perceptual barriers, cognitive strategies could include information about health consequences to address beliefs about medicines. Directing these from a credible source, such as a trusted provider in the general practice setting, is recommended. For practical barriers, behavioural strategies could be considered to promote habit formation, particularly when new medications are being introduced to existing routines. Strategies could include setting goals, using reminders, self-monitoring behaviour, and developing action plans. While these options were selected based on the available evidence, their effectiveness as strategies to promote adherence among people living with multiple chronic conditions as part of a structured behaviour change intervention should be empirically examined in future research.

PhD Research Topic 2 – "Financial Burden: The burden of financial costs of healthcare for people with multimorbidity."

PhD Student: Dr James Larkin (Royal College of Surgeons in Ireland).

PhD Supervisors - Professor Susan Smith, Trinity College Dublin, Dr Barbara Clyne, Royal College of Surgeons in Ireland, Dr Patricia Harrington, Health Information and Quality Authority.

Study Background

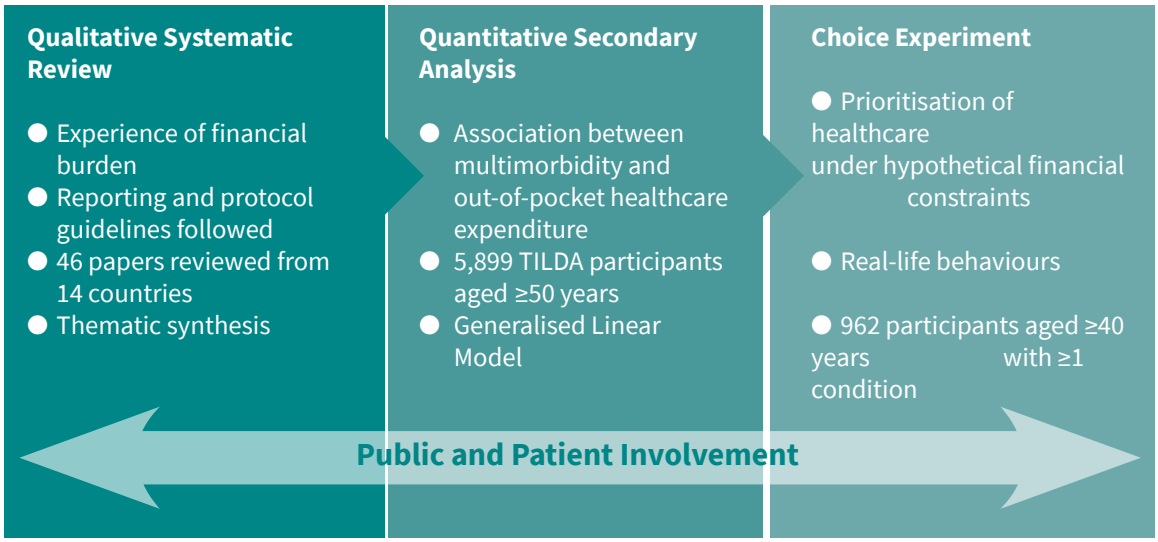
Having multimorbidity is associated with polypharmacy and greater healthcare utilisation . This arises as a result of the healthcare needed for each additional condition one has, but also the care fragmentation and duplication associated with multimorbidity. This results in high OOP healthcare costs for people with multimorbidity. As a result of this high OOP healthcare costs can have a range of negative effects, including on adherence health related quality of life, treatment burden and impoverishment. Compounding these issues, multimorbidity is negatively associated with socioeconomic status.

Therefore, an evidence base is needed on multimorbidity's financial impact on individuals. The overall aim of this thesis was to assess the financial costs experienced by people with multimorbidity in terms of:

1) their lived experience of financial costs related to their multimorbidity
2) the level of OOP healthcare costs they experience and
3) how they prioritise their healthcare when unable to afford healthcare costs.

Three studies were conducted to address these aims. Study 1 was a systematic review of qualitative research on multimorbidity and financial burden. Study 2 was a cross-sectional study of people in Ireland aged 50 years or over. It examined the impact of multimorbidity on out-of-pocket healthcare expenditure using a generalised linear model. Study 3 was a choice experiment, which was conducted with an online sample, examining how people with multimorbidity prioritise healthcare when faced with affordability challenges. A panel of people with multimorbidity provided input on different aspects of each of the projects.

Overview of PhD Studies



Overview of methods

Study 1: Systematic review

The systematic review of international qualitative research thematically synthesised 46 studies. Four themes were generated: the high costs people with multimorbidity experience, coping strategies to manage costs, negative effects of these areas on well-being, and how health insurance and government supports determine cost manageability. One of the strategies to manage costs was to make sacrifices in other areas, for example a person with multimorbidity living in New Zealand said “I’m surviving financially because of the welfare system.”

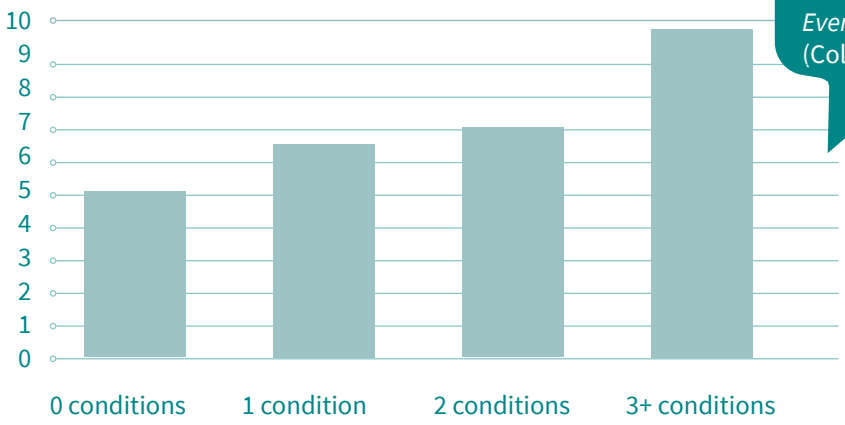
Study 2 Cross sectional study examining financial burden

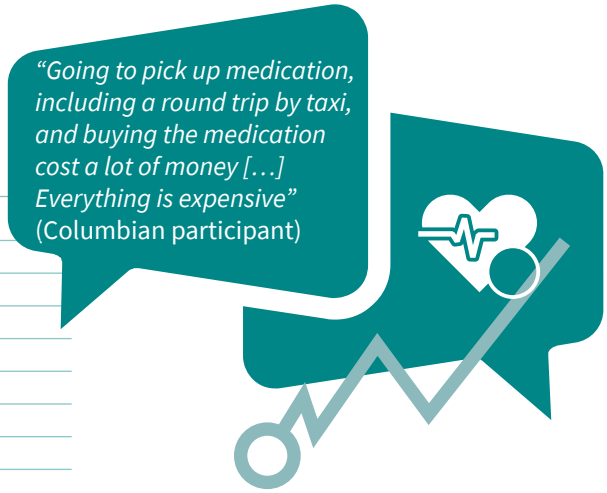
The cross-sectional study examining multimorbidity’s impact on out-of-pocket healthcare expenditure included 5,898 participants from the Irish Longitudinal Study on Ageing (TILDA). Among participants who had any out-of-pocket healthcare expenditure, individuals with multimorbidity spent more on average annually (€806.8 for two conditions, €885.8 for three or more conditions), than individuals with no conditions (€580.3).

It's important to note that those with more conditions spent a bigger percentage of their household income on healthcare. In Ireland, those with lower incomes are entitled to free primary, community and hospital care, and heavily subsidised prescription medicines. This entitlement was associated with a 48% reduction in out-of-pocket healthcare expenditure. More details on healthcare entitlements and multimorbidity are shown below.

Summary of Research Findings

Finding 1
High healthcare costs associated with multimorbidity





Study 3: Choice Experiment

The choice experiment included 962 participants and found that when presented with the hypothetical budget constraint, participants reduced expenditure on 'other healthcare (hospital visits, specialist doctors, etc.)', by the greatest percentage (50.2%), and medicines by the lowest percentage (24.8%). In their actual lives, participants tended to prioritise their healthcare over other areas of their lives. Amongst participants, 30% said they had used savings to afford their healthcare, 22% said they had reducing food spending and 9% had said they had borrowed money to afford healthcare. Further details of the effects of high healthcare costs on people with multimorbidity can be seen below.

Finding 2
High healthcare costs have unintended consequences

- **Non-adherence: 16%**
- **Non-attendance: 31%**
- **Choice Experiment: Prioritisation of different healthcare services and conditions**
- **Using savings (30%) reducing food spending (22%) or borrowing money (9%) to afford healthcare**

"I used to live on noodles, home brand noodles. And my son would say "where's the food mum?" and I'd say "we have to live on noodles, I need my medication"". (New Zealand participant)

Overall, these studies showed the scale of OOP healthcare expenditure and financial burden experienced by people with multimorbidity. This financial burden led to people with multimorbidity using a range of coping strategies, including cost-related non-adherence and making sacrifices in other areas of their lives. Cost-related non-adherence was explored further and it was found that when people with multimorbidity were experiencing financial burden they were most likely to prioritise their medicines. The financial burden associated with multimorbidity can be mitigated by targeted healthcare entitlements and ensuring those with entitlements are availing of them. Furthermore, several measures can be taken to reduce the healthcare burden that people experience such as deprescribing interventions and the development of a multimorbidity clinical guideline.

Together the three studies provided evidence as to how healthcare entitlements can protect people from financial burden

Finding 3
Healthcare entitlements can reduce financial burden significantly.

- **TILDA: The medical card, which entitles people to free or heavily subsidised healthcare, was found to reduce healthcare expenditure, by 48%**
- **Qualitative systematic review: participants could afford care because of the financial safety net provided by government support**
- **However, participants faced complexities and barriers when accessing healthcare or reimbursement**

"I'm surviving financially because of the welfare system" (Australian participant)

Study Recommendations

Recommendation 1
Cost-of-care conversations

- Systematic review and choice experiment highlighted cost-related non-adherence and idiosyncratic behaviours
- Healthcare workers should identify and discuss patient priorities, in the context of costs and financial burden.
- The potential to reduce patient costs and increase adherence

Recommendation 2
Reducing user charges and travel expenses

- The systematic review and choice experiment highlighted how travel expenses and user charges can lead to cost-related non-adherence/ attendance
- GP costs are important as international guidance highlights key role of GPs in coordinating care for people with multimorbidity
- NHS reimburses some healthcare travel expenses
- Simplify access to entitlements

Recommendation 3
System that addresses multimorbidity

- Systematic review and quantitative analysis highlighted fragmented care and high costs of medicines
- Multimorbidity clinical guideline
- Regular medication reviews
- Deprescribing

PhD Research Topic 3
"Link workers and Social Prescribing."

PhD Student: Dr Bridget Kiely (Royal College of Surgeons in Ireland).

PhD Supervisors -Professor Susan Smith (Trinity College Dublin), Professor Deirdre Connolly (Trinity College Dublin) Professor Eamon O'Shea (University of Galway).

Study Background

Policy responses to multimorbidity care have focused on personalised care and self-management, but GPs in deprived areas have limited capacity to deliver this. Social prescribing link workers are a potential intervention that could improve outcomes for people with multimorbidity. They support people to connect with non-clinical resources to improve health and wellbeing.

Overview of methods

The overall aim of this thesis was to investigate the potential impact of practice-based social prescribing link workers for people with multimorbidity attending general practices in socially deprived areas.

Specific objectives of the thesis were to:

1. Establish the global evidence base for social prescribing link worker interventions

2. Test the feasibility and acceptability of an evaluation of a practice based, social prescribing link worker intervention for people with multimorbidity

3. Explore the potential impact of the intervention and describe implementation, including the impact of context on, and barriers and facilitators to implementation.

Summary of Research Findings

Study 1 Systematic review

The review only identified 8 studies, with 6,500 participants and economic evaluations were limited. This showed an absence of evidence for social prescribing. These findings were controversially reported in media, but did contribute to a drive to support stronger evaluations of social prescribing among policy makers. Key findings are summarised below:

Finding 1
Systematic review

What we found

- **May have little or no impact on HRQoL, mental health though they may improve self-rated health.**
- **Intensive intervention in US patient care ratings and hospitalisation**
- **The opportunity costs of investing in social prescribing link workers are unknown**
- **Further evaluations needed.**

Study 2 RCT of link workers providing social prescribing

A pilot study, stakeholder engagement and public patient involvement informed a protocol for a randomised controlled trial and economic evaluation of a practice based social prescribing link worker intervention. The trial took place during the COVID-19 pandemic and recruited 252 patients across 13 general practices. This was considerable lower than the target number of 600 participants. The results indicated that there were no significant differences in primary or secondary outcomes, which may have related to the smaller than anticipated sample size. A sub-group analysis showed that men had a slight improvement in well-being. A pre-planned economic evaluation indicated that if the link workers had been operating at full capacity, there was a 79% probability of effectiveness at the €45,000 ICER threshold value for Ireland using the ICECAP-A capability well-being measure. This trial has informed a follow on larger trial which will attempt to determine cost-effectiveness in a larger sample nationally.

Finding 2
There is potential that GP based LWs are cost effective

	Cost per participant	ICER	Probability effective (€45,000)
In trial	€1,057	€79,683	28%
Full capacity higher salaries	€739	€50,075	54%
Full capacity RCSI salaries	€463	€26,855	79%

Capability well-being increased slightly for men

Activity index score increased if met LW at least once

Patients lost to follow up had lower educational attainment

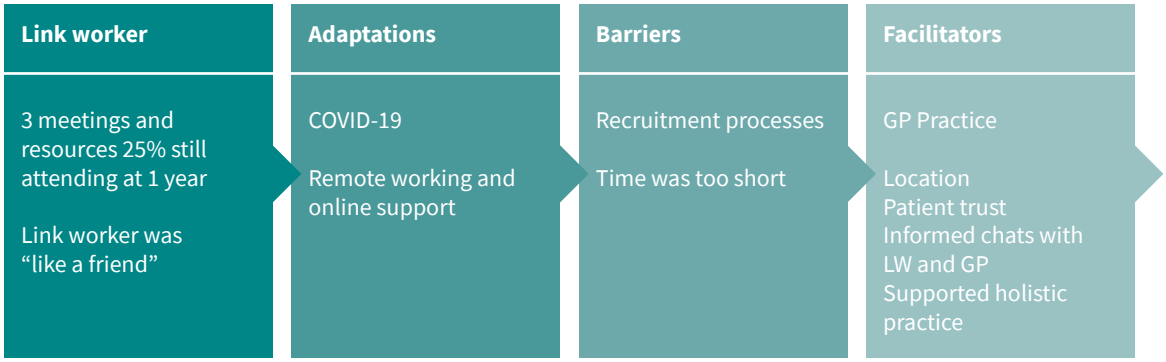
Participants on 10+ medications were less likely to meet LW

Study 3: Process Evaluation

The third study in the thesis was a mixed methods process evaluation, which showed that link worker support was successfully implemented with adaptations due to COVID-19 restrictions. There was 85% uptake of the link workers and referral to a median of three community resources. This did not always translate into connection with community resources, potentially because the one-month intervention was insufficient to support people with complex needs. This was exacerbated by the impact of the COVID-19 pandemic, which meant a shift to largely remote support and on-line resources. Qualitative interviews with GPs revealed that the recruitment process was onerous for GPs and patients.

Having the link worker at the practice facilitated communication and trusting relationships between GPs and the link worker and the link worker and patients. The link worker also helped to increase GPs knowledge about community resources. Link workers expressed challenges in supporting more complex patients. More complex patients as indicated by being on ten or more medications and higher anxiety scores were also less likely to meet with the link worker.

Finding 3: Process Evaluation
Patients liked the LW in the GP, but a month wasn't long enough



Study Recommendations

Overall, uncertainty remains about the effectiveness of social prescribing link workers and further evaluations are recommended, potentially considering a longer intervention to establish how best to support people experiencing multimorbidity and social deprivation.

The key recommendations arising from the three studies were:

1. A longer intervention, with the link worker embedded in GP practices could support more complex patients. This is based on the findings of the systematic review, which identified two US studies supporting a six-month intervention for patients with long-term conditions and the findings of the process evaluation detailed above.

2. The evidence base for social prescribing link workers remains limited, but there are a number of challenges that need to be considered for future evaluations. A core outcome set involving all stakeholders needs to be developed. From the RCT findings and based on input from the patient advisory group, consideration should be given to using the ICECAP-A well-being measure, as it potentially better captures the benefits of social prescribing and can be used for economic evaluations.

   Future studies should consider how to better support recruitment strategies and to minimise paperwork so as not to exclude patients with lower literacy levels. Suitable control groups are needed to evaluate effectiveness. Cluster randomised trials and interrupted time series are potential approaches. Any effective evaluation should consider costs and context. There is very little evidence on the cost effectiveness of social prescribing, with the current evidence quite dependant on social return on investment analysis, which while helpful, is very context specific and makes comparison difficult. That said, it is important to understand context and the details of implementation for any complex intervention and mixed methods process evaluations are an important element of any evaluation.

3. As social prescribing is being rolled out more widely in Ireland, the UK and further afield, it may be time to pause and consider if there is sufficient evaluation being carried out in parallel. As with any intervention the opportunity cost needs to be considered and the limited economic evaluations of social prescribing make this challenging to establish. At present there is limited availability of social prescribing link workers and so it is important to consider who to target. The LinkMM trial suggests that there are some groups who are not accessing social prescribing, such as those with more complex conditions and with higher anxiety levels. Current programmes need to monitor who is attending and if certain groups are not accessing the service whether they require different models of care. Finally, the success of social prescribing hinges on the availability of services to meet people's needs and the availability of the basic determinants of health. Without adequate attention to equitable resource provision in areas of deprivation the impact of social prescribing will be limited.

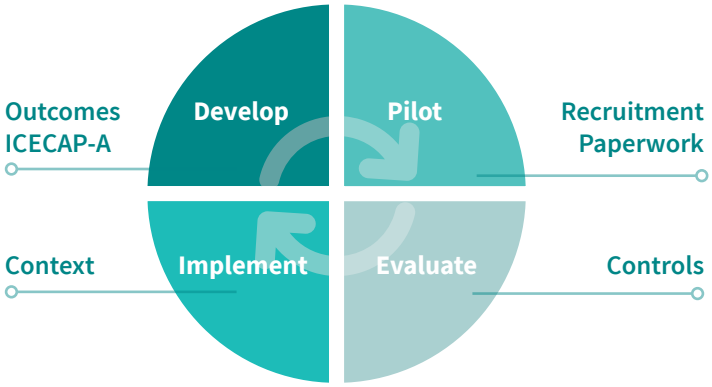
Recommendation 1

Longer LW support and stronger GP links for complex patients

- Prior research limited but supports longer intervention, with LW embedded in primary care
- Embedding in GP practice facilitates engagement with LW
- 1 month was not long enough for patients and 6 months not long enough for practices
- If LWs supporting more complex patients need time and training for this

Recommendation 2

Evaluation challenges need to be overcome



Recommendation 3

Too soon for a widespread roll out?

- Need for robust evaluations (particularly considering opportunity cost)
- Critical to consider who to target and monitor who is attending
- Social Prescribing alone not sufficient

PhD Research Topic 4 – "GP-based Pharmacists supporting medicines management in multimorbidity: Aisling Croke."

PhD Student: Dr Aisling Croke (Royal College of Surgeons in Ireland).

PhD Supervisors - Dr Barbara Clyne, Royal College of Surgeons in Ireland,
Professor Frank Moriarty, Royal College of Surgeons in Ireland,
Professor Susan Smith, Trinity College Dublin.

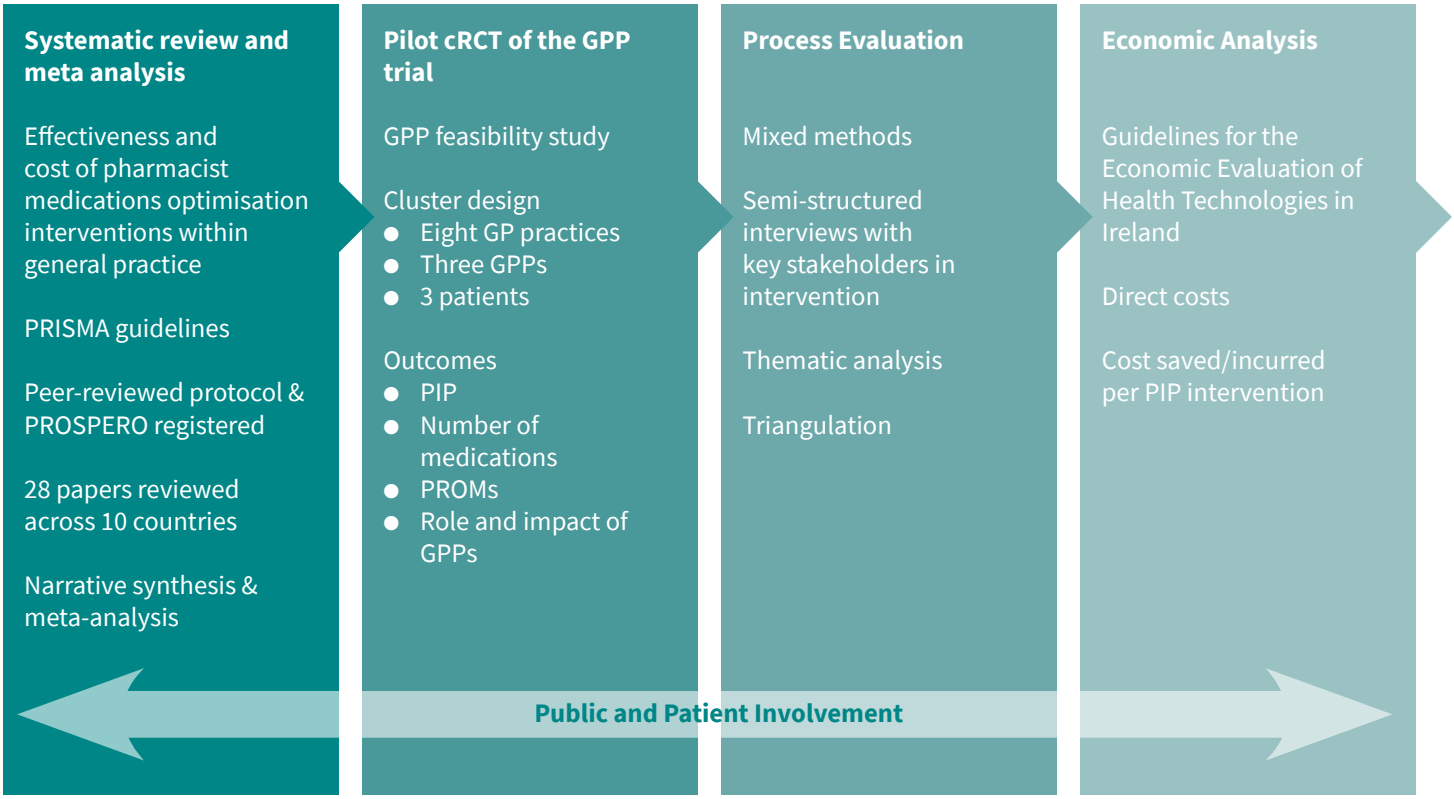
Study Background

Polypharmacy is often associated with multimorbidity with numbers of medicines being highly correlated with numbers of conditions as best practice and clinical guidelines are typically derived from populations which do not reflect these patients and tend to be single disease focused[xx]. Whilst the number of medications alone may not be an accurate descriptor of the quality and safety of prescribing, polypharmacy is associated with potentially inappropriate prescribing (PIP). PIP is the prescribing or omission of medications that may have adverse effects for patients . A previous systematic review of 66 studies estimated PIP prevalence in primary care to be 33% (95% CI; 30 – 37%), with 7% to 17% of all adverse outcomes related to older persons in primary care . PIP and inappropriate prescribing can lead to adverse drug reactions, hospitalizations, and increased healthcare use, particularly in older patients (65 years or older) . Another previous study had examined Irish prescribing data to explore the impact of PIP on healthcare costs; an additional €45 million in healthcare expenditures was associated with PIP in older Irish primary care patients . Previous research had also shown that the integration of pharmacists into general practice settings may lead to improved patient outcomes, reduced healthcare costs, and increased patient satisfaction .

Overview of methods - PhD Research Topic 4 – "GP-based Pharmacists supporting medicines management in multimorbidity: Aisling Croke".

This thesis aimed to encompassed a systematic review, a pilot cluster randomised controlled trial (cRCT) of general practice-based pharmacists (GPPs), and economic and process evaluations.

Overview of methodology



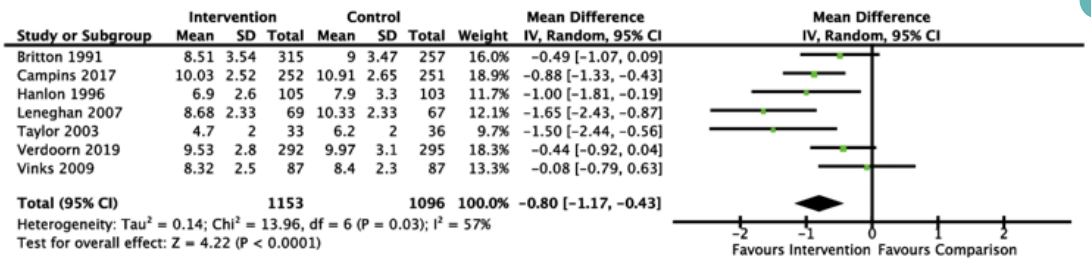
Summary of Research Findings

Study 1: Systematic review

The systematic review of controlled trials of the effectiveness and cost-effectiveness of pharmacists' interventions when integrated within general practice demonstrated that pharmacists can probably reduce the number of medications a patient is taking and PIP, but cost-effectiveness was undetermined.

Finding 1:
Pharmacists can reduce the number of medications and PIP

"risk of inadvertent side effects…risk of errors from the medications are significantly reduced from having the expertise of someone looking after their medications" (Practice Nurse)



For full visibility of data go to original open access article https://bmcprimcare.biomedcentral.com/articles/10.1186/s12875-022-01952-z

Study 2 Pilot cluster RCT

A previous uncontrolled feasibility study and public and patient involvement (PPI) informed the protocol for the GPP pilot cRCT. The trial took place during the COVID-19 pandemic and under-recruited. The GPP pilot cRCT demonstrated that pharmacist integration is feasible in general practice. The intervention significantly reduced PIP, but had no effect on the number of medications.

Finding 2
Feasibility of pharmacists in general practice

Continuation criteria

- **Recruitment**
- **Retention**
- **Uptake of medication reviews**

Economic analysis

- **€12,087.71 saved (12-month horizon) medication interventions**
- **Salary single largest cost ~ €40,000**
- **Challenges of measuring cost-effectiveness**

No significant changes in Health-Related Quality of Life (EQ5D-5L) were reported, but there were improvements in some of the other measures related to medication changes and multimorbidity. Participants reported significant changes in respect of increased perception of appropriateness and a decrease in the perceived burden of medications and treatment.

Cost-effectiveness was not possible to determine however there was potentially impactful cost savings made.

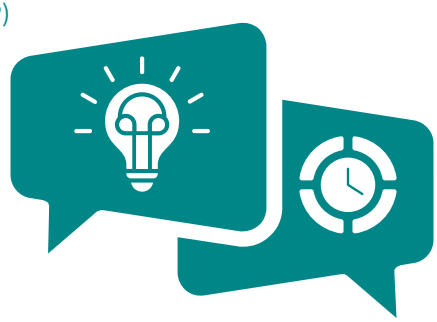
Study 3: Process Evaluation

The process evaluation showed that GPs, pharmacists and patients alike welcome pharmacist integration in the GP practice. Patient recruitment processes should be carefully considered in terms of increasing engagement and balancing information load. In future trials the role of the GPP should be defined and structured to maximise the impact of medication and patient-related outcomes.

Finding 3
Acceptability of pharmacists in general practice

- **Process evaluation**
  - **GPs, pharmacists, patients and practice nurses demonstrated acceptance of role**
- **Time**
  - **Issues surrounding GP time poverty**
  - **Patients gaining time with a healthcare professional**
- **Expertise of pharmacist**
- **Medications safety**

"…It's [an] amazing resource. It's phenomenal, you know, I suppose it's just to have the expertise on hand…not only looking at the medications in isolation but looking at the comorbidities and the patients and stuff like that it's a huge asset…" (GP)



Overall, the systematic review and pilot cRCT demonstrated that GP-based pharmacists are a feasible intervention with potential for impact on quality and safety of prescribing. The GPP intervention has now also progressed to a further evaluation in a definitive national cluster RCT.

Study Recommendations

The key recommendations are presented below:

Recommendation 1

Integration of pharmacists within general practice- acceptability

- Process evaluation highlighted acceptability of pharmacist role
- Empower patients to make decisions about their medications using patient centred reviews structures
- Evidence based approach

Recommendation 2

Integration of pharmacists within general practice- the potential impact

- Systematic review and trial highlighted the potential of integrating pharmacists within general practice
- Potential to reduce PIP and improve medications management for patients and healthcare professionals
- Progress GPP pilot cRCT to a definitive cRCT to determine effectiveness and cost-effectiveness

Recommendation 2

Uniformity of reporting

- Systematic review showed issues surrounding heterogeneity of outcomes reported and intervention implementation
- Uniformity of outcomes reporting – Core Outcomes Sets & evidence synthesis
- Uniformity of outcomes reporting – Core Outcomes Sets & evidence synthesis
- Build the body of evidence to support role expansion

Collaborative Doctoral Award (CDA) in Multimorbidity

Publications, Conference Presentations, Posters, Media Mentions

Publications

1. Foley L, Larkin J, Lombard-Vance R, Murphy AW, Molloy GJ. Prevalence and predictors of medication non-adherence among patients with multimorbidity: A systematic review protocol [version 2; peer review: 2 approved]. HRB Open Research. 2020/04/17 ed. 2019;2:29.
2. Foley L, Larkin J, Lombard-Vance R, Murphy AW, Hynes L, Galvin E, et al. Prevalence and predictors of medication non-adherence among people living with multimorbidity: a systematic review and meta-analysis. BMJ Open. 2021 Sep 1;11(9):e044987.
3. Foley L, Hynes L, Murphy AW, Molloy GJ. 'Just keep taking them, keep hoping they'll work': A qualitative study of adhering to medications for multimorbidity. Br J Health Psychol. 2021;27(3):691–715.
4. Foley L, Doherty AS, Wallace E, Boland F, Hynes L, Murphy AW, et al. Exploring the Multidimensional Relationship Between Medication Beliefs and Adherence to Medications Among Older Adults Living With Multimorbidity Using Polynomial Regression: An Observational Cohort Study. Annals of Behavioral Medicine. 2023;kaad004.
5. Croke A, James O, Clyne B, Moriarty F, Cardwell K, Smith SM. The effectiveness of integrating clinical pharmacists within general practice to optimise prescribing and health outcomes in primary care patients with polypharmacy: A protocol for a systematic review. HRB Open Research. 2019;2.
6. Croke A, Cardwell K, Clyne B, Moriarty F, McCullagh L, Smith SM. The effectiveness and cost of integrating pharmacists within general practice to optimize prescribing and health outcomes in primary care patients with polypharmacy: a systematic review. BMC Primary Care. 2023;24(1):41.
7. Croke A, Moriarty F, Boland F, McCullagh L, Cardwell K, Smith SM, et al. Integrating clinical pharmacists within general practice: protocol for a pilot cluster randomised controlled trial. BMJ open. 2021;11(3):e041541.
8. Larkin J, Foley L, Smith SM, Harrington P, Clyne B. The experience of financial burden for people with multimorbidity: A systematic review of qualitative research. Health Expectations. 2021;24(2):282–95.

9. Larkin J, Foley L, Smith S, Harrington P, Clyne B. The experience of financial burden for patients with multimorbidity: a protocol for a systematic review of qualitative research [version 2; peer review: 2 approved]. 2022 Aug 11 [cited 2023 Dec 8]; Available from: https://repository.rcsi.com/articles/journal_contribution/The_experience_of_ financial_burden_for_patients_with_multimorbidity_a_protocol_for_a_systematic_ review_of_qualitative_research_version_2_peer_review_2_approved_/20431944/1.

10. Larkin J, Walsh B, Moriarty F, Clyne B, Harrington P, Smith SM. What is the impact of multimorbidity on out-of-pocket healthcare expenditure among community-dwelling older adults in Ireland? A cross-sectional study. BMJ open. 2022;12(9):e060502.

11. Larkin J, Foley L, Timmons S, Hickey T, Clyne B, Harrington P, et al. How do People with Multimorbidity Prioritise Healthcare when Faced with Financial Constraints? A Choice Experiment [Internet]. medRxiv; 2023 [cited 2023 Dec 14]. p. 2023.04.10.23288383. Available from: https://www.medrxiv.org/content/10.1101/2023.04.10.23288383v1.

12. Kiely B, Croke A, O'Shea M, Boland F, O'Shea E, Connolly D, et al. Effect of social prescribing link workers on health outcomes and costs for adults in primary care and community settings: a systematic review. BMJ Open. 2022 Oct 1;12(10):e062951.

13. Kiely B, Clyne B, Boland F, O'Donnell P, Connolly D, O'Shea E, et al. Link workers providing social prescribing and health and social care coordination for people with multimorbidity in socially deprived areas (the LinkMM trial): protocol for a pragmatic randomised controlled trial. BMJ Open. 2021 Feb 1;11(2):e041809.

14. Kiely B, Connolly D, Clyne B, Boland F, O'Donnell P, Shea EO, et al. Primary care-based link workers providing social prescribing to improve health and social care outcomes for people with multimorbidity in socially deprived areas (the LinkMM trial): Pilot study for a pragmatic randomised controlled trial. Journal of Multimorbidity and Comorbidity. 2021 Jan 1;11:26335565211017781.

15. Kiely B, O'Donnell P, Byers V, Galvin E, Boland F, Smith SM, et al. Protocol for a mixed methods process evaluation of the LinkMM randomised controlled trial "Use of link workers to provide social prescribing and health and social care coordination for people with complex multimorbidity in socially deprived areas" [Internet]. HRB Open Research; 2021 [cited 2023 Dec 21]. Available from: https://hrbopenresearch.org/articles/4-38.

16. Foley L, Kiely B, Croke A, Larkin J, Smith SM, Clyne B, et al. A protocol for the evaluation of the process and impact of embedding formal and experiential Public and Patient Involvement training in a structured PhD programme. Journal of Multimorbidity and Comorbidity. 2021;11:26335565211024793.

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18. Larkin J, Smith SM, Christensen LD, Voss TS, Vestergaard CH, Paust A, Prior A. The Association between Multimorbidity and Out-of-Pocket Expenditures for Prescription Medicines among Adults in Denmark: A Population-Based Register Study. medRxiv. 2023:2023-11.

19. Kiely B, Hobbins A, Boland F, Clyne B, Galvin E, Byers V, Loomba S, O'Donnell P, Connolly D, Shea EO', Smith SM. An exploratory randomised trial investigating feasibility, potential impact and cost effectiveness of link workers for people living with multimorbidity attending general practices in deprived urban communities. BMC Prim Care. 2024 Jun 28;25(1):233. doi: 10.1186/s12875-024-02482-6.

20. Kiely B, Keenan I, Loomba S, Mack N, Byers V, Galvin E, O'Shea M, O'Donnell P, Boland F, Clyne B, O'Shea E, Smith SM, Connolly D. Implementing a General Practice-Based Link Worker Intervention for People with Multimorbidity During the Covid-19 Pandemic-a Mixed Methods Process Evaluation of the LinkMM RCT. Int J Integr Care. 2024 Dec 20;24(4):16. doi: 10.5334/ijic.8586. PMID: 39711994; PMCID: PMC11661012.

21. Connolly H, Delimata N, Galway K, Kiely B, Lawler M, Mulholland J, O'Grady M, Connolly D. Exploration of Evaluation Practices in Social Prescribing Services in Ireland: A Cross- Sectional Observational Study. Healthcare. 2024; 12(2):219. https://doi.org/10.3390/ healthcare12020219.

Conference Presentations

1. Croke A. The General Practice-Based Pharmacist Medications Optimisation Programme: Key findings & recommendations. 04/06/2024, RCSI Clinical Partner Evening.
2. Croke, A. The effectiveness and cost of integrating pharmacists within general practice to optimise prescribing and health outcomes in primary care patients with polypharmacy: A systematic review. 07/11/2023, All Ireland Pharmacy Conference.
3. Croke, A. General Practice-Based Pharmacist Medicines Optimisation Programme: Protocol. 12/03/2021, AUDGPI Conference, RCSI.
4. Croke, A. Advanced pharmacist practitioner roles. October 2019. AUDGPI, Early Career Showcase, RCSI.

5. Foley, L., Doherty, A., Wallace, E., Boland, F., Hynes, L., Murphy, AW., & Molloy, GJ. (2022, November). Exploring the multidimensional relationship between medication beliefs & adherence in multimorbidity: an observational study [Oral presentation]. North American Primary Care Research Group 51st Annual Meeting, Phoenix, AZ, United States.
6. Foley, L., Doherty, A., Wallace, E., Boland, F., Hynes, L., Murphy, AW., & Molloy, GJ. (2022, August). Exploring the multidimensional relationships between medication beliefs and adherence among people living with multimorbidity using polynomial regression: an observational cohort study [Oral presentation]. 36th Annual Conference of the European Health Psychology Society, Bratislava, Slovakia.
7. Foley, L., Hynes, L., Murphy, AW., & Molloy, GJ. (2021, November). 'Just keep taking them, keep hoping they'll work': a qualitative exploration of medication adherence among people ix living with multimorbidity [Oral presentation]. 24th Annual Meeting of the International Society for Patient Medication Adherence (ESPACOMP), Virtual Meeting.
8. Foley, L., Hynes, L., Murphy AW., Molloy GJ. (2021, August). 'Just keep taking them, keep hoping they'll work': a qualitative exploration of medication adherence among people living with multimorbidity [Oral presentation]. 35th Annual Conference of the European Health Psychology Society, Virtual Conference.
9. Foley, L., Hynes, L., Murphy AW., Molloy GJ. (2021, May). 'Just keep taking them, keep hoping they'll work': a qualitative exploration of medication adherence among people living with multimorbidity [Oral presentation]. 18th Annual Psychology, Health and Medicine Conference, Virtual Conference.
10. Foley, L., Hynes, L., Murphy, AW., & Molloy, GJ. (2021, March). A qualitative exploration of living with and adhering to medications for multimorbidity [Oral presentation]. Annual Joint Scientific Meeting of the AUDGPI and ICGP, Virtual Conference.
11. Foley, L., Hynes, L., Murphy, AW., & Molloy, GJ. (2021, February). A qualitative exploration of living with and adhering to medications for multimorbidity [Oral presentation]. 7th Annual SPHeRE Conference, Virtual Conference.
12. Kiely B, Galvin E, Byers V et al. Primary care-based link workers providing social prescribing to improve health and social care outcomes for people with multimorbidity in socially deprived areas (The LinkMM trial). Protocol for a RCT and baseline results. Annual Joint Scientific Meeting of the Association of University Departments of General Practice in Ireland (AUDGPI) and Irish College of General Practitioners (ICGP). Online. March 2021.
13. Kiely B, Croke A, O'Shea M, et al. Effect of social prescribing link workers on health outcomes and costs for adults in primary care and community settings: a systematic review. Oral Presentation. The Structured Population and Health Services Research Education (SPHeRE) Network 8th Annual Conference. Online. February 2022.

14. Kiely B, Loomba S, Boland F, et al. One year follow-up survey of participants in the LinkMM trial: Link worker engagement and community resource use. Annual Joint Scientific Meeting of AUDGPI and ICGP. Online. March 2022.
15. Kiely B, Croke A, O'Shea M, et al. Effect of social prescribing link workers on health outcomes and costs for adults in primary care and community settings: a systematic review. Society for Academic Primary Care Annual Scientific Meeting, University of Central Lancashire, Preston, UK. July 2022.
16. Kiely B, Hobbins A, Boland F, et al. Link workers for people living with multimorbidity attending general practices in deprived urban communities. An exploratory randomised trial investigating feasibility, potential impact and cost effectiveness. Joint North-South Public Health Conference 'The Health-Wealth Divide: Leaving No One Behind'. Online. November 2023.
17. Kiely B, Hobbins A, Boland F, et al. Link workers for people living with multimorbidity attending general practices in deprived urban communities. An exploratory randomised trial investigating feasibility, potential impact and cost effectiveness. Annual Joint Scientific Meeting of AUDGPI and ICGP. University of Limerick, March 2024. Awarded Best Research Presentation.

Posters

1. Croke, A., Cardwell. K,. Clyne. B,. Moriarty. F,. McCullagh. L,. Smith. SM,. The effectiveness and cost-effectiveness of integrating clinical pharmacists within general practice to optimise prescribing and health outcomes in primary care patients with polypharmacy: A systematic review. 29/03/2022. 8th SPHeRE Network Annual Conference, 'Wicked Policy Problems-Pulling Back the Curtain'. Online conference.
2. Croke, A., Cardwell. K,. James. O,. Clyne. B,. Moriarty. F,. Smith. SM,. The effectiveness of integrating clinical pharmacists within general practice to optimise prescribing and health outcomes in primary care patients with polypharmacy: A Systematic Review. Interim findings poster. 30/06/2021-01/07/2021. SAPC Online Annual Conference; Living and Dying Well.
3. Foley L., Larkin J., Lombard-Vance R., Murphy AW., Hynes L., Galvin E., Molloy G. (2021, June/July). Prevalence and predictors of medication non-adherence among people living with multimorbidity: a systematic review and meta-analysis [Poster presentation]. 49th Annual Scientific Meeting of the Society for Academic Primary Care, Virtual Conference.
4. Foley, L., Larkin, J., Lombard-Vance, R., Murphy, AW., Hynes, L., Galvin, E., & Molloy, G. (2021, May). Prevalence and predictors of medication non-adherence among people living with multimorbidity: a systematic review and meta-analysis [Poster presentation]. 18th Annual Psychology, Health and Medicine Conference, Virtual Conference.

5. Foley, L., Larkin, J., Lombard-Vance, R., Murphy, AW., Hynes, L., Galvin, E., & Molloy, G. (2020, November). Prevalence and predictors of medication non-adherence among people living with multimorbidity: a systematic review and meta-analysis [Poster presentation]. 24th Annual Meeting of the International Society for Patient Medication Adherence (ESPACOMP), Virtual Meeting.
6. Foley, L., Larkin, J., Lombard-Vance, R., Murphy, A.W. & Molloy, G.J. (2019, September). Prevalence and predictors of medication non-adherence among patients with multimorbidity: a systematic review [Poster presentation]. 33rd Annual Conference of the European Health Psychology Society, Dubrovnik, Croatia.
7. Foley, L., Lombard-Vance, R., Murphy, A.W. & Molloy, G.J. (2019, March). Prevalence and predictors of medication non-adherence among patients with multimorbidity: a systematic review [Poster presentation]. 16th Annual Psychology, Health and Medicine Conference, Kildare, Ireland.
8. Kiely B, Galvin E, Boland F et al. Can primary care-based link workers providing social prescribing improve health outcomes for people with multimorbidity in socially deprived areas? A randomised controlled trial. Society for Academic Primary Care Annual Scientific Meeting. Online. July 2021.
9. Larkin J, Foley L, Smith SM, Harrington P, Clyne B. The experience of financial burden for people with multimorbidity: A systematic review of qualitative research. The Structured Population and Health Services Research Education Annual Conference. Online. February 2021.
10. Larkin J, Foley L, Smith SM, Harrington P, Clyne B. The experience of financial burden for people with multimorbidity: A systematic review of qualitative research. Society for Academic Primary Care Annual Conference. Online. June 2021.
11. Larkin J, Walsh B, Moriarty F, Clyne B, Harrington P, Smith SM. The Association between Multimorbidity and Out-Of-Pocket Healthcare Expenditure among Community-Dwelling Adults: findings from The Irish Longitudinal Study on Ageing (TILDA). The Structured Population and Health Services Research Education Annual Conference. Online. March 2022.
12. Larkin J, Foley L, Smith SM, Harrington P, Clyne B. The experience of financial burden for people with multimorbidity: A systematic review of qualitative research. Association of University Departments of General Practice in Ireland Annual Conference. Online. March 2021.
13. Larkin J, Walsh B, Moriarty F, Clyne B, Harrington P, Smith SM. The Association between Multimorbidity and Out-Of-Pocket Healthcare Expenditure among Community-Dwelling Adults: findings from The Irish Longitudinal Study on Ageing (TILDA). Association of University Departments of General Practice in Ireland Annual Conference. Online. March 2022.

14. Larkin J, Walsh B, Moriarty F, Clyne B, Harrington P, Smith SM. The Association between Multimorbidity and Out-Of-Pocket Healthcare Expenditure among Community-Dwelling Adults: findings from The Irish Longitudinal Study on Ageing (TILDA). WONCA World Rural Health Conference 2022. Limerick. June 2022.
15. Larkin J, Walsh B, Moriarty F, Clyne B, Harrington P, Smith SM. The Association between Multimorbidity and Out-Of-Pocket Healthcare Expenditure among Community-Dwelling Adults: findings from The Irish Longitudinal Study on Ageing (TILDA). Society for Academic Primary Care Annual Conference. Preston. July 2022.
16. Larkin J, Foley L, Timmons S, Hickey T, Clyne B, Harrington P, et al. How do People with Multimorbidity Prioritise Healthcare when Faced with Financial Constraints? A Choice Experiment. Health Services Research UK. Birmingham. July 2023
17. Larkin J, Walsh B, Moriarty F, Clyne B, Harrington P, Smith SM. The Association between Multimorbidity and Out-Of-Pocket Healthcare Expenditure among Community-Dwelling Adults: findings from The Irish Longitudinal Study on Ageing (TILDA). North American Primary Care Research Group. Phoenix, Arizona. November 2023.
18. Larkin J, Smith SM, Christensen LD, Voss TS, Vestergaard CH, Paust A, Prior A. The Association between Multimorbidity and Out-of-Pocket Expenditures for Prescription Medicines among Adults in Denmark: A Population-Based Register Study. Health Services Research UK. Oxford. July 2024.

Media

1. “Connecting people to their community: ‘GPs don’t have time . . . we do’; Service that identifies local activities to help combat post-pandemic anxiety is on the rise”. Irish Times Health Supplement. June 2022
2. “Social Prescribing needs more evidence to support its benefits before widespread roll out- new study”. The Conversation. October 2024.
3. “People with chronic conditions forced to reduce basic living expenses to afford health costs, says study”. Irish Times Health Supplement, March 2025.

Final Dissemination Meeting Summary

In November 2023, findings and recommendations from the four PhD projects on the topic of multimorbidity were disseminated in Dublin, Ireland. The PhD programme, led by Professor Susan Smith (Trinity College Dublin), is funded by a HRB CDA in Patient-focused Research. The audience consisted of a national representation of patients, general practitioners, pharmacists, health service researchers, PhD students, policy makers, and HSE staff. Of note was a significant international dimension provided by the Scottish Multimorbidity PhD Programme led by Professor Frances Mair of Glasgow.

PhD Students and Supervisors at Meeting for dissemination of findings and recommendations arising from Collaborative Doctoral Award (CDA) in Multimorbidity Programme.

Dr Annalisa Montesanti of the HRB introduced the event by highlighting the aims of the funding programme, which include strengthening cross disciplinary collaborations and training skilled researchers to generate and translate findings to improve patient health. Following an introduction to the topic of multimorbidity, Susan Smith introduced the audience to Michael who lives with multiple long-term conditions and who collaborated with the PhD students as a Public and Patient Involvement (PPI) contributor throughout the research. Michael, in conversation with PhD researcher Dr Bridget Kiely (Royal College of Surgeons Ireland; RCSI), described his experiences of living with multiple conditions. He highlighted the high number of regular medicines he is prescribed, the financial costs of travelling to multiple appointments, and how symptoms and treatments for multiple long-term conditions co-exist. Michael then called for more personalised and connected healthcare to meet the needs of people who live with multiple ongoing conditions every day. This set the scene very well for the remainder of the morning, as the PhD students presented key findings and recommendations from their research, which aimed to understand and address these challenges.

Dissemination Meeting Session 1- Managing multiple medicines

The first session, titled “Managing Medicines”, was chaired by Professor Carmel Hughes (Queen’s University Belfast). Dr Louise Foley (University of Galway), with a background in health psychology, presented her PhD research on the topic of medication adherence. The key findings suggested that medication non-adherence is common but varies considerably in the multimorbidity literature, that multiple medicines and conditions extend the work associated with chronic condition self-management, and that beliefs about medicines prescribed for multimorbidity can be complex in how they relate to medication taking behaviours. Based on her PhD research, Louise recommended that involvement in decisions about medicines is individualised for people managing multiple conditions, that discussions about medication adherence are integrated into routine practice, and that a variety of strategies are used together to support people experiencing different types of barriers to taking multiple medicines.

Louise Foley, with a background in health psychology, presented her research on medication adherence among people living with multimorbidity at Session 1 - Managing multiple medicines.

This was followed by Aisling Croke (RCSI), a pharmacist, who presented her PhD research on the role of GPPs in medication optimisation interventions. The key findings suggested that pharmacists can reduce potentially inappropriate prescribing and number of medications, that costs reduce alongside reductions in potentially inappropriate prescribing, and that general practitioners, pharmacists, patients and GP nurses are accepting of pharmacists in the general practice setting. Drawing on this research, Aisling recommended that patients are empowered to make decisions related to medicines through patient-centred review structures, that greater uniformity of reporting outcomes is needed to establish a strong evidence base, and that there is potential for integrating pharmacists in the general practice setting, and this potential should be examined further in a definitive trial.

Aisling Croke (RCSI), a pharmacist, presented her PhD research on the role of GPPs in medication optimisation interventions at Session 1- Managing multiple medicines.

The session on medicines management concluded with a panel discussion featuring Louise and Aisling, alongside their respective PhD supervisors Professor Gerry Molloy (University of Galway) and Dr Frank Moriarty (RCSI).

The discussion was largely focussed on real-world implementation considerations. Practical barriers to implementing GPP roles were identified, including space, time and prescribing limits. Questions arose around how to engage those who are likely to benefit most from medication reviews and discussions about adherence, and how to incorporate such exchanges in a time-limited context. While there was an acknowledgement of the challenges of changing healthcare systems and cultures, the motivation among pharmacists to take on the general practice-based role was highlighted, and the value of simple strategies to support adherence was emphasised. Dr Ciara Kirke, clinical lead of medication safety with the Irish Health Service Executive, reported that when implemented in a real-world setting in the iSIMPATHY project, patient participation and satisfaction was very high, prompting further reflections on the nuances that exist between implementation in research and implementation in practice. Highlighting synergies across the PhD projects, the panel session concluded by reflecting on a recommendation from the PPI panel to explore the potential for general practice-based pharmacists to support medication adherence as part of their role in the GP setting.

Dissemination Meeting Session 2- Treatment burden

The second session, titled “Treatment Burden”, was chaired by Dr Frank Moriarty. Dr James Larkin (RCSI), with a background in psychology and health services research, presented his research on the experience of financial burden among people living with multimorbidity. The key findings highlighted the high healthcare costs associated with multimorbidity, that these high healthcare costs can have unintended consequences such as non-adherence and non-attendance, and that healthcare entitlements can

reduce financial burden significantly. Based on this PhD research, James recommended that cost-of-care conversations should be implemented by healthcare workers, that user charges and health-related travel expenses should be reduced, and that a healthcare system designed for multimorbidity is needed.

Dr James Larkin (RCSI), with a background in psychology and health services research, presented his research on the experience of financial burden among people living with multimorbidity at Session 2- Treatment burden.

This was followed by the final PhD presentation of the day. Dr Bridget Kiely (RCSI), a general practitioner, presented her PhD research on social prescribing for people living with multiple long-term conditions. The PhD research which is presented earlier in this report and includes a systematic review, a randomised controlled trial, a cost utility analysis and a process evaluation. Key findings from the systematic review highlighted that there is limited evidence for the cost-effectiveness of link worker interventions. The randomised trial suggested there is potential for general practice-based link worker interventions to be cost-effective, and the process evaluation found that patients welcomed the presence of link workers in the general practice setting, though would have preferred more time with them. Based on these findings, Bridget recommended that more time and stronger embedding of social prescribing in general practice is needed, that several issues across the phases of evaluation need to be overcome to produce a strong evidence base, and that it may be too soon for widespread rollout of link worker interventions in the absence of robust evaluations which account for opportunity costs.

Dr Bridget Kiely (RCSI), a general practitioner, presented her PhD research on social prescribing for people living with multiple long-term conditions at Session 2- Treatment burden.

The session on treatment burden concluded with a panel discussion involving James and Bridget, PPI contributor Michael, James' PhD supervisor Dr Barbara Clyne (RCSI), and Professor Frances Mair (University of Glasgow).

Once again parallels were drawn between the two PhD projects, emphasising the importance of care that addresses both health and social needs. The position of link workers within a multidisciplinary team was discussed, specifically the importance of establishing a clear role that is not merely filling gaps in existing service provision. Audience members were interested to know more about the training and professional background of link workers, and comparisons were made with the UK healthcare system where social prescribing has been implemented in primary care. The overarching theme of the panel discussion spoke to the point originally made by Michael, that is, the need for personalised and connected healthcare to reduce the burden experienced by people living with multiple ongoing conditions.

Dissemination Meeting Session 3- Public and Patient Involvement in research

The first of the afternoon sessions was a reflection on Public and Patient Involvement in the PhD research. Louise Foley introduced the session with a brief overview of the formal and experiential PPI training that was embedded in the PhD programme and highlighted a recent programme-level publication reporting the process and impact of this PPI training and collaboration. This was followed by a conversation between PPI contributor Declan and PhD student James, who discussed their individual experiences of working collaboratively across four related PhD projects and the impacts of the collaboration on the research and individuals involved.

PPI contributor Declan Keely and PhD student James Larkin, discuss their personal experiences of working collaboratively across four related PhD projects at Dissemination Meeting Session 3- Public and Patient Involvement in research.

Declan reflected on the progress the PhD students made over the years, particularly in relation to communicating clearly and effectively with the public and highlighted the PPI panel's role in ensuring the approach to research was always acceptable to people living with multiple conditions.

Dissemination Meeting Session 4- International Perspective

An international perspective was then presented by Professor Frances Mair, who directs the Multimorbidity PhD Programme for Health Professionals in Scotland, funded by the Wellcome Trust. With a focus on cohort building, Frances described the training and skills development opportunities for the PhD fellows, who are completing research across the themes of prevention and management, physical and mental multimorbidity, and polypharmacy, with a cross-cutting theme of inequalities. Several of the fellows visited Dublin with Frances to attend the dissemination event and to network with the Irish PhD cohort the day before which is reflected upon further in a blog by Benedict Warner (University of Glasgow).

Frances continued the presentation by referring to some key insights on the topic of multimorbidity, including the effects of social isolation, social stigma and treatment burden on outcomes for people living with multiple long-term conditions. The talk concluded with a call to make healthcare simpler, more kind, and less work for people living with multimorbidity.

Professor Frances Mair, who directs the Multimorbidity PhD Programme for Health Professionals in Scotland presents an International Perspective at the Dissemination Meeting Session 4.

Dissemination Meeting Session 5- Policy and practice implications

The day concluded with a panel discussion on policy and practice implications, chaired by Professor Andrew Murphy (University of Galway), and featuring Professor Peter Bower (University of Manchester), Dr Sara Burke (Trinity College Dublin), PPI Contributor Michael Metcalfe, Professor Frances Mair, and Dr Ciara Kirke (Health Services Executive). The importance of addressing health inequalities and targeting primary and secondary prevention was first discussed and a reorientation towards integrated care was considered, however the challenges posed by a misalignment of patient and system priorities was also highlighted. The central role of evidence was emphasised throughout the panel discussion, specifically the importance of clear evidence for what works well in real-world settings. This final panel session concluded with a reflection that also serves as motivation for bringing forward patient-focused research on multiple long-term conditions: to approach research incrementally and build on what we know is working well in practice, with the aim of establishing a compelling evidence base for meaningful investment in patient-oriented care.

Programme Recommendations

By Professor Susan Smith and Professor Andrew Murphy

The HRB CDA in Multimorbidity significantly added to the existing evidence base for managing multimorbidity across a wide range of areas, with multidisciplinary teams using diverse methods. There was some disruption to projects during the COVID-19 pandemic, but the PhD Scholars and their research teams pivoted to address these challenges in ways that provided additional supports to patients and clinicians during that time.

In summary, the PhD programme recommendations for addressing multimorbidity are:

1 Adherence:

- Individualise involvement in medication decisions
- Integrate adherence discussions into routine practice
- Consider a variety of cognitive and behavioural strategies to support adherence

2 Financial Burden

- Consider cost-of-care conversations
- Reduce user charges for care and reimburse travel costs
- Recognise that people living with multimorbidity experience higher financial burden

3 Link workers delivering social prescribing

- Address fragmented care and ensure the whole system addresses multimorbidity
- Need longer term supports and stronger GP links for patients living with morecomplex ongoing health problems
- Need to overcome the challenges of evaluating these types of interventions
- Insufficient evidence for widespread roll out – need to consider who to target and opportunistic cost

4 GP-Based Pharmacists

- Integration of pharmacists with general practice is feasible and acceptable
- Impact on medication safety through reduction in Potentially Inappropriate Prescriptions
- Need to standardise how we report on evaluations so we can make comparisons across studies

Implications for Multimorbidity Research

A wide range of studies were conducted using different methodologies but all focusing on building the evidence base for multimorbidity. A range of research recommendations have been identified:

- Research should address health inequalities, target primary and secondary prevention and keep a focus on reducing treatment burden for people living with multimorbidity.
- PPI input at all stages of the process is critical to ensuring research that addresses issues of importance to patients and their families. PPI should be conducted in a way that respects contributors' involvement and acknowledges their expertise by experience.
- Study designs need to be carefully considered to address the questions being answered and the programme has demonstrated the value of using a range of methods and designs when addressing a complex problem like multimorbidity
- Standardised outcomes should be used to allow for comparison between studies and facilitate international evidence synthesis.
- From a sustainability perspective and to build efficiencies into research, future HRB CDA grants would expand from the current single cohort focus to include multiple cohorts of PhD students to facilitate both vertical and horizontal peer to peer learning and build critical mass in key research areas.

Implications for practice and policy

The Overarching Recommendations from the HRB CDA in Multimorbidity that relate to clinical practice and health policy include:

- Acknowledge the challenge and complexity for people living with multimorbidity
- Support people with multimorbidity to make individualised decisions about their care
- Consider opportunities to limit treatment and financial burden, which are higher in multimorbidity, including through cost-of-care conversations
- The current reorientation towards integrated care is important, however the challenges posed by a misalignment of patient and system priorities needs to be considered
- The central role of evidence to inform policy for management of long-term conditions needs to be emphasised in all decision making, with an acknowledgement of the lack of clear evidence for what works well in real-world settings
- Health system changes are needed to address multimorbidity, including
  - Defragmentation of care
  - Addressing multimorbidity in all decisions about care delivery
  - Manging medicines with the support of GP-based pharmacists
  - Longer term support from link workers delivering social prescribing with strong GP links

Impact of the Programme on PhD Scholars - Reflections

"As a PhD student on the CDA-MM, I gained a real appreciation for the importance of multi-disciplinary approaches to understanding complex experiences like living with multiple long-term conditions. I was challenged by many "firsts" too, including practicing PPI for the first time, recruiting participants in the community setting, working with secondary data, presenting research at international conferences, and thinking beyond the boundaries of my own discipline of health psychology. The environment of the CDA-MM – made up of peers, supervisors, collaborators and members of the public with diverse experience and expertise – supported me to develop these skills, which I draw on regularly in my current role as Postdoctoral Researcher at University of Limerick". **Dr. Louise Foley, School of Allied Health and Health Research Institute, University of Limerick.**

"My PhD was a formative experience. Working with my supervisors and my fellow PhD students was the most important part. Their diverse experiences and professional backgrounds, as well as their constructive styles, meant I could learn many of the key aspects of being an impactful academic. Also, working with people who had experiences of multiple chronic conditions, as well as exploring the importance of the patient voice, gave me a greater understanding about the structural inequalities that exist in research and healthcare. Ultimately, I feel the PhD put me in a position to have a meaningful and positive impact on healthcare and society". **Dr. James Larkin, Department of General Practice Royal College of Surgeons in Ireland**

"I feel incredibly fortunate to have been part of the collaborative doctoral award. Firstly, I would like to acknowledge and thank my supervisors, Professor Susan Smith, Professor Deirdre Connolly and Professor Eamon O'Shea. They were approachable, available and generous with their time and expertise throughout the process. I would like to acknowledge the Health Research Board for funding the collaborative doctoral award, including this PhD, and the Structured Population Health Research Education programme.

I benefitted greatly from peer support and structured learning through both. Particular thanks to Aisling Croke, James Larkin and Louise Foley, my fellow CDA scholars. I would also like to acknowledge the Department of General Practice and RCSI for providing an ideal environment, surrounded by wise and supportive friends and colleagues, in which to do my work.

During my PhD I started a family. It would not have been possible to do this without paid maternity leave. Without this, I would not have been able to complete a PhD and I cannot emphasise how important this was.

Having completed my PhD I have gained a lot of skills and knowledge and a new way of looking at the world. I hope that this broadening of my horizons will have a positive impact in my current role as a clinical lecturer to undergraduate medical students and I hope to pursue a career in academia in the future." **Dr. Bridget Kiely, Senior Clinical Lecturer, General Practice, Royal College of Surgeons in Ireland.**

"My PhD was a positive and enriching journey. I feel very fortunate to have been able to complete this journey as part of the collaborative doctoral award which allowed unique and varied experiences based on the diverse skills and backgrounds my supervisory team and CDA colleagues. I would like to acknowledge and thank my three supervisors, Dr. Barbara Clyne, Professor Susan Smith and Dr. Frank Moriarty for their unwavering support and guidance. My PhD was enriched by the support and friendship of my CDA PhD group, Bridget Kiely, James Larkin and Louise Foley. Beyond a doubt, one of the most impactful aspects of my PhD was the involvement of our PPI panel members, which gave deeper meaning to my research work. I now have three daughters who were not present at the start of this journey and I was incredibly lucky to have such a supportive and constructive environment in which to complete my research. Having completed my PhD I have gained a wealth of skills and knowledge which will positively impact my work as a senior lecturer to undergraduate pharmacy students where I will also have the opportunity to further my academic interests." **Dr. Aisling Croke, Senior Lecturer, Practice of Pharmacy, SETU Waterford.**

Conclusion

Participants attending our final dissemination meeting concluded with a reflection that also serves as motivation for bringing forward patient-focused research on multiple long-term conditions: to approach research incrementally and build on what we learn. This is working well in practice, with the aim of establishing a strong evidence base for meaningful investment in patient-oriented care.

The HRB CDA in Multimorbidity has addressed its original aim which was to generate a national cohort of skilled post-doctoral researchers who can make a significant future international impact across a range of academic, clinical practice and policy settings, having developed expertise in the generation of research evidence to support cost-effective and patient centred management of multiple long-term conditions.

Appendices

Appendix 1: Public and Patient Involvement Panel Members

Mr Michael Metcalfe
Ms Karen Cowap
Mr Declan Keely
Mr Tony Hickey
Mr Paddy O'Neil
Ms Brid Nolan
Mr Thomas Bergin
In particular, we acknowledge the contribution of Ms Nuala Baker, who passed away during the CDA-MM.

Appendix 2: PhD Supervisors

Thesis Supervisors: Dr Louise Foley (University of Galway).

Research Topic – "Medication adherence among people living with multimorbidity: prevalence, predictors & intervention options".

Professor Gerry Molloy, University of Galway
Gerry is a Professor of Psychology and he leads the MEDication Adherence across the Lifespan (MEDAL) research group and is currently linked to several leading health psychology research groups in Europe. Over the last 10 years the main focus of this programme of research has been on describing, understanding and changing medication taking behaviour. Five key overarching questions include: (1) What is the extent of non-adherence to treatments? (2) What are the causes of non-adherence to treatment? (3) What are the consequences of non-adherence (4) How can we improve the measurement of medication taking behaviour? (5) What interventions support optimal medication taking behaviour? Gerry was an elected member of the Executive Committee of the European Health Psychology Society (EHPS) between 2010 and 2014 and is currently a member of the Editorial Board of Psychology & Health. He has been an Associate Editor of the British Journal of Health Psychology and the International Journal of Behavioral Medicine. He is currently an Associate Editor of Health Psychology Review.

Professor Gerry Molloy, University of Galway. Supervisor for Dr. Louise Foley's PhD project.

Professor Andrew Murphy, University of Galway
Andrew is Foundation Professor of General Practice at University of Galway and a partner in a semi-rural general practice in Turloughmore, County Galway. His research, largely quantitative and always collaborative, addresses chronic disease management and professional practice in the community. Andrew has been a lead investigator on trials evaluating the role of general practitioners in A&E, the management of cardiovascular disease, chronic pain, COPD, urinary tract infections, influenza like-illness and adherence in hypertension. Andrew is currently Chair of the German Federal Ministry of Education and Research International Advisory Board to Primary Care Research Networks; he is also a member of the Advisory Board to the Norwegian Primary Care Research Network.

Professor Andrew Murphy, University of Galway. Supervisor for Dr. Louise Foley's PhD project.

Dr Lisa Hynes, Croí
Dr Lisa Hynes is the Head of Health Programmes with Croí, the west of Ireland Cardiac & Stroke Foundation. Lisa is a Chartered Member of the Psychological Society of Ireland and completed a Structured PhD in Psychology & Health at the University of Galway in 2016. Working in community-based prevention of heart disease and stroke currently, Lisa's background is in the development of complex health behaviour change interventions. Lisa has worked in intervention development and evaluation in the areas of type 1 diabetes, asthma and multimorbidity, with a focus on qualitative and stakeholder led approaches.

Dr Lisa Hynes, Head of Health Programmes, Croí. Supervisor for Dr. Louise Foley's PhD project.

Thesis Supervisors: Dr James Larkin (Royal College of Surgeons in Ireland).

Research Topic– "Financial Burden: The burden of financial costs of healthcare for people with multimorbidity."

Professor Susan Smith
Susan Smith is Professor of General Practice at Trinity College Dublin and works as a General Practitioner at Inchicore Family Doctors in Dublin 8. She did her undergraduate medical degree in TCD and then did GP training in Ireland and the UK, followed by a period working as an academic GP in Australia. She retuned to Ireland where she has worked as an academic GP in UCD, RCSI and TCD and continues to work as a GP at Inchicore Family Doctors in Dublin 8. Prof Smith is the Associate Director of the HRB Primary Care Clinical Trials Network Ireland and the Clinical Lead for HRB CICER, which provides evidence synthesis supports for the National Clinical Effectiveness Committee.

Professor Susan Smith, Professor of General Practice at Trinity College Dublin, Supervisor for Dr James Larkin's PhD project.

Dr Barbara Clyne
Dr Barbara Clyne is senior lecturer in the Department of Public Health and Epidemiology, RCSI. Her research focuses on the conduct of research to support evidence based decision making across the evidence ecosystem. She has significant expertise in the design and conduct of randomised controlled trials and evidence synthesis of clinical effectiveness, safety, and cost-effectiveness, and has particular interest in older people and ageing, multimorbidity, and appropriate prescribing. She is a co-applicant/ collaborator on a number of grants, including a Definitive Intervention and Feasibility Award 'Medicines and Social Prescribing to aDdress pAtient priorities in multimorbidity (MIDAS): A multi-arm definitive cluster randomised trial in Irish general practice" and the HRB Primary Care Clinical Trials Network Ireland. Barbara is also an associate editor for the journal Trials.

Dr Barbara Clyne, senior lecturer, Department of Public Health and Epidemiology, RCSI, Supervisor for Dr James Larkin's PhD project.

Dr Patricia Harrington
Dr Patricia Harrington joined the Health Technology Assessment (HTA) Directorate in the Health Information and Quality Authority (HIQA) in 2007 where she is currently Deputy Director (HTA). She completed a BSc (Pharmacy) in Trinity College, an MSc (Clinical Pharmacy) in the University of Derby and a PhD (Health Outcomes Research) in the University of Texas, at Austin. She previously worked as a clinical pharmacist in Ireland. She has extensive experience in delivering evidence synthesis reports to inform national policy decisions and in the development of methodological guidelines and quality assurance frameworks to underpin these syntheses.

Dr Patricia Harrington, Deputy Director, Health Information and Quality Authority, Supervisor for Dr James Larkin's PhD project.

Thesis Supervisors: Dr Bridget Kiely (Royal College of Surgeons in Ireland).

Research Topic – "Link workers and Social Prescribing."

Professor Deirdre Connolly
Dr. Deirdre Connolly is Professor in Occupational Therapy, Trinity College Dublin. With a strong background in occupational therapy and health services research, her work focuses on enhancing the quality of life for individuals with chronic conditions and multimorbidity, and those living with and beyond cancer, particularly through rehabilitation and community-based interventions. Professor Connolly is known for her contributions to understanding and developing the role of occupational therapy in managing the impact of chronic diseases on daily activities and supporting the well-being of individuals living with chronic diseases across various healthcare settings. In addition to her academic and research roles, she is actively involved in professional organizations and has published extensively in peer-reviewed journals, contributing significantly to the field of occupational therapy.

Dr. Deirdre Connolly is Professor in Occupational Therapy, Trinity College Dublin, Supervisor for Dr Bridget Kiely's PhD project.

Professor Eamon O'Shea
Eamon O'Shea is a Professor of Economics in the School of Business & Economics at the University of Galway. He was founder and inaugural Director of the Irish Centre for Social Gerontology (ICSG). He is currently Director of the Centre for Economic and Social Research on Dementia at University of Galway. He holds an M.A. in Economics from University College Dublin, an M.Sc. in Health Economics from the University of York and a PhD from the University of Leicester. Professor O'Shea has authored/co-authored 20 books and monographs, mainly in the field of ageing, dementia and social policy. His work has been influential in setting the agenda for the reform of services and policies for people with dementia in Ireland.

Eamon O'Shea, Professor of Economics in the School of Business & Economics, University of Galway. Supervisor for Dr Bridget Kiely's PhD project.

Thesis Supervisors: Dr Aisling Croke. (Royal College of Surgeons in Ireland).

Research Topic – "GP-based Pharmacists supporting medicines management in multimorbidity".

Professor Frank Moriarty
Professor Frank Moriarty is associate professor at the School of Pharmacy and Biomolecular Sciences and Institutional Lead for Open Research at RCSI. He is also a visiting research fellow at The Irish Longitudinal Study on Ageing (TILDA), where is medications lead, and was previously senior research fellow at the HRB Centre for Primary Care Research at the Department of General Practice, RCSI. He is Vice Chair of the Research Data Governance Board of the CSO's Health Research Data Centre, and is a member of the steering committee for the Network of European Researchers in Deprescribing (NERD). Frank is an affiliate with medRxiv, the preprint server for health sciences, and is also a member of the editorial boards of Research in Social and Administrative Pharmacy and the Journal of Multimorbidity and Comorbidity.

Professor Frank Moriarty is associate professor at the School of Pharmacy and Biomolecular Sciences and Institutional Lead for Open Research at RCSI. Supervisor for Dr Aisling Croke's PhD project.

Professor Susan Smith
Susan Smith is Professor of General Practice at Trinity College Dublin and works as a General Practitioner at Inchicore Family Doctors in Dublin 8. She did her undergraduate medical degree in TCD and then did GP training in Ireland and the UK, followed by a period working as an academic GP in Australia. She retuned to Ireland where she has worked as an academic GP in UCD, RCSI and TCD and continues to work as a GP at Inchicore Family Doctors in Dublin 8. Prof Smith is the Associate Director of the HRB Primary Care Clinical Trials Network Ireland and the Clinical Lead for HRB CICER, which provides evidence synthesis supports for the National Clinical Effectiveness Committee.

Professor Susan Smith, Professor of General Practice at Trinity College Dublin, Supervisor for Dr Aisling Croke's PhD project.

Dr Barbara Clyne
Dr Barbara Clyne is senior lecturer in the Department of Public Health and Epidemiology, RCSI. Her research focuses on the conduct of research to support evidence based decision making across the evidence ecosystem. She has significant expertise in the design and conduct of randomised controlled trials and evidence synthesis of clinical effectiveness, safety, and cost-effectiveness, and has particular interest in older people and ageing, multimorbidity, and appropriate prescribing. She is a co-applicant/ collaborator on a number of grants, including a Definitive Intervention and Feasibility Award 'Medicines and Social Prescribing to aDdress pAtient priorities in multimorbidity (MIDAS): A multi-arm definitive cluster randomised trial in Irish general practice" and the HRB Primary Care Clinical Trials Network Ireland. Barbara is also an associate editor for the journal Trials.

Dr Barbara Clyne, senior lecturer, Department of Public Health and Epidemiology, RCSI, Supervisor for Dr Aisling Croke's PhD project.

Appendix 3: Advisory Panel

Dr Mairin Ryan, Director HTA, HIQA, Dublin
Prof Michael Barry, Director NCPE, Dublin
Prof Paddy Gillespie, University of Galway Health Economics
Prof Laura McCullagh, TCD, Health Economics
Dr Conor Teljieur, Chief Scientist, HIQA
Ms Michelle O'Neill, Deputy Director, HIQA
Dr Darach O'Ciardha, Social Prescribing

Appendix 4: International advisors

Professor Frances Mair, University of Glasgow, Scotland
Professor Carmel Hughes, Queen's University Belfast
Professor Pete Bowers, University of Manchester, UK
Professor Martin Fortin, University of Sherbrooke, Canada
Professor Cynthia Boyd. Johns Hopkins University, Baltimore, USA
Professor Kate O'Donnell, University of Glasgow
Professor Mogens Vestergaard, University of Aarhus, Denmark
Professor Olov Rolandsson, Umea University, Sweden

Acknowledgements

The HRB CDA in Multimorbidity in particular acknowledges the active participation and dedication of the four PhD Scholars, Dr Louise Foley, Dr James Larkin, Dr Bridget, Kiely and Dr Aisling Croke. They were always a pleasure to work with and the success of the programme is largely down to their enthusiasm and commitment to academic excellence and improving patient care. The Scholars convened and trained the PPI panel who we would like particularly to acknowledge and thank. The PPI panel provided critical input to ensure the research was done with patients and not for them. They included Mr Michael Metcalfe , Ms Karen Cowap , Mr Declan Keely, Mr Tony Hickey, Mr Paddy O'Neil , Ms Brid Nolan, Mr Thomas Bergin. In particular, we acknowledge the contribution of Ms Nuala Baker, who passed away during the CDA-MM.

We'd also like to acknowledge Dr Fiona Boland, who provided statistical support, Dr Barbara Clyne who provided support in process evaluations and evidence synthesis, Dr Frank Moriarty who provided support in medicines management, Prof Paddy Gillespie, Dr Anna Hobbins and Prof Laura McCullough who provided health economic support and Ms Edel Murphy who supported PPI panel training. We would like to acknowledge all the PhD supervisors and the international Scientific Advisory Group who provided critical input as the PhD studies were conducted.

Finally we would like to acknowledge Brenda Quigley who provided administrative support to the programme and also Laura O'Connor and Breda Kelleher in the HRB Primary Care Clinical Trials Network who supported practice recruitment and the PPI panel administration.

Finally we'd like to acknowledge the Health Research Board who funded the award and our host institutions, RCSI, University of Galway and TCD who supported its delivery and management with a particular acknowledgment to Bridget Gavin in TCD who coordinated the production of this report for the programme.

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