Open access Protocol

BMJ Open

Developing a data-informed care planning improvement intervention in long-term care in Nova Scotia: protocol for an advisory-led interpretive qualitative study

Michael Kalu [1], Nazanin Nasiri,[2] Andrea Iaboni [3], Parisa Ghanouni,[2] John Hirdes [4], Steve Iduye,[5] Elaine Moody,[6] Kathleen Norman,[7] Samuel Searle,[8] Olga Theou,[2] Luke Turcotte,[9] Linda Verlinden,[10] Lori E Weeks [6], Caitlin McArthur [11]

To cite: Kalu M, Nasiri N, Iaboni A, *et al*. Developing a data-informed care planning improvement intervention in long-term care in Nova Scotia: protocol for an advisory-led interpretive qualitative study. *BMJ Open* 2025;**15**:e082610. doi:10.1136/bmjopen-2023-082610

- Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (https://doi.org/10.1136/bmjopen-2023-082610).

Received 29 November 2023
Accepted 09 May 2025

For numbered affiliations see end of article.

Correspondence to
Dr Michael Kalu;
mkalu@yorku.ca

ABSTRACT

Introduction The quality of care provided in long-term care (LTC) homes has been a concern for many years, and the COVID-19 pandemic has further raised awareness of this issue. Care planning helps identify and prioritise areas to improve LTC residents' health. Data are routinely collected to support care planning, for example, the interRAI LTC facilities instrument and real-time location systems. However, the best way to use these data to inform care planning and decision-making while including residents and family members remains elusive. This study aims to develop a *data-informed care planning improvement intervention* that uses routinely collected data to guide resident-centred care planning in LTC. Specifically, we will: (1) examine how, where and why routinely collected data are used in current care planning processes in LTC; (2) identify barriers and facilitators to using data to guide care planning from the perspectives of staff, residents and family caregivers; and (3) develop care planning intervention guided by the Behaviour Change Wheel.

Methods and analysis An advisory committee of residents, family members and LTC staff will provide study oversight of this *interpretive qualitative description study,* conducted in LTC homes in Nova Scotia from May 2023 to April 2025. Participants, including LTC residents, their family members and staff, will be invited to participate in two 60–90 min focus groups or 45–60 min individual interviews and/or three 2-hour observation sessions. Data from interviews, focus groups and care observations will be analysed using inductive content analysis to answer the objectives. Next, we will deductively map the identified barriers and facilitators onto the Behaviour Change Wheel, which suggests that **C**apability, **O**pportunity and **M**otivation are needed for a Behaviour to occur (COM-B system). Subsequently, we will have a 1 day advisory committee meeting to: (1) select the intervention components using the APEASE criteria, which asks whether the function is Affordable, Practicable, Effective, Acceptable, Safe, and promotes Equity; and (2) describe the final intervention using the Template for Intervention Description and Replication checklist to ensure the reproducibility of the intervention in future work. The result of this study has the potential to contribute to the understanding of the process in enhancing care and resident outcomes in LTC homes across Canada.

Ethics and dissemination This study has been approved by the Dalhousie University Health Sciences Research Ethics Board. Informed consent will be obtained from all participants or their substitute decision-makers before they take part in interviews, focus group discussions and care observations. Data will be de-identified, and privacy and confidentiality will be maintained through secure storage and handling of both electronic and physical documents. Study findings will be shared with participants through lay summaries and infographics after the second interview and observation, as well as at the conclusion of

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ Long-term care (LTC) residents with dementia or cognitive impairment will be included in the study using alternative communication methods such as writing and drawing to ensure their active participation.
- ⇒ By actively engaging the project advisory committee (eg, residents, family members, staff) as equal partners in decision-making, we will support knowledge translation and effectively disseminate findings through summaries, infographics and targeted videos for diverse stakeholders.
- ⇒ The intervention design is informed by behaviour change theory, patient engagement and consultations with knowledge users, enhancing its relevance and feasibility for implementation.
- ⇒ The study's findings may have limited generalisability beyond the selected LTC homes in Nova Scotia.
- ⇒ Potential measurement errors or biases may arise from self-reported data collected through interviews, as responses could be influenced by recall difficulties, personal perceptions or social desirability.

the study. Results will also be disseminated to researchers, healthcare professionals and LTC providers across Canada via presentations at local, national and international conferences, publications in open-access journals and through print and video materials tailored to the audience.

BACKGROUND

In Canada, long-term care (LTC) homes provide health and personal care services for people living with medical or physical needs who require access to 24-hour nursing care, personal care and other therapeutic and support services.[1] The population of LTC residents in Canada, including Nova Scotia, is culturally diverse, reflecting the country's increasing immigration trends and the presence of Indigenous, racialised and linguistically diverse groups.[2 3] Additionally, LTC residents are a heterogeneous group, meaning they vary in terms of health conditions, functional abilities, cognitive status and personal interests. Many residents live with multiple chronic conditions such as hypertension, osteoarthritis and dementia, highlighting the need for individualised care plans tailored to improve both health and social outcomes.[3–5] Care planning is an integrated, iterative and collaborative process between individuals and healthcare practitioners to develop a comprehensive, individualised plan that assesses the impact of a resident's condition on their life and determines the most effective means of supporting their holistic health and well-being.[6] A well-defined care planning process is essential to ensuring that care plans are regularly reviewed and updated to align with residents' evolving needs.

The Nursing Act, a law that contains the scope of practice statements and controlled acts authorised in nursing across Nova Scotia, mandates the inclusion of priority problems, client goals, nursing interventions and evaluation of client response within care plans.[6] However, there have been documented deficiencies in the quality of care plans within LTC homes.[7] Traditional standardised care planning lacked both personalisation and structured review mechanisms, failing to address residents' evolving needs and preferences.[8] More recently, resident-centred models have been promoted, encouraging residents to actively participate in their own care whenever possible. This may include setting personal goals—such as improving their quality of life or maintaining independence—attending their own care conferences and making choices about daily activities or kind of care to receive.[9] These efforts are supported through collaboration with their families, point-of-care nurses, care aides and other members of the interdisciplinary team.[8] Quality of care provision in LTC has been a topic of concern for decades,[10] and the COVID-19 pandemic has further catalysed a call for improving care in LTC homes.[11] A review of 48 Canadian LTC reports commissioned regarding quality of care between 2010 and 2020 identified that 45.8% of the reports recommended LTC care planning to be data driven.[12] However, the best way to do so in a way that meets user needs in a timely and useful way remains elusive. It also requires significant behaviour change within the sector as new sources of data become available and are integrated into practice.

Routinely collected data, such as the interRAI Long-Term Care Facilities (LTCF) instrument and Real-Time Location Systems (RTLS), can inform care planning in LTC settings. The interRAI LTCF instrument is a standardised comprehensive assessment containing approximately 150 items, covering areas such as cognitive function, mood and behaviour, physical function, pain management, nutrition, social engagement, medication use and mobility. It is used in most Canadian provinces and internationally (eg, Iceland, the Netherlands, Belgium, New Zealand, Singapore, Spain, Switzerland) (www.interrai.org). In Canada, the interRAI LTCF is mandated for use in LTC homes in several provinces, including a recent implementation in Nova Scotia. The interRAI LTCF is completed on admission, every 3 months after that or if there is a significant change in status. Trained coordinators, usually nurses, complete the interRAI LTCF through conversations with residents, family members and staff. The interRAI LTCF has demonstrated good validity and reliability in LTC.[13] Using data collected via the interRAI LTCF, clinical assessment protocols are triggered through embedded algorithms to identify residents at risk for adverse outcomes and those who have the potential to improve.[14] For example, the Activities of Daily Living Clinical Assessment Protocol is triggered through an algorithm to identify residents at risk for functional decline.[14] A scoping review found that the interRAI LTCF provides a viable way of collecting clinical data for assessment, identifying at-risk residents, supporting the formation of an appropriate care plan and improving the quality of care at the facility level.[8]

Overall, using interRAI LTCF data increases the utilisation of care plans by systematically identifying resident needs and ensuring they are addressed in individualised care plans. The structured assessment improves staff awareness by providing a comprehensive view of health concerns, leading to more proactive care planning.[15] Additionally, it enhances interdisciplinary communication and supports quality improvement initiatives, aligning with accreditation standards. Studies show that facilities using interRAI experience better identification of health concerns, greater resident and family involvement in care planning, and reductions in unnecessary hospitalisations, reinforcing its impact on LTC care quality.[15] However, care plans have been found to be inconsistent with data from interRAI assessments.[16] Studies that have examined the use of interRAI LTCF data to inform care planning found inconsistent use of care plans and subsequently poorer health outcomes for residents.[17–19] These mixed results could be because the way the information in the interRAI LTCF is integrated into the care planning process is not optimised and has not considered knowledge user needs. Another plausible reason could be that health providers often perceive the collection of interRAI LTCF data as a burdensome administrative exercise rather than a tool to support care planning.[20]

RTLS are a newer technology that usually comprises a software application and reference points that tracks the real-time resident location and movement by detecting and synthesising positioning data from wireless tags (eg, bracelets) attached to people.[7] RTLS has been used in healthcare to monitor handwashing,[21] prevent falls,[22] track individuals,[21 23] enhance independence[24 25] and collect health data.[22 26] Although evidence has shown that RTLS can be used to improve independence and physical safety of residents[27] and enhance in-person monitoring,[24 28–33] its use in care planning is limited. A scoping review reported several factors, including, but not limited to, poor technological knowhow, infrastructure challenges and poor shared understanding in care planning, as barriers to implementation, use and adoption of RTLS for use in LTC homes.[27] The findings from this scoping review further highlight the lack of evidence of implementation science theory to inform and optimise outcomes.[27] Although there is interest among providers and organisations to better integrate RTLS into work routines to improve quality of care,[27] the challenges in using RTLS to improve the efficiency of clinical processes have repeatedly been reported in LTC studies.[34–36] The aforementioned scoping review found that integrating RTLS into local workflows, policies and procedures while exploring stakeholders' perspectives, including residents, families and care providers, were ways to support integration.

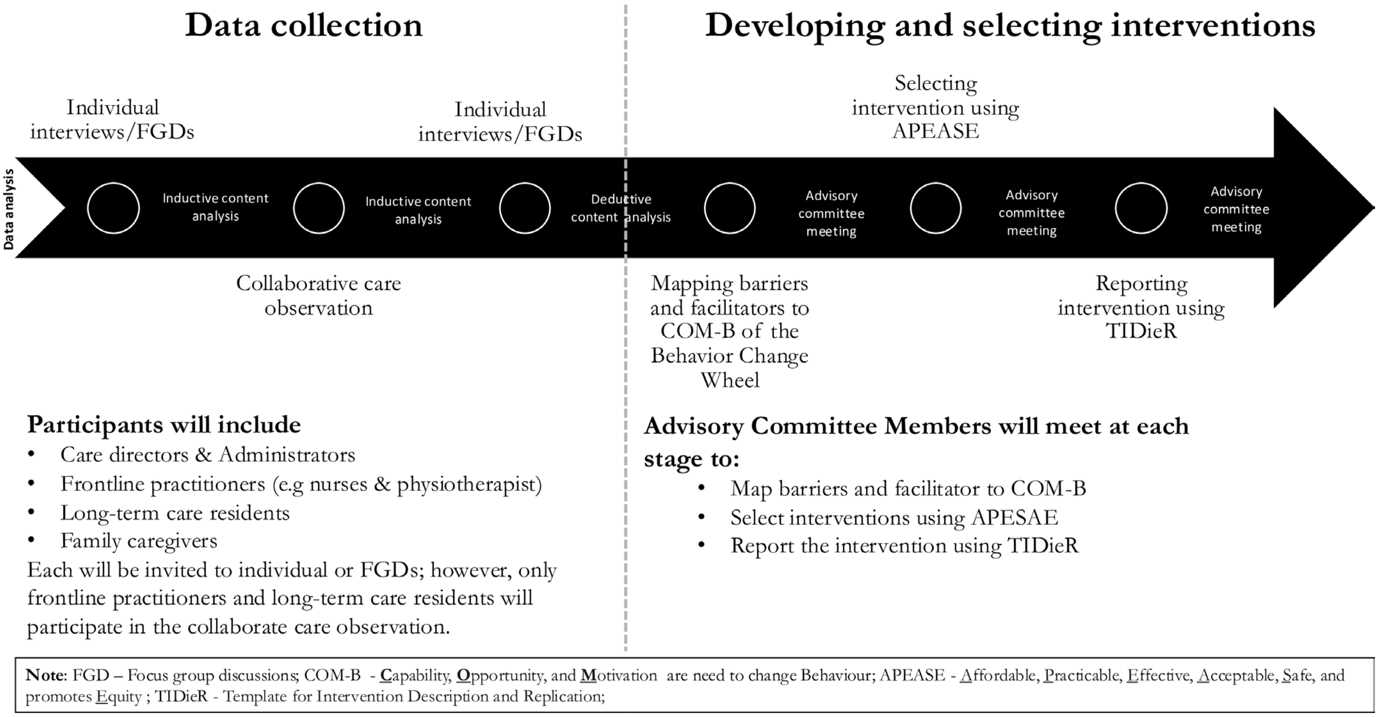
The care planning process in LTC is not well documented, and there is no clear description of how frequently care plans are reviewed, the types of questions posed to residents and care partners to inform the care plan or how they are implemented into practice. Our research aims to fill this gap by examining current data use, identifying barriers and facilitators and developing an intervention using the Behaviour Change Wheel (BCW). This will establish a structured, data-informed approach to resident-centred care planning in Nova Scotia, aligning with best practices while addressing residents' needs. Therefore, the overall aim of this study is to develop a *data-informed care planning improvement intervention* to use routinely collected data to guide resident-centred care planning in LTC. Our specific objectives are to: (1) understand how, where and why routinely collected data are used in current care planning processes in LTC; (2) identify barriers and facilitators to using data to guide care planning from the perspectives of staff, residents and family caregivers; (3) link barriers and facilitators to potential intervention using the BCW framework; (4) select the most appropriate interventions based on APEASE criteria; and (5) report the intervention using the Template for Intervention Description and Replication (TIDieR) framework.

The BCW integrates 19 behaviour change frameworks, providing a structured and comprehensive method for designing interventions that connect intervention content to mechanisms of action.[37] At its core lies the Capability-Opportunity-Motivation-Behaviour (COM-B) model, which suggests that behaviour emerges from the dynamic interplay between an individual's capabilities, opportunities and motivations to perform a target behaviour. The BCW provides tables that link behaviour change interventions to what needs to change for the knowledge users to perform the target behaviour (ie, capability, opportunity, and/or motivation).[37] In this study, the target behaviour is using data from the interRAI LTCF and RTLS to inform care planning, and we will identify what needs to change by identifying the barriers and facilitators (objective 2). We will link the identified barriers and facilitators to all potential behaviour change interventions through the linkage tables provided within the BCW (objective 3). The APEASE criteria help researchers systematically determine the best interventions identified through the BCW for their context.[37] The APEASE criteria have researchers consider whether an intervention has content that is appropriate for stakeholders (acceptability), is able to be delivered as intended (practicality), is likely to be effective or cost-efficient (effectiveness), is accessible and implementable for the target population (affordability), is mindful of both intended and unintended consequences (safety) and is capable of reducing or mitigating disparities within the target group (equity).[37] We will choose the content of our behaviour change intervention by employing the APEASE criteria (objective 4). TIDieR is a checklist and guide designed to improve the completeness and replicability of intervention reporting in research.[38] It ensures interventions are described in sufficient detail for clinicians to implement them and for researchers to replicate studies. The 12-item framework includes key aspects such as the intervention's rationale, materials, procedures, delivery method, provider, location, frequency, tailoring and adherence.[38] To ensure our behaviour change intervention is reported completely and can be replicated in future work, we will report it using the TIDieR checklist.

METHODS AND ANALYSIS

Study design

We will employ Sally Thorne's Interpretive Description qualitative design[39] to allow us to describe the when, why and where healthcare professionals use routinely collected data to inform care planning of the LTC residents, as well as identify the barriers and facilitators to using routinely collected data to guide care planning from the perspective of healthcare professionals, and LTC residents and their family members. This study is grounded in constructivism and naturalistic interpretive inquiry that would allow us to co-create knowledge with healthcare professionals, and LTC residents and their family members to offer practical solutions to using routinely collected data to inform care in LTC settings. This project has two phases consisting of (1) data collection via interview, focus group discussion and care observation and (2) a day-long project advisory meeting to develop, select and report intervention (see figure 1). Throughout this project, it is essential to



Participants will include

- Care directors & Administrators
- Frontline practitioners (e.g nurses & physiotherapist)
- Long-term care residents
- Family caregivers

Each will be invited to individual or FGDs; however, only frontline practitioners and long-term care residents will participate in the collaborate care observation.

Advisory Committee Members will meet at each stage to:

- Map barriers and facilitator to COM-B
- Select interventions using APESAE
- Report the intervention using TIDieR

Note: FGD – Focus group discussions; COM-B - Capability, Opportunity, and Motivation are need to change Behaviour; APEASE - Affordable, Practicable, Effective, Acceptable, Safe, and promotes Equity ; TIDieR - Template for Intervention Description and Replication;

Figure 1 Study phases.

clarify that we have no intention of accessing or analysing the interRAI or RTLS data. However, we will focus on discussing/talking about the data collected within the LTC setting and how staff, residents and family members currently use, or would like to use, the data effectively to inform care practices. We will describe our methodology below and will report our work according to the Standards for Reporting Qualitative Research checklist.[40] This study has been approved by the Dalhousie University Research Ethics Board (#2023–6617).

Approach and methodological framework

Patient and public involvement

Informed by the Strategy for Patient Oriented Research (SPOR),[41 42] we will engage stakeholders' members throughout the entirety of the project. This project will be guided by a project advisory committee consisting of at least two research team members, two residents, two family members and two LTC staff from across four LTC homes in Nova Scotia. The project advisory committee will meet with the research group bi-monthly to discuss the project including recruitment, methods, analysis, progress, dissemination strategies and next steps. Project Advisory Committee members will also be involved in supporting participant recruitment and dissemination of knowledge translation products (eg, presentations, videos). We will report our stakeholders' engagement using the Saskatchewan Centre for Patient-Oriented Research Level of Engagement Tool[41] in all manuscripts and presentations. All project advisory committee members will be recognised according to the SPOR Patient Partner Appreciation Policy, including an hourly rate of $25 (Canadian dollar) as per recommendation of the SPOR Working Group.[42]

Methodological framework

Knowledge translation frameworks guide researchers to consider complex factors that influence the success of the implementation process.[43 44] The BCW is one framework that prompts users to select knowledge translation interventions based on physical, social, psychological and environmental factors that influence the COM-B system.[44] Users can identify what needs to change for the desired behaviour to occur (ie, resident-centred data-driven care planning) by identifying barriers and facilitators and mapping them onto the COM-B system. The BCW then guides the user to select potential knowledge translation interventions based on their COM-B analysis. Using context-specific barriers and facilitators, users can design theory-informed interventions which increase the potential for sustainable practice change. Knowledge translation strategies from other healthcare settings are often poorly transferable to LTC because of the unique skill mix of care providers, environment, availability of resources and complexity of residents.[45] Thus, a context-specific analysis of the factors that need to change is necessary to guide implementation of data-driven resident-centred care planning.

Research team, advisory committee and reflexivity

The research team is an interdisciplinary team of researchers and clinicians with extensive knowledge of rehabilitation provision, use of routinely collected data such as the interRAI LTCF and RTLS in LTC settings, expertise in knowledge translation, including but not limited to developing theory-informed interventions using the BCW, and methodological expertise, including qualitative methods, applying health information systems to support clinical decisions while incorporating quality improvement principles. All authors understand and/or have practice in the research context (ie, LTC settings). At this study's conceptualisation, data collection and analysis phase, the authors reflected and identified their 'Subjective I's'.[46] These 'Subjective I's' are the values, beliefs and assumptions based on authors' experience as clinicians having worked in the LTC setting, used the interRAI and RTLS in different capacities, and methodological expertise. Each author and advisory committee member, specifically those actively involved in data collection and analysis, will state how these beliefs would influence data collection and analysis and mapping of the barriers and facilitators to the BCW. This approach will help us to refrain from directing our conscious ideas to influence data analysis and interpretation of our research findings.

Study setting and recruitment

This study will be conducted across four LTC homes in Nova Scotia including at least one from small, medium and large population areas. We followed Statistics Canada's definition of population area sizes: small (1000–29 999 people), medium (30 000–99 999 people) and large (more than 100 000 people).[47] The study will start in October 2023 and finish in April 2025. We will employ purposive, criterion-based and maximum variation sampling throughout the project, including selecting LTC homes and the participants. We will employ a maximum variation purposive sampling to select a diverse range of four LTC homes, including those using interRAI LTCF and those implementing or transitioning to RTLS. This combination of LTC homes will provide a comprehensive representation of current and upcoming usage of these technologies in diverse geographical contexts.

We will recruit participants from the selected four LTC homes using several approaches including spontaneous recruitment, snowball sampling and advertisement. First, spontaneous recruitment,[48] the available members of the advisory committee will lead an hour workshop to introduce the project to the LTC residents, family members and staff. The workshop will consist of project objectives, including the risks, benefits of participation, confidentiality, anonymity and participants' right to withdraw from the study to the participants. Interested participants would indicate interest after the workshop. Second, through snowball sampling, the LTC staff (registered nurses, licensed practical nurses, home administrators, physiotherapists and geriatricians), the family caregivers and LTC residents who attended the workshop will be asked to inform others who might be interested about the research, and those interested in participating will contact the researchers. Third, through advertisement, we will email each LTC home a flyer with information about the study. The flyer will be posted on the strategic notice board and the LTC homes weekly newsletter with the research team's contact details, including email and phone numbers. Participants who want to be involved will contact the research team. We will screen all participants recruited using the inclusion criteria described below, and only those that meet the inclusion criteria will be invited to participate in the study.

Sampling and sample size

We will employ criterion-based purposive sampling to include participants (residents, family caregivers and staff) in the study. Residents will be included if they lived in the selected LTC for at least 2 months, can communicate in English and are willing to participate in the study. We will not be excluding LTC residents with dementia or any form of cognitive impairment because our research team has successfully developed inclusive approaches by using various methods of communication, such as writing and drawing, to ensure their active participation.[49] Family caregivers will be included if they have been visiting the residents for at least 2 months, can speak to the care planning needs of the residents and are willing to participate in the study. Staff (eg, nurses, continuing care aides, community managers, recreation therapists, physiotherapists, occupational therapists, social workers and physicians) will be included if they have worked as full-time or part-time staff for at least 6 months in the LTC home and can speak English.

We aim to recruit four to five participants for each group (residents, family caregivers and staff) from each home. This sample size for each group is required to accommodate rich and diverse discussions in a focus group discussion, aligning with the recommended sample size for the interpretive qualitative description study.[39]

Data collection

We will explain the study aims, risks, benefits of participation, confidentiality, anonymity and participants' right to withdraw from the study to the participants. Only participants who provide written and ongoing oral informed consent will be allowed to participate. For LTC residents with moderate/severe dementia, we will obtain ongoing consent from their substitute decision-maker and assent from the resident. To ensure continued assent, we will actively observe verbal and non-verbal cues, particularly during interviews and focus groups. If a resident expresses discomfort, verbally refuses or attempts to leave, we will take this as a withdrawal of assent. Conversely, if they remain engaged and willingly converse, we will interpret this as ongoing assent. Demographic information of each participant will be obtained, and include the age and gender of all participants; the number of years employed in LTC and role (for staff); the number of years living in LTC and comorbidities (for residents); and relationship to the resident (eg, spouse, child, friend), number of months/years resident has lived in LTC, and time spent per week with a resident (for family members).

Data collection will occur over 6 months and in three stages, and will involve focus group discussions (FGDs), individual interviews and care observation sessions (See figure 1). In Stage 1, while care directors and administrators will be invited to a semi-structured individual interview (conducted face-to-face, by telephone or virtually), LTC residents, family caregivers and frontline staff members will each be invited to separate FGDs specific to their group. However, staff members, LTC residents and family caregivers who cannot attend the FGDs can be interviewed individually. This first individual interview/FGDs will aim to understand how, where and why routinely collected data are used in current care planning processes in LTC. In Stage 2, staff members, regardless of their participation in the first interview/FGD, will be invited to a collaborative care planning observation following the initial interview. This observation will aim to understand the care planning process better and identify any practical barriers or facilitators. Staff members will be notified in advance of the objective of the observation, as well as the date and time of the event. As staff members may be caring for residents during the observation, the researchers will seek consent from the residents to observe the care planning process. Although there is a potential for the Hawthorne effect, which involves individuals altering their behaviour due to being observed or studied,[50] we will explicitly communicate to the staff that our intention is not to evaluate their care observation performance but instead to observe and document their utilisation of data (if any) and identify the facilitators and barriers associated with using data to inform LTC residents' care planning. Three care planning observations, each lasting 2 hours, will be conducted for using an observation guide (see online supplemental appendix 1 - observation guide), and will observe multiple care plans of residents being developed. For Stage 3, participants (LTC residents, family members and staff) will be invited to a second interview/FGD to discuss the care planning observation and identify any challenges or enablers in using data to guide care planning processes (see figure 1).

All interviews (45–60 min) and FGDs (60–90 min) will be conducted using semi-structured interview guides (see online supplemental appendix 1 – interview guide), developed through the synthesis of literature on the use of interRAI and RTLS to inform care planning.[19 20 27] These approaches included conducting group-specific focus group discussions or individual interviews and choosing an interview location/medium to ensure equal participation opportunities for all participants and to provide a more comfortable and open environment for sharing their thoughts and experiences outside their work environment.

Data analysis

Data will be transcribed using otter.ai,[51] an artificially intelligent transcription service; however, we will review it to ensure accuracy. We will employ the 'borrowing techniques' of Sally Thorne's Interpretive Description,[39] which involves adopting methods, such as open coding, categorisation and constant comparison from various qualitative research methods to help in understanding the behaviour of using or not routinely collected data to inform LTC residents' care. Specifically, we will be adopting both inductive and deductive content during the data analysis of this study.[39 52] The data from the interviews and observations will be analysed using inductive content analysis as described by Kyngas *et al*,[52] as it allows for subjective interpretation of contextual meaning to the text data through a systematic classification process of coding and identifying themes and patterns. First, we defined a unit of analysis—a phrase, clause or statements that answers each study objective; for instance, a chunk of text that describes *where, how, and why data are used (objective 1)* and *barriers and facilitators (objective 2) to using data to inform care for LTC residents.* Multiple coders will independently commence early analysis that comprises data immersion through journaling and handwritten field notes to develop an understanding of the data from the interviews and observations. Second, each coder will independently code line-by-line, identifying codes and patterns across the data that answer each objective 1 and 2 above. Third, both coders will meet and triangulate their codes by comparing similarities and differences between the open codes to create categories, forming a code book that will be applied to the remaining transcribed interview. A third coder would resolve any disagreement on themes for each objective.

Objective 3: linking barriers and facilitators to potential interventions using the Behaviour Change Wheel framework

To achieve objective 3, we will conduct deductive content analysis to map the barriers and facilitators identified in the inductive analysis above to the COM-B system of the BCW. Multiple coders will map the barriers and facilitators independently and subsequently meet to compare and merge their mapping scheme and prepare for presentation in an advisory committee meeting. Any discrepancies between their mapping scheme will be discussed extensively and resolved during the advisory committee meeting.

Objective 4: selecting intervention components

Once the barriers and facilitators are mapped onto the COM-B system, the BCW provides links from the COM-B components to potential intervention functions (eg, persuasion, modelling, enablement, environmental restructuring, restriction, coercion, incentivisation) that could overcome barriers and leverage facilitators.[37] This linkage is based on a synthesis of 19 previously published behaviour change frameworks.[44] The intervention functions identified will help us design our behaviour change intervention to support behaviour change. For example, if 'social opportunity' is a COM-B component identified, then restriction, environmental restructuring and enablement are the linked intervention functions. In our intervention, we could then use intervention functions like environmental restructuring to change how the data are presented to clinicians during care planning or restriction where evidence of using data to inform care planning is required by the home.

We will select the intervention functions to guide the design of our intervention using the APEASE criteria, which assess the intervention's Affordability, Practicability, Effectiveness, Acceptability, Safety and Equity.[37] For example, while restriction may be an identified intervention function, it may not be practicable or acceptable, nor does it promote equity. See online supplemental appendix II for full definitions of all the COM-B components, intervention functions, and APEASE criteria.

The APEASE analysis will be completed by the project advisory committee in a 1day meeting (hybrid online and in-person). Before the meeting, each member of the group will review the potential intervention functions and the APEASE criteria. For residents and family members, this will be done in an individual meeting with a research team member. At the meeting, each advisory team member will provide their rationale, based on the APEASE criteria and their own experiences, for why the intervention function should or should not be included. At the end of the meeting, the team will vote on which intervention functions should remain in the final intervention. Only intervention functions that receive at least 75% of the vote will remain, as this threshold aligns with a previously established voting method used to include care approaches for a health condition,[53] ensuring a strong consensus while incorporating diverse perspectives.

Objective 5: reporting the intervention

Through the COM-B linkage and the APEASE analysis (online supplemental appendix III) described above, we will identify a data-informed care planning improvement intervention. The final intervention will be described using the TIDieR checklist to ensure reproducibility of the process in future work.[38] A larger result dissemination event will be organised to present the findings and discuss further practicality testing in the LTC homes that participated.

Approaches to ensure rigour

Throughout the analysis phase, we will maintain an analytical memo process in which coders actively write reflective notes to capture their thoughts, insights and observations about the data. This process will help document key findings, themes, patterns and questions that emerge from the data. An audit trail will be maintained to track methodological decisions, including during brainstorming sessions, care observation debriefing and the advisory committee meetings for developing, selecting and reporting interventions to change behaviours. Using multiple data collection approaches, such as interviews/FGDs and careful observation, provides credibility on the comprehensiveness allowing for triangulation of multiple data sources while maintaining reflexivity. As a form of member checking, we will summarise the themes to the participants for feedback at different project stages. We will provide a thick description to enhance transferability. Thick description is a qualitative research term initially introduced by Ryle[54] that refers to interpreting and ascribing meaning to a person's actions and behaviours, taking into account the context of the situation, and ascribing present and future intentionality to the behaviour.[17] In practical terms, thick description involves capturing details of what happened during interviews or focus group discussions, as well as during observation, which may not be adequately captured in the transcripts. To do so, we used field notes during the interview processes to make notes of that behaviour, and in the context the behaviour happens.[55 56]

Ethics and dissemination

This study has been approved by the Dalhousie University Health Sciences Research Ethics Board (REB #: 2023–6570). Informed consent will be obtained from all participants before they take part in interviews, focus group discussions and care observations. For residents living with dementia, consent will be obtained from their substitute decision-maker, while ensuring the participant's autonomy is respected. Additionally, ongoing assent will be monitored and obtained from participants with dementia to ensure their continued willingness and comfort throughout the study. Consent will be documented either in writing or, if conducted virtually, via audio-recorded verbal consent. Participants can withdraw from the study at any time and may also withdraw their data up to 6months after participation.

All data will be de-identified and stored securely in password-protected, encrypted files. The research team will have access to de-identified data for analysis and manuscript preparation. Results will be presented in aggregate, with qualitative data using de-identified quotes. Privacy and confidentiality will be maintained throughout the study, with data shared securely between team members and third-party transcription services following strict privacy protocols. Physical documents will be stored in a locked cabinet.

We will share study findings with participants in two stages: first, after the second interview and observation, participants will receive a lay summary outlining the care planning process and key barriers and facilitators to using data; second, at the conclusion of the study, participants will receive a one-page summary of suggested interventions. Beyond participant dissemination, our results will be shared with researchers and healthcare professionals through presentations at local (eg, Nova Scotia Health), national (eg, Canadian Geriatrics Society) and international (eg, International Association of Gerontology and Geriatrics) conferences, and published in leading open-access journals (eg, Implementation Science, BMC Geriatrics). We will publish two manuscripts, one on barriers and facilitators to data-informed care planning, and another on proposed interventions based on the BCW model. Additionally, we will share our results with other LTC providers across Canada through organisations such as the Canadian Long-Term Care Association, using print (eg, written summaries, infographics) and video materials tailored to the audience (eg, lay summaries).

DISCUSSION

Routinely collected clinical data are currently collected in LTC. However, the best way to use these data to inform care planning and decision-making while including the resident and their family members in the process remains elusive. This project will create the best way to use these data to inform LTC residents' care. We will develop a data-informed care planning improvement intervention by applying behaviour change theory, consultation with knowledge users and patient engagement. The intervention will be ready to pilot test in subsequent projects. This project is timely, as there is a growing availability of routine data in LTC homes. This trend is expected to continue, as evidenced by the increasing utilisation of artificial intelligence in generating data in LTC homes.[27–30] The result of this study has the potential to contribute to the understanding of the process of enhancing care and resident outcomes in LTC homes across Canada. In addition, this study might provide insight into how healthcare professionals could personalise care, using routinely collected data to promote continuity of care by delivering proactive interventions that meet residents' diverse needs and preferences.

We have considered various feasibility factors, potential challenges and corresponding mitigation strategies for this study. We recognise the uncertainty of the ongoing COVID-19 pandemic, as it may limit our ability to conduct focus groups, interviews and observations in person. Given the significant impact of COVID-19 on LTC homes, including restrictions on external visitors and research activities, we have made provisions in this protocol to adapt to virtual FGDs, interviews and observations as needed. Recruitment and ongoing consent/assent among LTC residents, especially those with dementia, can be challenging.[49] Furthermore, real and perceived communication challenges can make it difficult to include LTC residents with dementia as patient partners and study participants. However, our team has experience conducting qualitative data in LTC and is currently synthesising methods to engage LTC residents living with dementia in research.[55] We are confident that we have the skills to engage residents successfully and meaningfully in our project as both patient partners and study participants.

The potential limitation to the findings of this study is its applicability to other LTC homes outside the selected ones in Nova Scotia. However, we aim to develop a way to support LTC homes to use data to inform care planning in the future. In the current context in Nova Scotia, only some homes are using the interRAI LTCF and RTLS. Indeed, the interRAI LTCF is in the process of being implemented provincewide. Our results will provide information that can support homes as they integrate the interRAI LTCF into their care processes. We will also provide important information for homes interested in implementing RTLS and integrating it into their care planning processes. However, the major strength of this project lies in the use of the project advisory committee as equal partners engaging in decision-making throughout the project supporting integrated knowledge translation, as well as in end-of-grant knowledge translation where we will develop and provide written summaries, infographics and video materials with targeted lay summaries for each project advisory committee group (eg, residents, family members, staff).

CONCLUSION

We will develop a theory-guided behavioural intervention to support the use of data to inform care planning. The work will be based on the needs and preferences of LTC residents, family and staff, with an aim to improve the quality of care and promote better LTC resident health outcomes. The developed intervention will be tested in subsequent future studies. Publishing a multimodal interpretive description study is one of the recommended strategies to ensure rigour promoting credibility and reproducibility of the research findings in a similar research context.

Author affiliations
[1]York University, Toronto, Ontario, Canada
[2]Dalhousie University, Halifax, Nova Scotia, Canada
[3]University Health Network, Toronto, Ontario, Canada
[4]Health Studies and Gerontology, University of Waterloo, Waterloo, Ontario, Canada
[5]Rankin School of Nursing, St Francis Xavier University, Antigonish, Nova Scotia, Canada
[6]School of Nursing, Dalhousie University, Halifax, Nova Scotia, Canada
[7]Shannex Inc, Halifax, Nova Scotia, Canada
[8]Department of Geriatric Medicine, Dalhousie University, Halifax, Nova Scotia, Canada
[9]Department of Health Sciences, Brock University, St Catharines, Ontario, Canada
[10]Maritime SPOR Support Unit Halifax, Halifax, Nova Scotia, Canada
[11]School of Physiotherapy, Dalhousie University, Halifax, Nova Scotia, Canada

X Michael Kalu @Michael_Kaluebe and Caitlin McArthur @McArthurCaitlin

Acknowledgements We acknowledge the Maritime SPOR SUPPORT unit for Dr Michael Kalu's Postdoctoral MSSU Awards.

Contributors MK and CM conceptualised the study, and MK drafted the manuscript. NN, AI, PG, JH, SI, EM, KN, SS, OT, LT, LV, LEW and CM provided a critical review of the study and manuscript. CM is the guarantor, as she is the principal investigator.

Funding This study was funded by a research grant from the Canadian Institutes of Health Research Project Grant (Funding reference number: PJT – 186041). The funders had no role in the study design, nor will have a role in the data collection, analysis, interpretation of the data, writing of the manuscript or decision regarding publications.

Competing interests CM, JH and LT are interRAI Fellows. All other authors declare no conflict of interest.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Not applicable. However, in publishing the final paper when the project is completed, we will only publish anonymous quotes from participants who provided consent.

Provenance and peer review Not commissioned; externally peer reviewed.

ORCID iDs

Michael Kalu http://orcid.org/0000-0003-2070-2213
Andrea Iaboni http://orcid.org/0000-0003-4268-6832
John Hirdes http://orcid.org/0000-0001-9619-6543
Lori E Weeks http://orcid.org/0000-0001-5334-3320
Caitlin McArthur http://orcid.org/0000-0001-9985-2796

REFERENCES

1 Canadian Institue for Health Information. Long-term care homes in Canada: how many and who owns them? 2021. Available: https://www.cihi.ca/en/long-term-care-homes-in-canada-how-many-and-who-owns-them
2 Srugo SA, Jiang Y, de Groh M. At-a-glance - Living arrangements and health status of seniors in the 2018 Canadian Community Health Survey. *Health Promot Chronic Dis Prev Can* 2020;40:18–22.
3 World Health Organization. Ageing and health. 2024. Available: https://www.who.int/news-room/fact-sheets/detail/ageing-and-health?utm_source=chatgpt.com
4 Gibbard R. Sizing up the challenge: meeting the demand for long-term care in canada. The Conference Board of Canada; 2017 Available: https://www.cma.ca/sites/default/files/2018-11/9228_Meeting%20the%20Demand%20for%20Long-Term%20Care%20Beds_RPT.pdf
5 Ng R, Lane N, Tanuseputro P, *et al*. Increasing Complexity of New Nursing Home Residents in Ontario, Canada: A Serial Cross-Sectional Study. *J Am Geriatr Soc* 2020;68:1293–300.
6 Nova scotia college of nursing. Nursing care plan guidelines. 2022. Available: https://cdn3.nscn.ca/sites/default/files/documents/resources/NursingCarePlan.pdf
7 Tuinman A, de Greef MHG, Krijnen WP, *et al*. Accuracy of documentation in the nursing care plan in long-term institutional care. *Geriatr Nurs (Lond)* 2017;38:578–83.
8 Iduye S, Risling T, McKibbon S, *et al*. Optimizing the InterRAI Assessment Tool in Care Planning Processes for Long-Term Residents: A Scoping Review. *Clin Nurs Res* 2022;31:5–19.
9 Nova scotia health. Goals of care. 2025. Available: https://library.nshealth.ca/GoalsofCare/Form
10 Estabrooks CA, Straus SE, Flood CM, *et al*. Restoring trust: COVID-19 and the future of long-term care in Canada. *Facets (Ott)* 2020;5:651–91.
11 Béland D, Marier P. COVID-19 and Long-Term Care Policy for Older People in Canada. *J Aging Soc Policy* 2020;32:358–64.
12 Wong EKC, Thorne T, Estabrooks C, *et al*. Recommendations from long-term care reports, commissions, and inquiries in Canada. *F1000Res* 2021;10:87.
13 Hirdes JP, Ljunggren G, Morris JN, *et al*. Reliability of the interRAI suite of assessment instruments: a 12-country study of an integrated health information system. *BMC Health Serv Res* 2008;8:277.
14 Morris J, Berg K, Bjorkgren M. *InterRAI clinical assessment protocols (CAPs) for use with community and long-term care assessment instruments. Version 9.1*.
15 Hawes CH, Morris JN, Phillips CD, *et al*. Development of the Nursing Home Resident Assessment Instrument in the USA. *Age Ageing* 1997;26:19–25.
16 Kuha S, Niemelä K, Vähäkangas P, *et al*. Quality of care plans in long-term care facilities for the older persons-How well is information from RAI assessments utilised in care planning? *Int J Older People Nurs* 2022;17:e12442.
17 Schnelle JF, Bates-Jensen BM, Chu L, *et al*. Accuracy of nursing home medical record information about care-process delivery: implications for staff management and improvement. *J Am Geriatr Soc* 2004;52:1378–83.
18 Levine DA, Saag KG, Casebeer LL, *et al*. Using a modified nominal group technique to elicit director of nursing input for an osteoporosis intervention. *J Am Med Dir Assoc* 2006;7:420–5.
19 Kontos PC, Miller KL, Mitchell GJ. Neglecting the importance of the decision making and care regimes of personal support workers: a critique of standardization of care planning through the RAI/MDS. *Gerontologist* 2010;50:352–62.
20 Dash D, Heckman GA, Boscart VM, *et al*. Using powerful data from the interRAI MDS to support care and a learning health system: A case study from long-term care. *Healthc Manage Forum* 2018;31:153–9.
21 Van Hoof J, Verboor J, Oude Weernink CE, *et al*. Real-Time Location Systems for Asset Management in Nursing Homes: An Explorative Study of Ethical Aspects. *Information* 2018;9:80.
22 Bowen ME, Crenshaw J, Stanhope SJ. Balance ability and cognitive impairment influence sustained walking in an assisted living facility. *Arch Gerontol Geriatr* 2018;77:133–41.
23 Bowen ME, Kearns W, Crenshaw JR, *et al*. Using a Real-Time Locating System to Measure Walking Activity Associated with Wandering Behaviors Among Institutionalized Older Adults. J Vis Exp 2019.
24 Zwijsen SA, Depla M, Niemeijer AR, *et al*. Surveillance technology: an alternative to physical restraints? A qualitative study among professionals working in nursing homes for people with dementia. *Int J Nurs Stud* 2012;49:212–9.
25 Robinson L, Hutchings D, Corner L, *et al*. Balancing rights and risks: Conflicting perspectives in the management of wandering in dementia. *Health, Risk & Society* 2007;9:389–406.
26 Jansen CP, Diegelmann M, Schnabel EL, *et al*. Life-space and movement behavior in nursing home residents: results of a new sensor-based assessment and associated factors. *BMC Geriatr* 2017;17:36.
27 Grigorovich A, Kulandaivelu Y, Newman K, *et al*. Factors Affecting the Implementation, Use, and Adoption of Real-Time Location System Technology for Persons Living With Cognitive Disabilities in Long-term Care Homes: Systematic Review. *J Med Internet Res* 2021;23:e22831.
28 Hall A, Wilson CB, Stanmore E, *et al*. Implementing monitoring technologies in care homes for people with dementia: A qualitative exploration using Normalization Process Theory. *Int J Nurs Stud* 2017;72:60–70.
29 Hall A, Brown Wilson C, Stanmore E, *et al*. Moving beyond 'safety' versus 'autonomy': a qualitative exploration of the ethics of using monitoring technologies in long-term dementia care. *BMC Geriatr* 2019;19:145.
30 Bowen ME, Wingrave CA, Klanchar A, *et al*. Tracking technology: lessons learned in two health care sites. *Technol Health Care* 2013;21:191–7.
31 Niemeijer AR, Frederiks BJM, Depla M, *et al*. The ideal application of surveillance technology in residential care for people with dementia. *J Med Ethics* 2011;37:303–10.
32 Masciadri A, Comai S, Salice F. Wellness Assessment of Alzheimer's Patients in an Instrumented Health-Care Facility. *Sensors (Basel)* 2019;19:3658.
33 Niemeijer AR, Frederiks BJM, Riphagen II, *et al*. Ethical and practical concerns of surveillance technologies in residential care for people with dementia or intellectual disabilities: an overview of the literature. *Int Psychogeriatr* 2010;22:1129–42.
34 Georgiou A, Marks A, Braithwaite J, *et al*. Gaps, disconnections, and discontinuities--the role of information exchange in the delivery of quality long-term care. *Gerontologist* 2013;53:770–9.
35 Or C, Dohan M, Tan J. Understanding critical barriers to implementing a clinical information system in a nursing home through the lens of a socio-technical perspective. *J Med Syst* 2014;38:99.
36 Yu P, Zhang Y, Gong Y, *et al*. Unintended adverse consequences of introducing electronic health records in residential aged care homes. *Int J Med Inform* 2013;82:772–88.
37 Michie S, Atkins L, West R. *The behaviour change wheel: a guide to designing interventions*. Silverback, 2014:329.

38 Hoffmann TC, Glasziou PP, Boutron I, *et al*. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. *BMJ* 2014;348:g1687.
39 Thorne S. *Interpretive description: qualitative research for applied practice*. 2nd edn. London: Routledge, 2016.
40 O'Brien BC, Harris IB, Beckman TJ, *et al*. Standards for Reporting Qualitative Research. *Acad Med* 2014;89:1245–51.
41 Saskatchewan centre for patient-oriented research. Patient-Oriented Research Level of Engagement Tool (PORLET). 2019. Available: https://www.scpor.ca/porlet20
42 SPOR Evidence Alliance. Patient partner appreciation policy and protocol. 2022. Available: https://sporevidencealliance.ca/wp-content/uploads/2022/01/SPOREA_Patient-and-Public-Appreciation-Policy_2021.01.14-1.pdf
43 Helfrich CD, Damschroder LJ, Hagedorn HJ, *et al*. A critical synthesis of literature on the promoting action on research implementation in health services (PARIHS) framework. *Implement Sci* 2010;5:82.
44 Michie S, van Stralen MM, West R. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement Sci* 2011;6:42.
45 Estabrooks CA, Squires JE, Hayduk L, *et al*. The influence of organizational context on best practice use by care aides in residential long-term care settings. *J Am Med Dir Assoc* 2015;16:537.
46 Kalu ME. How does "subjective I" influence a qualitative research question, theoretical approach and methodologies? *Glo Jnl Pure Appl Sci* 2019;25:97.
47 Statistics Canada. Rural area (RA). 2022 Available: https://www150.statcan.gc.ca/n1/pub/92-195-x/2021001/geo/ra-rr/ra-rr-eng.htm
48 Peek L, Fothergill A. Using focus groups: lessons from studying daycare centers, 9/11, and Hurricane Katrina. *Qual Res* 2009;9:31–59.
49 McArthur C, Alizadehsaravi N, Quigley A, *et al*. Scoping review of methods for engaging long-term care residents living with dementia in research and guideline development. *BMJ Open* 2023;13:e067984.
50 Otter.ai. The #1 ai meeting agent. 2023. Available: https://otter.ai
51 Rezk F, Stenmarker M, Acosta S, *et al*. Healthcare professionals' experiences of being observed regarding hygiene routines: the Hawthorne effect in vascular surgery. *BMC Infect Dis* 2021;21:420.
52 Kyngäs H, Mikkonen K, Kääriäinen M. *The application of content analysis in nursing science research*. 1st edn. Cham: Springer International Publishing, 2020.
53 Lui K, Bajuk B, Foster K, *et al*. Perinatal care at the borderlines of viability: a consensus statement based on a NSW and ACT consensus workshop. *Med J Aust* 2006;185:495–500.
54 Ryle G. *Collected essays 1929 - 1968 collected papers volume 2*. London: Hutchinson, 1971.
55 Dellefield ME. Interdisciplinary care planning and the written care plan in nursing homes: a critical review. *Gerontologist* 2006;46:128–33.
56 Ponterotto J. Brief Note on the Origins, Evolution, and Meaning of the Qualitative Research Concept Thick Description. *TQR* 2015.