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# Frailty Screening in Primary Care-Based Memory Clinics: Feasibility, Acceptability, and Preliminary Findings

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## Article

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## Abstract

We evaluated the feasibility and acceptability of frailty screening using handgrip strength with gait speed measures within four primary care-based memory clinics in Ontario. This mixed methods quality improvement initiative examined the reach, effectiveness, adoption, implementation, and maintenance of frailty screening from the perspective of patients ($N$ = 216), care partners ($N$ = 142), and healthcare providers ($N$ = 9). Frailty screening was well-received by patients and care partners and perceived as quick and easy to administer and integrate into assessment processes by healthcare providers at all four memory clinics. The ease of integrating frailty screening into clinic processes was a key factor facilitating implementation; few challenges or suggestions for improvement were identified. All four clinics plan to continue frailty screening, three using the methods adopted in this study. Integrating frailty screening into memory assessments is feasible and acceptable and, given the interactional relationship between frailty and dementia, provides a significant opportunity to improve health outcomes for older adults.

## Résumé

Nous avons évalué la faisabilité et l'acceptabilité du dépistage de la fragilité à l'aide de la force de la poignée de main et de mesures de la vitesse de marche dans quatre cliniques de soins primaires de la mémoire en Ontario. Cette initiative d'amélioration de la qualité fondée sur des méthodes mixtes a examiné la portée, l'efficacité, l'adoption, la mise en œuvre et le maintien du dépistage de la fragilité du point de vue des patients ($n$ = 216), des proches aidants ($n$ = 142) et des prestataires de soins de santé ($n$ = 9). Le dépistage de la fragilité a été bien accueilli par les patients et les proches aidants, et il a été perçu comme rapide et facile à administrer et à intégrer dans les processus d'évaluation par les prestataires de soins de santé dans les quatre cliniques de la mémoire. La facilité d'intégration dans les processus de ces cliniques a été un facteur clé de la mise en œuvre du dépistage de la fragilité; peu de défis ou de suggestions d'amélioration ont été rapportés. Les quatre cliniques prévoient poursuivre le dépistage de la fragilité, trois d'entre elles à l'aide des méthodes adoptées dans cette étude. L'intégration du dépistage de la fragilité dans les évaluations de la mémoire est faisable et acceptable et, compte tenu du lien interactionnel entre la fragilité et la démence, elle constitue une occasion importante d'améliorer les résultats de santé des personnes âgées.

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## Introduction

Frailty is a medical state of increased vulnerability that places older adults at greater risk for adverse health outcomes such as falls and fractures, disability, functional dependence, institutionalization, and death (Abbasi et al., 2018; Fried et al., 2001). In community-dwelling older adults, the reported prevalence of frailty ranges widely from 4% to 60%, with population age, frailty measure used, and healthcare setting (Collard et al., 2012) underlying the variability in prevalence. There is increasing evidence that frailty is impacted by the presence of chronic health conditions such as heart failure, dementia, and depression (Abbasi et al., 2018). The relationship

between frailty and dementia is thought to be interactional, with each condition increasing the risk of the other (Kojima et al., 2016). Several studies have also found that frailty increases the risk of developing mild cognitive impairment (MCI) and dementia, and promotes more rapid cognitive decline (Bai et al., 2021; Boyle et al., 2010; Kojima et al., 2016; Rogers et al., 2017). This connection between cognitive impairment and frailty has been consistent in studies conducted in multiple countries (Furtado et al., 2018).

Health outcomes for people living with dementia are compounded by frailty, placing them at an added high risk of health destabilization and death (Albala et al., 2017). Dementia may limit a person's ability to maintain healthy lifestyle behaviours (diet, physical activity) that result in the development of frailty (Canevelli et al., 2015). Moreover, impaired judgment associated with dementia may result in people engaging in inappropriate mobility activities that, if they are also frail, may increase their risk for falls, fractures, and other injuries that result in disability (Rivan et al., 2021). Even in the absence of dementia, those who have MCI and are frail are at greater risk for falls, injuries, and disability than those who have MCI without frailty (Rivan et al., 2021).

There is evidence that the level of frailty may be a significant moderator in the link between Alzheimer's disease pathology and disease expression, in that higher levels of frailty increase the likelihood of greater disease pathology and expression whereas lower levels of frailty may serve to mask the clinical expression of disease pathology (Wallace et al., 2019). As such, multifaceted interventions targeting physical, cognitive, nutritional, and psychosocial needs may be instrumental in delaying dementia (Wallace et al., 2019). Timely and targeted, person-centred, and multi-factorial interventions such as exercise, medication reviews, nutritional supplementation, social engagement, and comprehensive interdisciplinary geriatric assessment and management can potentially delay or prevent frailty and, among those who are frail, can reverse frailty scores and/ or may prevent or delay dementia (Abbasi et al., 2018; Rivan et al., 2021).

It is known that both dementia and frailty both independently and in combination increase the risk of health destabilization and therefore when assessing for one of these conditions, it is logical that the other should also be assessed. Canadian Consensus guidelines for the diagnosis and treatment of dementia recommend that frailty be assessed in both primary care and memory clinic settings as a marker of future dementia and that interventions for managing frailty be implemented to reduce the burden of dementia (Ismail et al., 2020). Conversely, consensus guidelines for the screening and management of frailty in primary care include screening for cognitive impairment (Ruiz et al., 2020). Screening tools need to be valid and reliable in distinguishing frailty from normal aging and quick and easy to administer given that tool complexity and lengthy time requirement are barriers to screening within primary care (Abbasi et al., 2018; Ambagtsheer et al., 2022). Canadian Consensus guidelines suggest the use of gait speed as a screen for frailty; however, based on our earlier work, the use of gait speed alone as a screen for frailty in primary care can result in a high false positive rate (Lee, Patel et al., 2017). Our previous research demonstrated that the dual measures of gait speed and hand grip strength provided a quick, efficient process for screening for frailty and were more accurate, precise, specific, and sensitive than single trait measures such as gait speed alone (Lee, Patel et al., 2017). This dual trait frailty measure has formed the basis of the Case Finding for Complex Chronic Conditions in Adults 75 years of age and older (C5-75) program. The C5-75 program is a feasible and systematic way to screen for frailty in primary care when screening for dementia (Lee et al., 2021).

In this quality improvement study, we question whether our quick, efficient processes for screening for frailty in C5-75 could be adapted and implemented within Multispecialty Interprofessional Team (MINT) memory clinics, which assess and manage memory concerns within primary care (Lee, Hillier et al., 2017). This study aims to determine the feasibility and acceptability of frailty screening within the MINT memory clinic care model. Using the RE-AIM framework (Glasgow et al., 2001), a commonly used framework for studying the implementation of new healthcare interventions, we examined the reach, effectiveness, adoption, implementation, and maintenance of frailty screening from the perspective of patients, care partners, and healthcare providers.

## Methods

### Settings

Five MINT memory clinics in Ontario committed to participating in this study. An overview of the MINT memory clinic care model is presented in Box 1. There are currently over 100 MINT memory clinics across Ontario, in urban, rural, and remote settings; more recently, 20 clinics have been established in five other provinces. More information about this dementia care model is provided elsewhere (Lee, Hillier et al., 2017; Lee et al., 2022). The five MINT memory clinics participating in this study are within the Waterloo Wellington region in Ontario, Canada, which has a population base of 587,165, with 91,295 being 65 years of age or older (Statistics Canada, 2023). One of the clinics serves both urban and rural

Box 1: Description of MINT Memory Clinics

**Multi-Specialty Interprofessional Team (MINT) Memory Clinics**

- MINT memory clinics are physician-led and specialist-supported multidisciplinary teams consisting of nurses, social workers, pharmacists, and community service providers such as representatives from the Alzheimer Society and home care services.
- The clinics are created following the completion of a standardized nationally accredited training program (Lee et al., 2013).
- Patients are referred to the clinic by their primary care practitioner (family physician, nurse practitioner) for a comprehensive assessment of memory concerns; ongoing care is provided within a shared care approach with the patient's primary care practitioner and is individualized based on needs and goals for care for the patient and care partner.
- Funding for the operation of the clinics is provided by the practice settings in which they are located as supported by the government (health human resources, space, equipment, supplies) within Canada's publicly funded health care system, with in-kind contributions from community organizations working within the clinics (e.g., Alzheimer Society, home care services, community pharmacies).
- In some family practice settings lacking multidisciplinary healthcare providers, MINT Clinic team members in various disciplines have been provided in-kind from other local organizations (Lee et al., 2019).
- Funding to support the training and establishment of new MINT memory clinics and ongoing continuing education is provided by various sources including government and research institution-funded research grants, charitable foundations, and not-for-profit organizations.
- Various evaluative studies have demonstrated that these clinics build capacity for quality dementia care at a primary care level and reduce the need for direct referrals to specialists by 90%, making efficient use of limited specialist resources (Lee, Hillier et al., 2017).
- This care model has demonstrated achievement of the Quintuple Aim of better patient and provider experiences of care, better health outcomes and equity, and lower costs compared to usual care (Wong et al., 2023).

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populations, three serve primarily urban populations, and one serves a primarily rural population. The clinics are similarly staffed, including family physicians, nurse practitioners, registered nurses or registered practical nurses, social workers, occupational therapists, and pharmacists, where available. These clinics are well-established as they have been operational between 8 and 14 years.

### C5-75 frailty screening

The C5-75 program consists of a two-level algorithm in which Level 1 assesses frailty using gait speed, handgrip strength, physical activity, exhaustion, and unintentional weight loss, consistent with the Fried frailty phenotype (Fried et al., 2001). Those patients who screen positive for frailty in Level 1 then complete Level 2 screening for common geriatric conditions associated with frailty, which includes assessment for falls and fracture risk, caregiver burden, depression, anxiety, social isolation, urinary incontinence, malnutrition, excess alcohol use, risk of adverse outcomes, Using the Assessment Urgency Algorithm, as well as a full medication review. The C5-75 algorithm is presented elsewhere (Lee et al., 2021). The information gathered in both Level 1 and Level 2 screening is used to develop care plans with the aim of reducing the risk of destabilization (Lee et al., 2018).

Within the participating memory clinics, frailty screening was focused primarily on Level 1 screening as the comprehensive MINT Clinic assessment captures many of the conditions included in the Level 2 screening. While C5-75 was designed for systematic screening for frailty in people aged 75 and older in regular primary care practice, for this study it was recommended that all people aged 65 and older receive Level 1 screening because potential memory concerns may justify case finding at a younger age (Lee et al., 2023). Thus, for this study, the frailty screening program was referred to as the C5-65 program to reflect the lowered age threshold. Screening processes were adapted so that they could be integrated into MINT memory clinic workflow processes and coordinated with locally available community supports.

The results of the frailty screening determined the appropriate intervention(s); if there were concerns, the person was referred to the appropriate care provider for further assessment and management, tailored to the preferences, values and goals of care for the individual. Frailty was measured using the Fried frailty phenotype, which consists of gait speed, hand grip strength, exhaustion, and unintentional weight loss, and physical activity measures (Fried et al., 2001). Gait speed was calculated as the number of seconds to walk 4 meters at a usual pace with the fastest time of two trials being documented (Abellan van Kan et al., 2009). Hand grip strength (in kilograms) was measured using a hand-held dynamometer (Jaymar Hydraulic Dynamometer Model #281-12-0600, J.A. Preston Corp, Clifton, NJ) with the higher score of 2, 3-second trials (with each hand, in kilograms) being recorded (Syddall et al., 2003). Exhaustion was a self-reported measure using the Center for Epidemiologic Studies Depression Scale item "I could not get going," in the past week (rarely or none of the time, <1 day; some or a little of the time, 1 to 2 days; a moderate amount of the time, 3 to 4 days; most of the time, 5 to 7 days) (Fried et al., 2001). Weight loss was measured as self-reported unintentional weight loss of 4.5 kg or more in the previous year (yes, no). Physical activity was measured by self-reported descriptions (I am physically active; I do 30 minutes or more of moderate intensity physical activities on five or more days per week; I am physically active occasionally or during some seasons much more than others; I am not physically active beyond moving around or walking during activities of daily living) (Topolski et al., 2006).

Patients were deemed frail when they met at least three of the following Fried frailty phenotype criteria: (1) low gait speed of 6 seconds or more to walk 4 m, independent of sex, (2) low grip strength, within the lowest 20% of the population, stratified by sex, (3) exhaustion reported as "occurred a moderate amount of the time" or "all of the time", (4) unintentional weight loss of 4.5 kg or more in the past year, or, (5) limited physical activity beyond walking around during activities of daily living. Our previous research has demonstrated that for those aged 75 years of age and older in regular community-based practice, the cut-off hand grip strength for females and males is less than 14 kg/m$^2$ and 24 kg/m$^2$, respectively (Lee et al., 2017). As we did not know whether these cut-offs (lowest quintile or 20% of the population) would be the same for adults 65 years and older with memory concerns, we analyzed hand grip data from the first 258 patients screened to identify cut-offs specific to the memory clinic population 65 years of age and older. The cut-offs were determined to be: less than 15 kg/m$^2$ and 26 kg/m$^2$ for females and males, respectively (Lee et al., 2023). Using this data, we demonstrated that gait speed and grip strength are a validated proxy for the Fried frailty phenotype to screen for frailty for older adults 65 years and older with memory concerns (Lee et al., 2023), as we did previously for older adults 75 years of age and older in regular primary care practice (Lee, Patel et al., 2017). Once the use of gait speed and grip strength as a proxy for the Fried frailty phenotype was validated in this population, the clinics discontinued measuring physical activity, exhaustion, unintentional weight loss, and used gait speed and grip strength, as described above, to identify frailty.

As a lack of knowledge of frailty screening and management has been identified as a barrier to frailty identification and management (Nan et al., 2022), all healthcare providers ($N$ = 10) involved in administering the frailty screening were invited to participate in a brief training session. In this session, they learned about frailty (what it is and its implications), how to administer the gait speed and hand grip strength tests, and how to manage frailty. Opportunities were available for all other MINT clinic team members to learn more about frailty and frailty screening during annual continuing medical education sessions held provincially for all MINT memory clinics.

### Participants

Participants in this study were patients who completed frailty screening as part of the MINT memory clinic assessment in one of the five participating clinic sites, as well as their care partners, and healthcare providers who administered the frailty screening. To be eligible to participate in this study, memory clinic patients must: have completed the C5-65 screening program; be able to read, write, and speak in English; and be competent to consent, as determined by a healthcare provider. Care partners also had to be able to read, write, and speak in English and must have been present during the memory clinic assessment. Patients and care partners were excluded from the study if judged, by a healthcare provider, as being too acutely ill or distressed to complete a survey. To be eligible to participate, healthcare providers must have completed the C5-65 screening training session, have been previously trained to complete the C5-75 screening, and must have been actively involved in administering the screening protocol with at least one or more patients.

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### Design and measures

We used a mixed methods approach, with quantitative (prospective frailty screening data collection, patient and care partner satisfaction survey, and a healthcare provider survey) and qualitative methods (interviews with healthcare providers) to assess the implementation of frailty screening within the participating memory clinics as guided by the RE-AIM framework (Glasgow et al., 1999). The RE-AIM evaluation framework concentrates on the feasibility of implementing new innovations to inform dissemination planning, focusing on program: reach, effectiveness, adoption, implementation and maintenance (Glasgow et al., 1999). The RE-AIM framework, as applied to this study is presented in Table 1.

Memory clinic healthcare providers who were administering the frailty screening prospectively collected information on the date of assessment, patient age, sex, known medical history prior to screening, assessment diagnosis, and caregiver distress, if applicable, as measured using the 4-item Zarit Burden Interview (Bédard et al., 2001), patient depression at the time of the memory clinic visit as measured by the Cornell Depression Scale (Alexopoulos et al., 1988), Fried frailty measures (gait speed, hand grip strength, physical activity level, exhaustion, and weight loss), as described above, and for patients deemed frail, referrals to community services for intervention, such as exercise programs, nutrition counselling, and fall prevention programs.

Following completion of the memory clinic assessment, patients and their care partners were invited to complete a paper-based anonymous satisfaction survey in which they used a 5-point scale (not at all satisfied, a little bit, somewhat, very, extremely satisfied) to rate their satisfaction with various aspects of the screening process (explanation of the purpose of the screening tests, administration of the screening, explanation of the results, and inclusion of frailty screening in the memory clinic assessment). They were also asked whether they thought it was worth the extra time to go through the screening process (yes, no, not sure) and were given an opportunity to provide open-ended comments about the screening. This survey was completed in the clinic waiting room and returned in a sealed envelope to a clinic team member or receptionist.

At the end of the study time period, memory clinic healthcare providers involved in administering the frailty screening were invited to complete a survey in which they were asked to: rate their level of satisfaction with various aspects of the screening process (appropriateness, ease of completion, value for time, communication regarding screening results, and administration process), the feasibility of implementing the screening within the memory clinic care model and the extent to which frailty screening was a valuable addition to the MINT memory clinic care model, all using 5-point rating scales (not at all, a little bit, somewhat, very, extremely satisfied/ feasible/ valuable). They were also asked to rate their level of agreement (5-point scale: strongly disagree to strongly agree) with the statement: "I support the continued implementation of the C5-65 screening program." This survey was administered online (www.LimeSurvey.org).

Following the administration of the survey, memory clinic healthcare providers involved in administering the frailty screening were invited to participate in an individual interview conducted via telephone to gather more in-depth information about frailty

**Table 1.** RE-AIM framework as applied to the evaluation of the integration of frailty screening in MINT memory clinics

| RE-AIM domains & definitions | Evaluation outcome indicators | Sources of information |
|---|---|---|
| **Reach**<br>The proportion of the target population that participates in a program and sample characteristics | • Number and percentage of memory clinic patients who are screened for frailty<br>• Number and percentage of patients identified as frail<br>• Patient characteristics<br>• Comparison of characteristics for those who screened frail and those who were not frail | • Prospective frailty screening data collection:<br>○ patient demographic information<br>○ history and clinic assessment outcomes |
| **Effectiveness**<br>Impact of a program on relevant outcomes | • Number and percentage of frail patients referred to community support services or programs (e.g., exercise, dietitian, social programs)<br>• Patient satisfaction with the way the screening purpose was explained, screening was conducted, inclusion in the memory clinic appointment and value for time spent<br>• Ratings of health care provider satisfaction with the process of administration, ease of completion, value for time, and integration into memory clinic assessment; acceptability, feasibility, and value for time spent ratings<br>• Healthcare provider perceptions of screening | • Prospective frailty screening data collection: screening outcomes<br>• Patient and caregiver satisfaction survey<br>• Healthcare provider survey<br>• Healthcare provider interviews |
| **Adoption**<br>Proportion of settings that implement a program and who is adopting it (setting, discipline) | • Number and percentage of participating memory clinics that implemented the screening<br>• Characteristics of the setting adopting the screening<br>• Disciplines of those conducting the screening | • Prospective frailty screening data collection<br>• Healthcare provider interviews |
| **Implementation**<br>The extent to which a program is delivered as intended, with adherence to specified implementation processes | • Number and percentage of patients assessed in the memory clinic that completed both gait speed and grip strength measures<br>• Number and percentage of frail patients whose care partner was assessed for stress/ distress.<br>• Mean (standard deviation) time required to implement screening<br>• Identification of implementation enablers and barriers, and suggestions for improvement to implementation | • Prospective frailty screening data collection<br>• Healthcare provider survey<br>• Healthcare provider interviews |
| **Maintenance**<br>Ongoing program sustainability | • Number and percentage of memory clinic sites continuing to screen for frailty at the last clinic day within the evaluation time period<br>• Ratings of healthcare provider perceptions of the value added to frailty screening<br>• Support for ongoing implementation within MINT memory clinics | • Prospective frailty screening data collection<br>• Healthcare provider survey |

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**Table 2.** Guide for the interviews with MINT memory clinic healthcare providers

| **Healthcare provider interview questions** |
|---|
| • What do you think are the strengths of the C5–65 screening protocol? What do you like about it? |
| • Do you think there are any weaknesses or gaps in the C5–65 screening protocol? Is there anything you don't like about the screening protocol, or that you think is missing? |
| • What are some of the factors that enabled, or facilitated the integration of C5–65 within the memory clinic assessment? |
| • What are some of the barriers, or challenges experienced to date in implementing C5–65 screening in the memory clinic? |
| • Do you have any suggestions for improvements to how C5–65 is implemented in the memory clinic or for the longer-term sustainability of C5–65 within the clinic model? |

screening within MINT memory clinics. Interview questions are presented in Table 2.

## Data collection and analysis

Following completion of the frailty screening training, clinics were able to start the frailty screening. The study time period was 15 months in length, starting July 1, 2020 and ending September 31, 2021. One clinic site completed the frailty screening training later then the other clinics and had a study period of six months. Memory clinics prospectively collected the frailty screening data and distributed the patient and care partner satisfaction survey throughout the entire time that each clinic was collecting data for this study. At the end of the study time period, memory clinic healthcare providers involved in administering the frailty screening received an invitation via email to complete the survey; the link to the survey was embedded in the email message. Respondents were given a two-week time period to complete the survey and received two reminders to complete the survey. The reminders were distributed via email, a week and a day prior to the deadline date. Survey completion was anonymous; respondents were not required to identify themselves or the clinic site in which they worked. Similarly, following the deadline date for the online survey, invitations to participate in the interviews were distributed via email to all healthcare providers. Interviews were scheduled at the healthcare provider's convenience and were conducted by one author (LMH) to ensure consistency; this Master's level research associate has academic training in qualitative methodology and has much experience in conducting interviews and analyzing qualitative data. The study participants were not known to the interviewer. All interviews were completed and digitally recorded with participant verbal consent and transcribed by a professional transcription service.

Descriptive statistics (frequencies, means, standard deviation, SD) for the frailty screening and survey data were generated using SPSS 28.0 software (IBM Corp, Armonk, NY: IBM Corp, 2022). We explored differences in frailty screening results between clinic sites and those who were frail and those not frail using Pearson chi-square with Fisher's exact test and Kruskal-Wallis one-way analysis of variance, as appropriate. Consistent with a naturalistic enquiry approach, we used descriptive content analysis to summarize the informational content and generate themes from the open-ended survey questions and interview transcripts (Sandelowski, 2010). Undertaken without prior assumptions, one author (LMH) conducted this inductive analysis, which was reviewed by a second author (EC), to ensure reliability and accuracy. These two individuals clarified theme descriptions via consensus agreement in the discussion.

Study rigor was ensured with the use of an audit trail of decisions made regarding data collection and analysis, and detailed field notes maintained by the interviewer for each interview. One author (LMH) reviewed all transcriptions against audio recordings to ensure accuracy in transcription. All authors reviewed and provided feedback on study findings and interpretations.

This study was approved by the Hamilton Integrated Research Ethics Board, McMaster University (REB#: 9451). All study participants received a detailed study information sheet; signed consent was not required as submission of a completed survey implied consent and interview participants provided verbal consent to complete the interview.

**Table 3.** Participant characteristics

| Characteristics | Results |
|---|---|
| Patient caregiver survey respondents group, *n* (%) | (*N* = 373) |
| Patients | 216 (57.9) |
| Care partners | 142 (38.1) |
| Unspecified | 15 (4.0) |
| Age, total sample, mean (SD) | 75.8 (12.0) |
| Patients | 80.9 (6.5) |
| Care partners | 67.6 (14.1) |
| Sex, total sample, *n* (%) | |
| Female | 214 (57.4) |
| Male | 151 (40.5) |
| Health care provider survey respondents discipline, *n* (%) | (*N* = 9) |
| Nurse practitioner | 1 (11.1) |
| Registered nurse/registered practical nurse | 6 (66.7) |
| Occupational therapist | 2 (22.2) |
| Years of experience in current profession, mean (SD) | 20.2 (11.0) |
| Health care provider interview participants discipline, *n* (%) | (*N* = 6) |
| Nurse practitioner | 1 (16.7) |
| Registered nurse/registered practical nurse | 3 (50.0) |
| Occupational therapist | 2 (33.3) |

*Note:* Percentages may not sum to 100% due to missing values.

## Results

A total of 373 patient and caregiver surveys were completed, 216 by patients and 142 by care partners (15 did not identify their group), representing 84% of patients screened (*N* = 373/444). Nine healthcare providers completed a survey, representing 90% of those trained to administer the screening (*N* = 9/10) and six completed an interview, representing 60% (*N* = 6/10) of those trained. Participant characteristics are presented in Table 3.

## Reach

Of the five memory clinics that had committed to participate in this study, only four were able to conduct the frailty screening. One

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**Table 4.** Characteristics of patients who completed the frailty screening

| Characteristic | Total sample (*N* = 444) | Not frail (*N* = 375) | Frail (*N* = 69) | *p*-value |
|---|---|---|---|---|
| Age, years | | | | |
| Mean (SD) | 80.1 (6.9) | 79.3 (6.7) | 84.2 (6.1) | **<0.001** |
| Range | 60 – 99 | 60 – 99 | 66 – 95 | |
| Median | 80.0 | 79.0 | 85.0 | |
| Age group, *n* (%) | | | | |
| 50–74 years | 98 (22.1) | 92 (24.5) | 6 (8.7) | **0.003** |
| 75+ years | 346 (77.6) | 283 (75.5) | 63 (91.3) | |
| Sex, *n* (%) | | | | |
| Female | 226 (53.2) | 195 (52.0) | 41 (59.4) | 0.294 |
| Male | 208 (46.8) | 180 (48.0) | 28 (40.6) | |
| Known medical history prior to screening (% yes) | | | | |
| Heart failure | 18 (4.1) | 13 (3.5) | 5 (7.2) | 0.176 |
| COPD | 19 (4.3) | 16 (4.3) | 3 (4.3) | 1.0 |
| Coronary artery disease (MI, angina, CABG) | 80 (18.0) | 71 (18.9) | 9 (13.0) | 0.307 |
| Hypertension | 241 (54.3) | 199 (53.1) | 42 (60.9) | 0.240 |
| Diabetes | 87 (19.6) | 75 (20.0) | 12 (17.4) | 0.742 |
| Hyperlipidemia | 128 (28.8) | 108 (28.8) | 20 (29.0) | 1.0 |
| Atrial fibrillation | 48 (11.0) | 38 (10.1) | 11 (15.9) | 0.338 |
| Stroke | 77 (17.3) | 61 (16.3) | 16 (23.2) | 0.168 |
| Osteoporosis | 100 (22.5) | 83 (22.1) | 17 (24.6) | 0.640 |
| Primary diagnosis, *n* (%) | | | | |
| MCI/ MCI multi-domain/possible MCI | 120 (27.0) | 109 (29.1) | 11 (15.9) | **0.027** |
| Dementia (any type) | 227 (51.1) | 174 (46.4) | 53 (76.8) | **<.001** |
| *Mixed dementia* | *60 (13.5)* | *45 (12.0)* | *15 (21.7)* | ***0.036*** |
| *Vascular dementia* | *20 (4.5)* | *13 (3.5)* | *7 (10.1)* | ***0.023*** |
| *Alzheimer disease* | *87 (19.6)* | *70 (18.7)* | *17 (24.6)* | *0.251* |
| *Frontotemporal, Lewy Body, Parkinson's or Alcohol-related dementia* | *15 (6.6)* | *12 (3.2)* | *3 (4.3)* | *0.714* |
| *Dementia unspecified* | *45 (10.1)* | *34 (9.1)* | *11 (15.9)* | *0.086* |
| Subjective cognitive impairment/ normal cognitive ageing | 30(6.8) | 28 (7.5) | 2 (2.9) | 0.200 |
| Not yet clear | 60 (13.5) | 57 (15.2) | 3 (4.3) | **0.012** |
| Additional diagnosis of psychiatric/ mood disorders | 55 (12.4) | 46 (12.3) | 9 (13.0) | 0.843 |
| Caregiver burden (if applicable) | | | | |
| *4-item Zarit scale* | (*N* = 380) | (*N* = 323) | (*N* = 57) | |
| Mean (SD) | 5.3 (3.9) | 5.2 (3.7) | 6.2 (3.8) | 0.047 |
| Range | 0 – 16 | 0 – 16 | 0 – 14 | |
| Median | 5.0 | 5.0 | 6.0 | |
| Cornel depression scale score (for patients) | (*N* = 402) | (*N* = 341) | (*N* = 61) | |
| Mean (SD) | 4.2 (4.1) | 3.9 (3.8) | 5.5 (5.2) | **0.026** |
| Range | 0 – 29 | 0 – 19 | 0 – 29 | |
| Median | 3.0 | 3.0 | 5.0 | |

*Note:* Percentages may not sum to 100% due to missing values.

clinic that closed in March 2020 due to the COVID-19 pandemic was unable to resume operations in time to participate in this study. There were no notable differences between this clinic and those who participated in the study. Across the final four memory clinics, a total of 605 individuals were assessed in the memory clinics during the study time period; 444 (74%) individuals were screened for frailty. Of the patients screened, 69 were identified as frail (15.5%). Patient characteristics are presented in Table 4. Most of those who were frail were diagnosed with MCI or dementia (92.8%; *N* = 64/69). The prevalence of frailty among those diagnosed with MCI was 9% (*N* = 11/120) and 23.3% among those with dementia (*N* = 53/227). In comparison to patients who did not screen positive for frailty, those who were frail were significantly older, had higher depression scale scores, and had care partners with higher caregiver burden scores. While significantly fewer patients who were frail were diagnosed with MCI, more patients who were frail were diagnosed with dementia (any type) than those who were not frail, and significantly more who were frail were diagnosed with mixed dementia and vascular dementia in comparison to patients who were not frail.

## Effectiveness

Of the 69 patients identified as frail, 73.9% (*N* = 51) had care plans that included referrals to community services (e.g., exercise programs, nutrition counselling, fall prevention programs) to help address their frailty status. There were no statistically significant differences in ratings between patients and care partners in their survey ratings, so results are presented across both groups (including those that did not identify their group). The majority of survey respondents (>79%) were 'very' or 'extremely' satisfied with the way the screening was explained to them (85%; *N* = 318) and conducted (89%; *N* = 330), the way the results were explained (79%; *N* = 294) and the way the screening was included in their

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**Table 5.** Patient and care partners satisfaction with their frailty screening experience (*N* = 373)

| Frailty screening experience, *n* (%) | Not at all satisfied | A little bit | Somewhat | Very | Extremely satisfied |
|---|---|---|---|---|---|
| The way the purpose of these tests was explained to you | 3 (0.8) | 5 (1.3) | 30 (8.0) | 155 (41.6) | 163 (43.7) |
| The way these screening tests were conducted | 1 (0.3) | 3 (0.8) | 18 (4.8) | 143 (38.3) | 187 (50.1) |
| The way the results were explained to you | 6 (1.6) | 6 (1.6) | 30 (8.0) | 128 (34.3) | 166 (44.5) |
| The way this screening was included in your memory clinic appointment | 2 (0.5) | 4 (1.1) | 27 (7.2) | 141 (37.8) | 181 (48.5) |

*Note:* Percentages may not sum to 100% due to missing values.

**Table 6.** Healthcare providers satisfaction with the screening process (*N* = 9), *n* (%)

| Aspects of the screening process | Not at all satisfied | A little bit | Somewhat | Very | Extremely satisfied |
|---|---|---|---|---|---|
| Appropriateness | 0 | 0 | 2 (22.2) | 5 (55.6) | 1 (11.1) |
| Ease of completion | 0 | 0 | 1 (11.1) | 5 (55.6) | 2 (22.2) |
| Value for time | 0 | 0 | 4 (33.3) | 4 (33.3) | 2 (16.7) |
| Communication regarding screening results | 0 | 0 | 6 (66.7) | 0 | 2 (22.2) |
| Administration process | 0 | 0 | 1 (11.1) | 3 (33.3) | 4 (44.4) |
| Feasibility | Not at all feasible | A little bit | Somewhat | Very | Extremely feasible |
| Implementation feasibility | 0 | 1 (11.1) | 0 | 3 (33.3) | 4 (44.4) |

*Note:* Percentages may not sum to 100% due to missing values.

**Table 7.** Key themes were generated from interviews with healthcare providers, with illustrative quotes (*N* = 6).

| Perceptions of frailty screening: Key theme/ subthemes | Illustrative quotes |
|---|---|
| **Frailty screening is a high-yield addition to memory clinic assessment without contributing to assessment burden**<br>• Frailty screening focused on gait speed and grip strength provides valuable information while being quick and easy to administer and incorporate into the existing clinic assessment | *"From a clinician perspective, it's pretty quick and easy to do… its pretty straightforward."* [HCPID3]<br>*"It was easy. I mean it wasn't hard to do. It was simple to understand and easy to implement."* [HCPID6]<br>*"I thought it was a nice addition. It was absolutely the easiest thing ever to implement into the memory clinic in my opinion."* [HCPID5]<br>*"I think its not bad because after we're sitting down with all the memory exercises it kind of gives them, stretch out their legs for a little walk."* [HCPID1] |
| **Subthemes:**<br>**Frailty screening using gait speed and hand grip strength provides an objective measure of frailty**<br>• Frailty screening assists in identifying those who may not appear to be frail, but are in fact frail, or vice versa, when this difficult to discern otherwise | "*Then I kind of know, even though they may look well, they could be frail. Even like last week I did have someone under age 65. They looked slim and frail, but I just still did it just to see what the numbers were…They weren't frail. They're fine…You get that concrete information about whether they're frail or not. That wasn't part of the memory clinic assessment before."* [HCPID1]<br>*"I think they look frail but then I'm surprised at how well they walk, so its hard to guess."* [HCPID2]<br>"*Having the walk test and having the grip strength and having some guidelines about what would be considered normal or within normal limits, it was nice to have something a little bit more objective…. I think it gives them [physicians] something a little bit more objective as opposed to the subjective report or just the subjective assessment you do when you see somebody, like: 'Oh they've got to be frail!' And maybe they're not.*" [HCPID4] |
| **Knowledge of frailty status can inform treatment/management decisions**<br>• Care planning can be targeted to address physical frailty | "*We're focused a lot on cognition and I think that little bit of gait speed and hand grip strength gives you a little bit of the physical component as well for frailty and obviously that is an indication of someone's vulnerability for other complications… This person is vulnerable and it just kind of flags that…. I'm imagining for the physicians to get a report explaining the frailty of their patients that they may not have recognized must be helpful if they're considering treatment down the road or even managing currently."* [HCPID2]<br>*"The team has the ability to act on things beyond just memory, so how memory and cognition are affecting function, this adds a physical piece to that as well. So, if somebody comes in, maybe they did quite well on the memory screening but clearly this was physical, not based on a lot, poor grip strength, poor gait* [speed]*, we are not going to follow up perhaps for the cognitive aspect, but we may refer on to address the physical aspects. So, somebody who is frail but cognitively well, and there's concern there about how they're managing, well you know what, a* [home and community care] *referral for a safety assessment – that might be a perfect time to flag it."* [HCPID5]<br>*"If we have this information* [frailty status] *then we can prescribe the appropriate treatments."* [HCPID4] |
| **Screening can prevent of adverse events with early identification and intervention**<br>• Knowledge of a patient's frailty status provides the opportunity for early intervention so as to prevent adverse events that occur with undetected frailty and other conditions and that can result in increased health service utilization | *"I think that we all know that patients that are frail are higher users of all of the health sectors, including Emerg, and then of course our ALC* [Alternate Level of Care] *and long term care and all of these things. So, its important to pick up those patients that are frail so that you can intervene and set up whether it be community resources or education around heart failure management or whatever. You can catch some things so that you are ending up with less Emerg visits, less ALC admissions, allowing people to age at home in a more friendly way and for as long as they can before having to go into long term care. So, I think assessing frailty is of the utmost importance and a way that we can do that easily with the memory clinic where we see generally older adults."* [HCPID6] |

*(Continued)*

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**Table 7.** *Continued*

| Perceptions of frailty screening: Key theme/ subthemes | Illustrative quotes |
|---|---|
| | *"I think for some of the things that are more likely to cause adverse events, like if there's shortness of breath or falls risk, preventing that sooner."* [HCPID3]<br>*"I mean the beauty of it is there's a preventative element to it which I think is slowly getting lost, at least in my experience, in healthcare… this is actually hands on, asking questions in a multifaceted assessment that is more preventative in nature."* [HCPID5] |

clinic assessment (86%; $N = 322$; Table 5). Similarly, the majority of respondents (75%; $N = 280$) indicated that it was worth the extra time to go through the screening process. Analysis of the open-ended survey question seeking comments on the screening revealed that patients and care partners were satisfied with the administration of the screening, in terms of it not being burdensome, the efficiency of the clinic team member administering the screening, and how it was implemented (clear explanations, comfortable environment).

> *"Better than sitting on the chair the whole time. Didn't take very long to complete."* [Patient]

> *"I felt comfortable throughout the whole process."* [Patient]

> "[Team member] *administered the test efficiently and professionally."* [Patient]

> *"I really liked how they explained the purpose of the test and what the results implied.* [Care partner]

> *"Everyone was very helpful, kind, and explained the purpose of the screening quite thoroughly. I really appreciate how the staff made my mother feel relaxed and comfortable."* [Care partner]

Patients and care partners also valued the screening as an opportunity to gather important information that would identify potential health issues and improve care and ultimately, quality of life when interventions are introduced to prevent adverse events and prevent or delay decline. Frailty screening was perceived as contributing to the comprehensiveness of the clinic assessment, providing a more holistic understanding of their health status, and ensuring that all health issues are identified and addressed. Moreover, care partners appreciated the screening as an opportunity to frailty, the gradual and subtle nuances of which may be difficult for them to observe.

> *"Any screening/tests that can be given to improve safety/quality of life are worth the time and effort."* [Patient]

> *"I thought it gave a wider scope of insight into getting a complete picture of my condition."* [Patient]

> *"Excellent resource for seniors to access concerns or potential concerns so people are not falling through the cracks."* [Care partners]

> *"I feel it's important to do this screening. As a caregiver, I'm not always aware of gradual deterioration in mobility as it happens slowly over time."* [Care partner]

> *"We think it's a great addition to the appointment time, as it could highlight another possible area of concern that may need further exploration and/or support to address it."* [Care partner]

The majority of healthcare provider survey respondents were 'very' or 'extremely' satisfied with the appropriateness ($N = 6/9$; 67%), ease of completing the frailty screening ($N = 7/9$; 78%), value for time spent ($N = 6/9$; 67%), and process of administering the screening ($N = 7/9$; 78%; Table 6). The majority of respondents were 'somewhat' satisfied with communication about the screening results ($N = 6/9$; 67%).

The major theme related to healthcare provider perceptions of the frailty screening identified from the qualitative analysis of interview transcripts was focused on frailty screening being a high-yield addition to the memory clinic assessment without creating a significant burden for the administrators. Frailty screening was perceived as quick and easy to administer and integrate into the memory clinic assessment, with value-added related to (subthemes) the provision of (1) an objective measure of frailty, where otherwise frailty can be difficult to discern; (2) information useful to targeting interventions/ care planning to address frailty; and, (3) early intervention to potentially prevent adverse events and increased health service utilization that can occur with undetected frailty. These themes are summarized, with illustrative quotes, in Table 7. Although frailty screening was described as easy and quick to implement, some implementation issues were identified by single interview participants such as patients with advanced dementia having difficulty following instructions on how to use the dynamometer; the need for equipment (dynamometer) and sufficient space for measuring gait speed, which may be a challenge for clinics with a restrictive physical layout; the logistics of sharing equipment and walking space when several patients are being assessed at the same time; and, the extra time needed to sanitize equipment after use, consistent with COVID-19 pandemic guidelines.

## Adoption

Although five clinic sites committed to participating in this study, one clinic was unable to reopen following the pandemic lockdown in March 2020 due to staff redeployment (COVID-19 assessment and vaccination centres). One of the four clinics participating in this study joined the study late due to pandemic-related human resources issues, and thus collected data for only 12 months, during which time they operated the clinic inconsistently resulting in fewer patients being assessed than anticipated. One clinic was trained later than the others to join the study and collected data for 6 months. Two sites were able to operate their clinic consistently throughout the study time period and were able to collect data for

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the full 15 months, regardless of the time in operation during the study time period. All four clinic sites were able to implement the frailty screening; these sites served urban (3 sites) and rural (1 site) populations. One clinic accepted referrals from across the region while the other three accept referrals from within the practice setting in which they are located, serving a total of 69 medical practices (range 11 – 24 per clinic) with a combined patient base of 100,500 patients (range 11,000 – 36,000 per clinic). Across the four sites, the screening was implemented by different healthcare providers dependent on available resources; screeners included a nurse practitioner, six registered or registered practical nurses, and two occupational therapists. There were no statistically significant differences between sites in mean gait speed ($p = 0.106$), grip strength ($p = 0.157$), or prevalence of frailty ($p = 0.241$).

## Implementation

Of the 444 patients that completed the frailty screening, gait speed was measured in 97% ($N = 432$) of patients, representing 71% of those assessed in the memory clinics during the study time period ($N = 605$). Healthcare providers reported that gait speed was not measured if patients were experiencing unusual mobility issues, were wheelchair-bound, or were generally having difficulty completing the assessment due to illness, distress, or fatigue. Grip strength was measured in 99% ($N = 442$) of the patients screened, representing 73% of patients assessed in the memory clinic ($N = 605$). As reported by healthcare providers administering the screening, the amount of time to complete the screening (gait speed, grip strength) ranged from 3 to 15 minutes, with a mean of 8.0 minutes (SD = 5.0; median = 5.0). Caregiver burden was measured in the care partners of 380 (86%) patients screened for frailty, representing 632.8% of those assessed in the memory clinic during the study time period ($N = 605$).

In terms of key lessons learned in the implementation of frailty screening, healthcare providers noted that their ability to implement the screening within the memory clinic assessment was facilitated by the ease with which they could integrate the frailty screening into the existing clinic assessment processes, which provided patients with an opportunity to move around during a primarily sedentary assessment.

> *"We always start with the cognitive piece, so people have been sitting for a while so it's nice to get up and walk anyway, and we do a gait assessment. So, to add the gait speed just means they walk a little bit longer and have a little bit more chance to stretch their legs in a long assessment. I think that the components to Level 1 are so easy to integrate into what we're doing already at the memory clinic."* [HCPID2]

Other enabling factors included the clinic team's openness and flexibility to resolve any logistical issues that arose when administrating the screening. Moreover, the provision of training and ongoing support in the administration of the screening facilitated implementation.

> *"So, if something is not smooth, no one hesitates, no one takes offence to say: 'What if we try this?'…the team spontaneously figures things out. So, it's very smooth."* [HCPID5]

> *"So, certainly the training that was done was very helpful. If I ever had any questions or concerns, I knew I always had somebody that I could reach out to, to get to answer those questions… I found that really helpful."* [HCPID6]

Generally, few challenges in implementing the screening were identified and no common challenges were identified among the interviewed healthcare providers. Several challenges were identified by single interview participants, such as the difficulty patients with advanced dementia experienced in following instructions on how to use the dynamometer, sharing the use of the single clinic dynamometer when more than one patient is being assessed at the same time, and the added time for screening on particularly busy clinic days when multiple patients are being assessed.

There were a few suggestions for improvements to the screening process as implementation was perceived as quite easy.

> *"No* [suggestions for improvements]. *It's all going good. No issues. Like I said, I just kind of incorporate it with the whole test."* [HCPID1]

## Maintenance

At the end of the study time period, three of the four clinic sites continued to implement the C5-65 frailty screening. One site, which supported the implementation of frailty screening, decided to discontinue the use of the gait speed and grip strength measures opting to use a self-report measure completed by patients and care partners prior to their first clinic visit; this change was designed to increase the time efficiency of the clinic assessment.

Regarding health care provider perceptions of the value-added of frailty screening within the memory clinic assessment, the majority of survey respondents ($N = 6/9$; 67%) provided ratings of the screening being 'very' or 'extremely' valuable; three healthcare providers ratings of 'somewhat' valuable ($N = 3/9$; 33%). The majority of healthcare providers ($N = 7/9$; 78%) supported the continued implementation of frailty screening (sum of 'agree' and 'strongly agree' ratings); one respondent provided a 'neutral' rating.

## Discussion

Key study findings are summarized in Box 2. Using the RE-AIM framework, this study demonstrated that incorporating frailty screening, using gait speed and hand grip strength measures, into MINT clinic memory assessments is acceptable to patients, care partners, and healthcare providers and is feasible when assessing memory concerns as an opportunity to improve health outcomes for older adults. Incorporating frailty screening into the memory clinic assessment provides a significant opportunity to identify frailty in those who have memory concerns and may be at greater risk of health destablization because of co-existing frailty. In this study, 74% of patients assessed in the memory clinic were screened for frailty. Informal feedback received from the clinic sites suggested that some patients were not screened if their frailty status was already known or if mobility or other health issues prevented them from completing the gait speed or grip strength measures. The screening was perceived as easy to integrate into existing clinic processes and added value to their efforts to improve health outcomes for older adults assessed and treated in the MINT memory clinics.

## Advantages of screening for frailty in MINT memory clinics

There are several advantages to screening for frailty within primary care-based memory clinics. Case finding conducted routinely as part of dementia care will ensure that frailty status is identified and managed within the context of cognitive impairment. Given that

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**Box 2: Key study findings consistent with the RE-AIM framework**

| | Key findings |
|---|---|
| **Key study indicators** | |
| **Feasibility and acceptability of frailty screening** | • Frailty screening, using gait speed and grip strength, is feasible to implement in MINT memory clinics.<br>• Frailty screening was acceptable to patients, care partners, and healthcare providers. |
| **RE-AIM framework indicators** | |
| **Reach** | • 74% (*N* = 444/605) of patients assessed in the memory clinics were screened for frailty.<br>• 16% (*N* = 69/444) of patients screened were deemed frail.<br>• Patients who were frail were significantly older, had higher depression scale scores and had care partners with higher caregiver burden scores than those not frail; more patients who were frail were diagnosed with dementia than those who were not frail. |
| **Effectiveness/impact** | • 79% (51/69) of patients deemed frail received care plans targeting their frailty.<br>• Patients and care partners were satisfied with the frailty screening and perceived it as value for time spent.<br>• Health care providers were satisfied with the screening process and perceived it as quick and easy to administer, providing an objective measure of frailty, and useful information for targeting early intervention to potentially prevent adverse events and increased health utilization. |
| **Adoption** | • Four of the five MINT memory clinics participating in this study implemented the screening (one clinic ceased operation due to the COVID–19 pandemic).<br>• The clinic sites serviced urban and rural populations, with three urban sites serving a total of 69 medical practices with a combined patient base of 100,500 patients and one site serving all family practices in a specified geographic location.<br>• Screening was implemented by a nurse practitioner, registered and registered practical nurses, and occupational therapists. |
| **Implementation/fidelity** | • Gait speed, grip strength and care partner burden screening were conducted with good fidelity (86%–99% of those screened)<br>• Mean time to complete screening was 8 minutes (mean = 5.0 minutes, range = 3 to 15 minutes).<br>• Identified facilitating factors: the ease with which screening was integrated into clinic processes, the team's openness and flexibility to resolve logistical issues, and the provision of training and support.<br>• Few challenges and suggestions for improvement were consistently identified. |
| **Maintenance/sustainability** | • Three of four clinics continue to use gait speed and grip strength to measure frailty; one site opted to use an alternative tool (self-report) to increase the time efficiency of the clinic assessment.<br>• The majority of health care providers perceived frailty screening as value-added and supported continued implementation. |

frailty screening within primary care practice is perceived as resource intensive (Ambagtsheer et al., 2019), embedding it within existing dementia assessment workflow is efficient, with C5-65 hand grip plus gait speed measurements requiring on average eight additional minutes. Moreover, screening results are communicated with the patient's primary care practitioner, so that working with the memory clinic team, care planning for frailty is seamless and coordinated, and can help to ensure ongoing medical management is optimized and appropriate in the context of frailty (Lee et al., 2015). Primary care is ideally suited for managing both frailty and memory concerns because of its continuity and its focus on a person-centred, multidisciplinary team-based holistic and preventative approach to care (Abbasi et al., 2018; Ambagtsheer et al., 2019). Individualized care plans for frailty can be reviewed and reinforced at the regularly scheduled visits at the MINT memory clinic; MINT memory clinic teams develop well-established and trusting relationships with patients and care partners over time and are in an ideal position to observe changes and modify care plans as needed. Memory clinics utilize team-based case management and act as a hub for integrated proactive community supports and services that are tailored to meet the unique needs of the patient and care partner as dementia advances. Moreover, the clinics' knowledge of and established relationships with community services are leveraged in interventions recommended to manage frailty, such as recommendations to improve diet, exercise, social connectedness and to reduce the risk of falls. With the addition of frailty screening in memory clinics, those who are frail and at the highest risk of poor outcomes may be identified and managed with pro-active care that may further help to avert health destabilization and associated healthcare system costs, allowing frail people with dementia to remain living in the community for even longer with the best quality of life.

## Implementation of screening in MINT memory clinics

The findings of this study suggest that healthcare providers perceive frailty screening as value-added to the memory clinic assessment and support its continued implementation. While healthcare providers appreciate the importance of frailty screening, the busy nature of primary care requires screening to be quick, easy, and simple to administer (Ambagtsheer et al., 2022). Screening tools in this study were perceived as quick and easy to administer, which will likely contribute to their sustained use. A barrier to frailty screening in this study was the COVID-19 pandemic; the resulting

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strain on health human resources impacted the clinics, so much so that one site was unable to reopen their clinic. Ongoing health human resource challenges resulting from the pandemic may have, in part, affected the decision of one clinic site to opt for a self-report frailty measure instead of gait speed and grip strength measures to reduce the time and workload for clinic staff.

Few studies have examined patient perspectives on frailty screening. In this study patients and care partners were satisfied with the frailty screening as an opportunity to learn more about their health status and to inform and improve care. Other research has found that frail older adults are skeptical about the value of and need for frailty screening using objective measurement tools, believing that frailty can be identified subjectively and fearing negative outcomes (e.g., stigmatization) associated with being labelled as frail (Archibald et al., 2021). In contrast, in this study, patients and care partners believed the screening provided important information that would inform their health care and, ultimately, health outcomes.

## Prevalence of frailty

In this study, the overall prevalence of frailty among patients 65 years of age and older with memory concerns assessed within the memory clinics was 16%, double that found in regular primary care practice with patients 75 years of age and older (Lee, Patel et al., 2017). This prevalence rate is lower than reported in other studies with community-dwelling older adults living with dementia, which have rates ranging from 24% to 99% (Koria et al., 2022). However, our memory clinic prevalence rate includes those with subjective cognitive decline, MCI, and dementia. In MINT memory clinics, repeated evaluative studies have shown that typically a third of patients are diagnosed with MCI, a third with dementia, and the remaining with other diagnoses including subjective cognitive decline (Lee, Hillier et al., 2017). In this study, the prevalence of frailty among those diagnosed with MCI was 9.2% and 23.3% among those with dementia, which is consistent with the findings of other studies (Koria et al., 2022).

## Sustainability and scalability of frailty screening in MINT memory clinics

This study provides valuable insights into factors that can enable sustained implementation of frailty screening and that support scaling of frailty screening to all MINT memory clinics. Hand grip strength and gait speed measures were deemed quick and easy to administer, making it feasible to integrate and implement into the existing memory clinic assessment workflow. Scaling frailty screening to all existing and new MINT memory clinics using these measures would be feasible and not costly given the relatively small time investment for training and screening and low equipment costs; dynamometers are easily accessible and affordable for most clinics. Screening was likely successful in this initiative due to health care providers' positive perceptions about screening and the training they received, which included evidence to support the effectiveness of screening, access to screening tools and management pathways, and involvement of multidisciplinary teams, all of which have been identified as enabling frailty screening (Nan et al., 2022). The feasibility of scaling frailty screening to all MINT memory clinics is supported by the ability to screen for frailty not being limited to any particular discipline. In this study, the screening was completed by a nurse practitioner, registered nurses and registered practical nurses, and occupational therapists, which allows clinic teams flexibility in implementation based on available staff resources. Challenges to adoption of frailty screening in this study were mainly related to the COVID-19 pandemic, which put an unprecedented strain on health services and human health resources across all sectors. Memory clinics were no exception to this and some clinics were not able to operate with staff being redeployed to the pandemic response (assessment or vaccination centers) or to other services. As COVID-19 rates have fallen and the need for pandemic response has lessened, many MINT memory clinics are now fully operational. Frailty screening has been included as a standard practice in the assessment protocol for all new MINT memory clinic teams trained and established after the current study; to date, this includes 26 new MINT memory clinics established across five Canadian provinces. Existing MINT memory clinics received education on the importance of screening for and managing frailty and training on hand grip and gait speed administration at an annual continuing education event delivered to all MINT memory clinic team members in February 2022.

## Strengths, limitations and future research

This study has several strengths and limitations. A strength of this study is that it included the perspectives of patients and caregivers; engaging older adults in studies that will inform the provision of healthcare services ensures that their specific needs are considered and addressed. We had a good response rate to study surveys, particularly the patient and care partner survey, considering that data collection occurred throughout the COVID-19 pandemic and the previously published evidence of stigma and negative connotations associated with frailty among older adults (Archibald et al., 2021). In this study, we focused on the perceptions of healthcare providers who were involved in administering the frailty screening; the perceptions of other memory clinic healthcare providers or clinicians who refer to the memory clinic on the value of the screening is not known. We anticipate that most, if not all team members, would perceive frailty screening as being beneficial as it was sustained over time and care plans were generated specifically to address frailty. This evaluation study was conducted with five MINT memory clinics in Southwestern Ontario, representing only a small proportion of the close to 100 clinics in operation at the time across the province. Finite resources and study implementation during the pandemic limited our ability to increase the number of clinics involved in this pilot study. Given that this screening has now been incorporated as standard practice within the MINT memory clinic model across Canada and feedback on the training and screening administration suggests it is well-received, it is unlikely that the results would have been much different with more clinics participating.

Research in the area of dementia and frailty is relatively new and more research is needed to better understand the relationship between these two conditions. There is some emerging evidence that suggests that the pattern of cognitive impairment and frailty occurrence, that is, whether people develop cognitive impairment or frailty first, or if they co-occur, may reflect distinct etiologies associated with different dementia subtypes and may result in differing treatment outcomes (Chu et al., 2019). Elucidating the dementia subtype-frailty relationship may inform the optimal targeting of interventions within MINT memory clinics. Frailty among people with dementia has been associated with multiple comorbid conditions such as depression, heart disease, stroke, and

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falls (Ge et al., 2020). In this current study, there were significant differences between those patients with memory concerns who were identified as frail and those not frail with respect to the known medical history of various age-related conditions. Studies with larger sample sizes are needed to better understand the relationship between frailty, cognitive impairment and comorbidity. More research is also needed on the clinical and patient-centred outcomes associated with the identification and management of frailty within the context of MINT memory clinics.

## Conclusions

In this study, the overall prevalence of frailty within the primary care memory clinic population was 16%, with 9% prevalence in patients with MCI and 23% prevalence in those with dementia. There is increasing research evidence showing that there is an association between frailty and cognitive impairment, in that each condition increases the risk of the other, highlighting the importance of screening for frailty when assessing memory concerns (Kojima et al., 2016). This study demonstrated that screening for frailty is feasible and acceptable in MINT memory clinics based on the perspectives of patients/ caregivers and healthcare providers. Frailty screening for patients with memory concerns is important because identifying frailty offers the opportunity to identify previously unrecognized or suboptimally managed co-existing conditions that worsen or are worsened by frailty and for introducing interventions that may reduce the risk of health destabilization that occurs when frailty and cognitive impairment co-exist. As demonstrated previously, hand grip and gait speed measures provide a sensitive, specific, accurate and precise surrogate for the Fried frailty phenotype and offer a quick and efficient method of measuring frailty in primary care memory clinics (Lee et al., 2023; Lee, Patel et al., 2017). Screening and coordinated care within the MINT memory clinic interprofessional care model can ensure that people living with dementia maintain community living and quality of life for as long as possible.

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