Agitated Behavior of Elderly and Alternative Simple Treatments: Individualized music – A feasibility study (the ABrEAST-iM feasibility study)

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ABSTRACT

Background

Behavioral and psychological symptoms of dementia (BPSD) influence older persons’ quality of life. Non-pharmacological interventions such as individualized music (iM) are promising to reduce BPSD and sustain interpersonal connectedness that contributes to quality of life. The purpose of this study was to assess the practicalities (e.g., process, results) of iM activities application on older adults over 65 years of age diagnosed with dementia living in residential care facilities. Our objectives were to: a) evaluate the recruitment process; b) explore the process of iM activity implementation; c) assess the clinical significance of the outcomes.

Methods

A concurrent mixed methods feasibility study designed and was conducted in two residential care facilities in British Columbia, Canada to assess the practicalities (i.e., recruitment, acceptability of the intervention, adherence to it, and clinical significance) of iM activities implementation on older adults diagnosed with dementia living in residential care facilities. Data were collected from residents, their families and staff using administrative records, observations, surveys, and interviews. Our primary outcomes were affect and quality of life.

Results

The observed iM activities were feasible, acceptable and adhered to by residents with clinical significance. Specifically, about 47% of eligible residents, their families and staff agreed to participate in and completed the study (recruitment); approximately 86% of participants enthusiastically received and were satisfied with the iM activity (acceptability); more than 70% of participants completed at least seven of the nine iM sessions (adherence); about 55% of participants experienced an increase in positive affect scores and 29% had a decrease in
negative affect scores after the intervention; more than 43% of participants had a reduction in BPSD (clinical significance). Finally, participants reported improvement of quality of life and positive effects of iM intervention and provided insights and suggestions to improve it.

**Conclusions**

Individualized music activities can be successfully implemented (i.e., feasible, acceptable, adherent) with significant clinical outcomes. Participants reported positive affect emotions, increase in quality of life and well-being. With this feasibility study, we developed a process to identify challenges and their solutions that may assist us in a following pilot study with similar iM intervention.

**Trial registration**: ISRCTN, ISRCTN37367520. Registered 21 May 2019 – Retrospectively registered, https://www.isrctn.com/ISRCTN37367520?q=&filters=conditionCategory:Mental%20and%20Behavioural%20Disorders&sort=&offset=1&totalResults=2303&page=1&pageSize=10&searchType=basic-search

**Keywords** (in alphabetical order): Behavioral and psychological symptoms of dementia (BPSD), dementia, feasibility study, individualized music, older adults, quality of life, residential care facilities.
Key messages regarding feasibility

1. The uncertainties we explored in this feasibility study include the recruitment process of study participants (i.e., residents, families, staff); acceptability and adherence of the iM intervention implementation procedure; and the clinical significance of the intervention.

2. The key feasibility findings are related to:
   a. Recruitment – About 47% (seven out of 15) of eligible residents (and their families and staff) agreed to participate in and completed the study.
   b. Acceptability – About 86% of participants were satisfied with the iM activity. Participants enthusiastically received the intervention and provided insights and suggestions to improve it. The emerged themes from the qualitative data analysis were “quality of life”, “familiarity with music”, and “positive (calming) effects”.
   c. Adherence – More than 70% of participants completed at least seven of the nine iM sessions.
   d. Clinical significance – More than 55% of participants experienced an increase in positive affect scores (duration and frequency); about 29% of them had a decrease in negative affect scores measured after the intervention; more than 43% of participants had a reduction in (i.e., improved) their BPSD in comparison with the baseline measures; and all participants had the highest positive scores during the iM intervention.

3. The implications of the feasibility study findings (“lessons learned”) for the design of the following pilot study include that:
   a. The iM intervention is feasible, acceptable, and promising regardless any potential cultural differences within settings or among participants. Any differences neither affected the intervention implementation nor the variation of the outcomes. Applying the
iM activity in two different natural contexts helped us understanding the nature and course of the intervention, which can be faithfully and effectively implemented according to the protocol.

b. The recruitment process was challenging but feasible. In the following pilot study, we may avoid those challenges (e.g., contact family members, recruit eligible staff), based on the knowledge we gained in this feasibility study (e.g., identify and solve them).

a. The methodological approach (i.e., concurrent mixed methods design) is feasible and robust.
INTRODUCTION

Dementia is a fast growing global challenge and one of the most urgent public health and healthcare issues [1-3]. Behavioral and psychological symptoms of dementia or BPSD (e.g., memory decline, agitation, apathy, withdrawal, depression) reduce a person's ability to perform activities of daily living. The World Dementia Council (WDC) [4] encourages non-pharmacological interventions to manage BPSD and improve the quality of life of patients and their families. Non-pharmacological interventions (e.g., music therapy [5-9], dance and painting [5]) can prevent or reduce BPS [10-12]. For example, music activates parts of the brain that are involved in mood regulation [13] and are stimulated by neurotransmitters (i.e., serotonin and dopamine) and other pleasurable activities (e.g., eating chocolate) [14]. Music-related activities reduce BPSD and sustain interpersonal connectedness that contributes to quality of life [15-18]. In particular, individualized music (iM) is a non-pharmacological, non-invasive, inexpensive, and low-risk intervention that promises benefits to persons with dementia as it can reduce agitation, stress and anxiety [19-21], and promote positive memories and emotions [21, 22].

The Medical Research Council guidance on complex interventions [23] advocates for assessing the feasibility of a research approach and the use of pilot studies as part of the development, testing, and evaluation of interventions in healthcare [24]. In general, the scope of a feasibility study is often narrow and mainly focused on building the foundation for a pilot or larger study and on issues relating to safety, efficacy or recruitment. Particularly, a feasibility study tests specific and practical ways that an intervention addresses and may include logistical issues (e.g., resources needed, running multicentre studies), uncertainties around a trial recruitment
and sample size or intervention development and delivery, whether a trial is possible or necessary, and/or how it can be conducted [25, 26].

In this paper, we discuss the process and results of a feasibility study focused on iM activities implementation on older people diagnosed with dementia to guide an in-preparation pilot test of the intervention designed to assess its effectiveness. Specifically, the purpose of this study was to assess the practicalities of iM activities application on older adults over 65 years of age diagnosed with dementia living in residential care facilities. Our primary objectives were to:

- Evaluate the viability of recruiting study participants – Criterion for success: 60% of eligible residents will agree to participate. Measurement: number of residents agreeing to participate, divided by all eligible residents.

- Explore the practicalities of the iM activity implementation such as

  a. Acceptability – Criterion for success: 75% of participants will be “satisfied” or “completely satisfied” with the intervention. Measurement: number of participants to be satisfied, divided by number of participants.

  b. Adherence – Criterion for success: 80% of participants will complete at least seven of the nine scheduled intervention sessions. Measurement: number of participants to complete at least seven sessions, divided by the number of participants.

  c. Clinical significance – Criterion for success: 40% of participants will demonstrate a change (reduction) of BPSD and an increase in positive (and decrease of negative) affect at least three weeks after participating in iM activities. Measurement: number of participants to show a change (smaller for negative and larger for positive) in their follow-up BPSD and affect scores than that at baseline, divided by the number of participants [27].
MATERIAL AND METHODS

Study design
A feasibility study was designed to observe how an iM activity can be applied and address uncertainties around recruitment, retention, and clinical significance of the intervention. Residents, their family members and nursing staff were involved and consulted during the data collection process.

Settings and Sample
Using a convenience sample, we recruited male and female adults 65 years of age or older who lived in two residential care facilities in British Columbia, Canada; where “Memory & Music (M&M)” programs have been already initiated based on resident needs, preferences and likes (participants’ flow shown in Diagram 1). In this paper, those facilities are referred as Setting 1 (or S1) and Setting 2 (or S2); both located on the Vancouver Island. Within each facility, the predetermined iM activity was delivered in a different way by staff, volunteers or family. For example, in S1 the personalized M&M program was already part of routine practices applied to 25 residents across 10 units in total. Devices (i.e., iPods) are independently used in a random way by volunteers, staff or family instead of requesting a medication to calm down a resident (“prescription of music”). That is, when a resident wanted to listen to music or staff noticed BPSD present. Volunteers kept notes of resident behavior before and after the M&M application and shared their records with the unit staff. In S2, music therapists were providing individualized music sessions of 20 minutes per week and group music sessions of 45 minutes per week for 75 residents as a therapeutic means. The inclusion criteria for study participants were:
a. Mild to moderate dementia (i.e., a Cognitive Performance Scale or CPS score of 2 to 4) used as a proxy for cognitive capability. The CPS [28] is part of the Resident Assessment Instrument Minimum Data Set 2.0 (RAI-MDS 2.0) [29] (reference period of seven days).

b. Manifested BPSD, when at least two indicators (e.g., resistance to care, abusiveness, aggressive or socially inappropriate behavior) are present in the last assessment as they are monitored in the RAI-MDS section E4 (i.e., a, b, c, d, e; reference period of seven days).

c. Lived in the residential care home for at least one month at the start of the study.

We excluded those residents who had an accompanying diagnosis of manic depressive – bipolar disorder or schizophrenia and those in a hospice care program. In addition, for each resident-participant, we also recruited one eligible: a) self-selected family member aged 18 or over who visited and knew the resident well; and b) professional caregiver/staff (i.e., healthcare aid/assistant/worker), who was employed in the participating facility for more than six months and regularly provided care to the resident and knew the person well.

**Instruments and Measures**

Data were collected from participants after they took part in at least three weeks of the iM program, to assess participant personal characteristics, BPSD, affect, antipsychotics, and quality of life, the following instruments were used:

1. Affect – We measured affect through direct observation of facial expression and body movement using Lawton’s Modified Behavior Stream (LMBS) [30], which assesses two groups of feelings/affect: positive (i.e., pleasure, interest, contentment) and negative (i.e., sadness, anxiety, anger). For example, pleasure was noted when the participant smiled, laughed, or showed other outward manifestation of happiness. Pleasure was measured using a 5-point Likert scale: (1) never, (2) less than 16 seconds, (3) 17-59 seconds, (4) 1-3
minutes, and (5) more than 3 minutes of the 10-min observation time [30]. Also, an option (6) “cannot tell” was added for our observation. All affect and resident verbal and non-verbal behavior measures were recorded representing duration (amount of time) and frequency. The reported inter-rater agreement for pleasure was ICC = 0.71 and agreement rate kappa = 90% [31].

2. Quality of life – We used the Quality of Life–Alzheimer’s Disease Scale (QoL-AD) [32-34], a brief 13-item questionnaire specifically designed for long-term care settings (validated in 11 countries), to assess the quality of life of older adults with dementia. The QoL-AD includes 13 dimensions with 4-point Likert response scales collected through both self (via interview; about 10 min) and proxy (via family or caregiver self-administered survey; 5 min) ratings for capturing both perspectives [34]; the scores ranged from 13 to 52 points. The internal-consistency reliability ranged from 0.67 to 0.89 [32, 35] and 0.94 for residents and 0.90 for staff [33]. The test-retest reliability (ICC) for resident and caregiver were 0.76 and 0.92 respectively [32] and there was evidence of its responsiveness [34].

3. BPSD – The Canadian version of the Resident Assessment Inventory Minimum Data Set version 2.0 (RAI-MDS 2.0) [29], administrative data, was used to capture resident patterns of behavior and psychological symptoms of dementia (e.g., agitation). Specifically, we evaluated participants’ behavioral symptoms such as wandering (i.e., E4a), verbally abusive behavior (i.e., E4b), physically abusive behavior (i.e., E4c), socially inappropriate or disruptive behavior (i.e., E4d), and resistance of care (i.e., E4e) as well as any potential change of those symptoms (i.e., E5).

4. Antipsychotics – Using administrative data (i.e., resident charts and nursing records of medications), we measured the number, type and dose of medications (e.g., antipsychotics)
administered to each resident-participant on a monthly basis before and during the iM program.

5. Personal characteristics – The RAI-\textit{MDS} 2.0 was used to obtain resident demographics, cognitive status, mood pattern, psychosocial well-being, physical functioning, activities involved in, and diagnoses.

6. Experiences and perceptions – In a private space within the facility (e.g., resident room), we conducted face-to-face, one-on-one semi-structured \textit{interviews} with residents, family and caregivers about their experiences and perceptions of the iM activity.

\textbf{Ethics approval and consent to participate}

This study has received ethics approval from the Harmonized Human Research Ethics Board (HREB) that was run as a pilot in BC at the time, involving all health authorities and higher education institutions (protocol number: BC15-146; approval reference number: VIHA file number: BC2015-052/02Feb2016). The consent process for residents or their substitute decision-makers and their families were initiated by a neutral third-party in each setting, who had access to residents and their families. The third-party sent “Consent-to-Contact” forms to obtain written consent to use personal information for contact regarding research recruitment. For consented residents and families, the third party sent the “Information and Consent Form for Reviewing Medical Records to Determine Resident Eligibility for Research” for written consent and permission to review their health records. For eligible residents to participate in the study, an invitation letter for participation and recruitment was sent out. A research assistant personally approached residents and families who were interested in participating in the study, and administered and explained the study consent form. Consented residents and their family members signed the last page of the consent form and kept a copy for their
records. The research assistant approached the consented resident to reobtain and record assent each time the resident participated in any stage of the study (i.e., interview, music activities). A similar process was followed for recruiting staff and family members. We were not able to provide any token of appreciation to participants in order to cover any incidental cost for attendance in interviews and completing questionnaires.

**Data analyses**

To address the aim and objectives of this feasibility study, we conducted quantitative and qualitative data analyses. The quantitative data analysis included descriptive statistics about study participants, feasibility of recruiting them, acceptability, adherence, and clinical significance of the iM activities. The qualitative data collected via interviews were recorded, transcribed verbatim, and analyzed using content and thematic analyses.

**RESULTS**

In both settings (S1 & S2), seven triads of participants (i.e., resident, family, and staff) were included in the study. Five residents (four women and one man) and their family and staff members were observed in S1; and two residents (one man and one woman) and their family and staff members in S2.

The residents’ mean age was 74 years (range: 66-80). The range of living in the facility was from 4 months to 138 months (11½ years) with their education level ranging from less than grade 11 to graduate degree. Most of the participants were widowed. Their cognitive status ranged from mild impairment (CPS #2) to moderate severe impairment (CPS #4). Demographic characteristics of participants are shown in Table 1.

The results of the quantitative data analysis included
• Feasibility of recruiting study participants – About 47% of eligible residents (seven participants out of 15 eligible residents) agreed to participate in and completed the study. Thirty-six (29 in S1 & 7 in S2) residents consented to participate, but only 15 (11 & 4 residents respectively) were eligible. Seven participants took part in the study (i.e., 5 at S1 & 2 at S2).

• Acceptability – About 86% (i.e., six out of seven) of participants were satisfied with the iM activity.

• Adherence – About 71% (i.e., five out of seven) of participants completed at least seven of the nine iM sessions.

• Clinical significance – Approximately 43% of participants had a change in their BPSD. Out of seven participants, one resident had a reduction (i.e., improved), while two participants experienced a deterioration of BPSD compared with the measures at baseline. Fifty-seven percent (57%) of participants (i.e., four out of seven) experienced increased positive affect scores (duration and frequency) and two participants (29%) had decreased negative affect scores measured after the iM activity. All of the participants had the highest positive scores during the iM intervention. Higher scores of positive and/or lower scores of negative feelings indicate a better (increased) level of affect.

The qualitative data analysis revealed three themes: quality of life, familiarity with music, and effects of music activity.

• Quality of life: A good quality of life would be a good environment and engagement/involvement in activities (e.g., exercise, walking in the garden or playing guitar); having a good balance of stimulation and/or companion (i.e., one to one visit and conversation), visiting a hairdresser, being kept entertained/busy with something productive.
• **Familiarity with music:** The majority of participants previously listened to music on the computer, played piano at a younger age, or always loved music. Specifically, one participant reported “listen to music for hours (up to four!)”; another never had an interest in music, but she preferred listening to the radio daily usually light classical music (e.g., pop-opera, Pavarotti); and another had a guitar background and strong interest in music.

• **Effects of music:** One participant, who was anxious before the music activity, reported her mind was “racing during pre-intervention”, was observed humming to the music with eyes closed, smiling, and nodding to the rhythm. She clearly appeared to be enjoying the music activity, wiggling her toes and tapping to the music. As her humming increased, she could be heard making the tone, whistling at times, singing, and paying more attention to her surroundings. She stated that music makes her feel “damn good”. The music’s calming effects were observed. Another resident asked when the music was going to start. With Elvis Presley playing on the speakers, she seemed content with a faint smile on her face and she was clapping her hands on her thigh along to the music and tapped her feet. A third resident sung along to the music (remembering the lyrics), moving her body along and tapped her feet to the music with a smile. She shared her memories of sitting in the cafes in Belgium and listening to and dancing to this type of music and how she met husband at a dance. She stated the experience gave her “goose-bumps” and asked the music therapist to “double up”, while she was singing along. She clapped at the end and laughed. When the music activity completed, she repeated the tones of the last song while walking out of the room, saying “this is now stuck in my head”.

DISCUSSION

Use of music is a non-pharmacological, low-cost, safe, humane and promising intervention that has the potential to reduce BPSD [36]; and as such, it has been widely studied in observational trials [37]. However, the procedures undertaken for the intervention and use of a one-size-fits-all music were the most common approaches [5]. In acknowledging that there are various challenges and issues that surround complex interventions, we followed the process of an evaluation feasibility study to explore the ways in which the iM intervention is implemented, and to obtain insights for a successful, optimized and high quality intervention for the in-preparation pilot study. Hence in this study, we evaluated specific and discrete aspects of the iM intervention using a simple observational study design. In particular, the primary objectives were to develop, test, and assess the feasibility of recruiting participants; to explore the practicalities of the iM activity implementation (i.e., acceptability, adherence, clinical significance); and to better understand resident, families and staff experiences and perceptions of the use of iM activity. Next, we describe the main “lessons learned” from this feasibility study to inform our following pilot study; specifically, whether the iM intervention is feasible, acceptable, and promising. Also, we compare our approach with the existing literature.

Lessons learned

1. Despite the contextual differences and the way iM activities were applied in each of the participating settings, the intervention was feasible, acceptable, and promising to recipients and stakeholders. Cultural differences had neither affected the implementation of the intervention nor the variation of the outcomes. Instead, different approaches in those two settings helped us to understand the nature and course of the iM intervention in its natural context.
2. The recruitment process in this study was essential to identify, solve, and avoid various challenges for the success of the following pilot study.

3. The measurement instruments were acceptable to participants and potential attrition would not affect the viability of the iM intervention. In particular, the RAI-MDS is considered an acceptable and easy way to obtain information about resident characteristics. Assessment of the intervention fidelity inform us that our plan and protocols were faithfully implemented.

4. The concurrent mixed methods design provided valuable information on whether the feasibility criteria were met (quantitative data) and how the iM intervention could be improved to influence its effectiveness (qualitative data). The quantitative data were used to evaluate the acceptability, adherence, and clinical significance of iM activities (e.g., participants enthusiastically received the intervention); to capture potential impact of the iM intervention, since its application was not standardized (i.e., unequal dose or duration); and to clarify the clinical significance of the iM activities. The qualitative data were used for providing us insights and suggestions that could improve the intervention. Overall, the iM application can be flexible, based on resident desires and preferences, and still effective and impactful. Our methodological approach clarified details for a subsequent pilot study that can be feasible and robust. However, we cautiously report the promising significance of this feasibility study due to its underpowered sample size.

**Comparison with the literature**

Studies on iM activities in persons with dementia [9, 38–42] provide valuable insights for the intervention implementation process and influential factors, outcomes evaluation, assessment criteria for the intervention and outcomes, development and testing of a middle-range theory of iM intervention, improvement of knowledge of and adherence to iM protocol [43], and training
staff in administering iM activities (i.e., utility) [44]. The most recent and similar study protocol on iM intervention comes from Germany [45], where a multi-center randomized controlled trial (RCT) protocol was described to address methodological limitations of previous studies and assess feasibility, efficacy, acceptability, and applicability of iM intervention to persons with dementia in nursing homes. However, although acceptance and applicability will be assessed using a self-developed survey without known or reported psychometric properties, feasibility and efficacy were not described at all. We were not able to locate any relevant publications based on that protocol; we guess, the RCT is still in progress. In comparison, our already completed feasibility study is a non-randomized before-after design focusing on certain processes and procedures. It is distinguishable as the only study that includes resident personal characteristics (e.g., diagnosis, medications, BPSD) based on administrative data that enables dosage and duration of as well as adherence to the iM intervention.

**Implications to practice, research, education**

For practice, this study findings indicate that iM activity is an alternative, humanistic, non-pharmacological, non-invasive, inexpensive, low-risk, and limited-time intervention with observable positive effects on older people with dementia. For education, the results show that any trained person (e.g., staff, family, volunteers) can implement iM activities in residential care facilities according to evidence-based guidelines [42]. For future research, our results suggest that iM intervention needs to continue being applied to residents in long-term care facilities as a holistic and person-centre approach. Scholars need to quantify the intervention process components (e.g., duration) and observable or anecdotal positive behaviors (e.g., agitation decrease, quality of life improvement) by including physiological outcomes such as
endocrinological measurements (e.g., salivary CgA, chromogranin A, immunoglobulin A) [46, 47], and to estimate the cost-effectiveness of the intervention [48].

**Strengths and limitations**

The strengths of this study include a rigorous mixed methods approach to iM activities by observing the implementation processes in two different contexts, measuring behavior-related outcomes, and capturing participant perspectives and experiences. The identified limitations are the limited sample size, and observational and anecdotal data collection. However, we were able to address this feasibility study aim and support the practicalities of iM activities.

**Dissemination of results**

Frequently, findings of feasibility studies are not widely reported for various reasons including lack of prioritization of dissemination due to their unclear role, scope, and optimal use. We believe that dissemination of feasibility and pilot studies is a best practice to prevent waste of resources and provide information for improving the design of larger studies. Therefore, we will publish the results of this feasibility study in an academic journal and present the primary results in the participating long-term care facilities and peer-reviewed conferences.

**CONCLUSIONS**

The observed individualized music activities were successfully implemented, indicating that the feasibility, acceptability, and adherence to iM activities with significant clinical outcomes is possible. The study participants reported an increase in their quality of life and positive effects associated with iM activities such as emotions, behavior and well-being. We have developed a process to identify challenges and solutions for a pilot study that may assist us and other researchers to pilot similar interventions.
LIST OF ABBREVIATIONS (in alphabetical order)

- ABrEAST: Agitated Behavior of Elderly and Alternative Simple Treatments
- BPSD: Behavioral and Psychological Symptoms of Dementia
- CPS: Cognitive Performance Scale
- HREB: Harmonized Human Research Ethics Board
- iM: Individualized Music
- LMBS: Lawton’s Modified Behavior Stream
- M&M: Memory & Music program
- QoL: Quality of Life
- QoL-AD: Quality of Life–Alzheimer’s Disease scale
- RAI-MDS (2.0): Resident Assessment Instrument Minimum Data Set version 2.0
- S1: Setting 1
- S2: Setting 2
- WDC: World Dementia Council

DECLARATIONS

Ethics approval and consent to participate: This study has received ethics approval from the Harmonized Human Research Ethics Board (HREB) in British Columbia, Canada, involving all health authorities and higher education institutions (protocol number: BC15-146; approval reference number: VIHA file number: BC2015-052/02Feb2016). The consent process for residents or their substitute decision-makers and their families were initiated by a neutral third-party in each setting, who had access to residents and their families.
**Consent for publication**: Not applicable.

**Availability of data and materials**: The datasets generated, used and/or analyzed during the current study are available from the corresponding author on reasonable request.

**Competing interests**: The authors declare that they have no competing interests.

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**Authors' contributions**: AM led the study concept and design, obtained funding, supervised the data collection, conducted data analysis, collaborated in the interpretation of data, and drafted the manuscript. AMB and DK collaborated on the study design, contributed to the interpretation of data, and had critical input to the manuscript. AS and MS collaborated on the conduct of the study, and had critical input to the manuscript. MB, JB, ML, FS, MP, SJF, RN, and VT collaborated on the conduct of the study and acquiring the data, and had critical input to the manuscript. All authors read and approved the final manuscript.

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Diagram 1 – Participant Flow

Letters sent to residents & families for consent to review medical records: 30

Not responded: 8

Consent for reviewing medical records: 15

Not eligible: 7

Eligible & consent residents (& families) to participate in the study (target): 8

Missed sessions: 1

Residents & families completed the study: 7

Letters sent to staff for consent to participate in the study: 15

Not eligible: 2

Consent from staff to participate in the study: 13

Exclude to match the number of eligible residents: 5

Excluded to match number of residents: 1

Staff included in the study: 8

Staff included in & completed the study: 7
Table 1 – Demographic characteristics of participants in the feasibility iM study

| Demographics                        | Settings | Feasibility study          |
|-------------------------------------|----------|-----------------------------|
| Residents per setting               | S1       | 5 out of 11 eligible        |
|                                     | S2       | 2 out of 4 eligible         |
| Age (mean / range)                  |          | 74 / 66-80 years            |
| Gender (female / male)              |          | 5 / 2                       |
| Marital status (majority)           |          | Widow                       |
| Time living in facility (range)     |          | 4 months – 11 years         |
| Education (range)                   |          | < Grade 11 to graduate degree |
| Cognitive status (range based on CPS\(^*\)) |          | Mild (CPS #2) to Moderate (CPS #4) |

\(^*\)Cognitive Performance Scale