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Making the Most of Mealtimes (M3): grounding mealtime interventions with a conceptual model

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In this issue of the journal, Whear and colleagues¹ present the results of a systematic review focused on mealtime interventions in long term care (LTC) and their effect on behavioral and psychological symptoms of dementia (BPSD) (e.g., fear, agitation). In a companion article² these authors focus on nutritional outcomes of mealtime interventions. Key findings from both of these systematic reviews are that: 1) there is the potential to positively influence nutrition parameters and BPSD by changing the mealtime environment, 2) quality of these studies is generally poor due to small sample sizes, lack of randomization, and inadequate control for confounding factors within resident, staff and organizational levels, and 3) interventions are only briefly articulated, limiting understanding of how they work and how they can be replicated in typical LTC homes. The authors recommend that high quality studies be conducted to demonstrate the value of these interventions for improving nutritional health and quality of life of residents.^{1,2} We would add to this recommendation that intervention research needs to be based on a conceptual framework grounded in current evidence that demonstrates that there are several influences on the varied activities (e.g., arriving, eating, waiting socializing) that occur during a mealtime³ and that there are several intermediate (e.g. BPSD, food intake, strength) and ultimate outcomes (e.g., nutritional status, comorbidity, quality of life, functional ability, mortality) to consider. Mealtime is a complex process with multiple levels of influence including residents, staff, home and government.³ For example, organizational practices around when the dining room is open for meals can result in rushed mealtimes and if staffing is short or staff are drawn away from

assisting others to encourage an agitated resident to remain at the table, all meal participants, including staff, are affected. Fully understanding the problem and its determinants is needed to design interventions that have the greatest impact.⁴

Malnutrition occurs in **more than half** of residents living in LTC^{5–10} with consequences of: infections; falls; pressure ulcers; declines in function and cognition; hospital admissions; extended lengths of stay in hospital; and death.^{11–15} Poor food and fluid intake is the primary cause for LTC malnutrition as average consumption is approximately 50% of food offered;¹⁶ thus LTC malnutrition is both *preventable* and *treatable*.^{16,17} Research has demonstrated that interventions can increase food intake and also improve nutritional status and other health and functional outcomes.^{18–21} The high prevalence of malnutrition and its potential consequences, necessitates the development of innovative and effective interventions that target poor food intake in LTC.

Improving food intake in LTC has been identified as a priority by researchers, decision makers and users (i.e., LTC homes, residents, families)^{22,23} yet, this aspect of care, as evidenced by these authors' reviews^{1,2} has been sorely neglected in terms of intervention research. This is partially due to the challenges of: conducting LTC research²⁴; measuring ultimate outcomes, some of which are influenced by factors other than BPSD and food intake; and lack of understanding of the complexity of improving food intake and mealtimes in LTC. To address this last gap, a comprehensive understanding of the food and fluid intake of residents in LTC and determinants of inadequate intake is needed to build the evidence base to support the development of sustainable, cost-effective and feasible interventions.²⁵

Whear and colleagues¹ focused on mealtime interventions for persons living with dementia that included changes to the foodservice, physical environment and social interaction. The mealtime experience can be operationalized as the physical and psychosocial mealtime environment and mealtime processes that can influence food intake. Mealtime is often the highlight of the day for residents, providing opportunities for social interaction as well as development of social relationships with care providers and dining companions.²⁶ Apathy and depression have been found to be independently associated with weight loss in LTC residents²⁷ and may be linked to the mealtime experience.²⁸ Two theories *Mealtimes as Active Processes in LTC*,³ and the *Life Nourishment Theory*,²⁹ developed in the context of persons living with dementia, demonstrate the importance and potential influence of the psychosocial environment on food intake. It is hypothesized that positive social connections and honoring individual identities (e.g., food preferences, when a resident wants to eat) at mealtimes will decrease BPSD and promote food intake and quality of life. For example, family style dining provides greater opportunity for social interaction and choice of food offerings and has been shown to improve energy intake.³⁰ The Eden Alternative, which is a 'household' model providing care to fewer residents so that it is more person-centred and home-like, has also shown some benefit with respect to maintaining body weight.³¹ This association may be linked to greater individualization of care including food preferences. Use of person-centred strategies such as accommodating individualized needs and preferences during mealtimes has been qualitatively explored^{32,33} but has yet to be quantitatively assessed with respect to improved outcomes.

As described in the systematic review in this issue¹, the physical environment has been the focus of the majority of mealtime interventions when considering the outcome of BPSD. Physical environments influence eating³⁴ and ‘homelike’ environments with music, décor, and table dressings have also been shown to improve residents’ food intake.^{35,36} Furthermore, food being plated on the unit, rather than in the kitchen, enhances consumption;³⁷ residents see and smell the food, interact with staff, and may be able to choose their meal and desired portions at the point of service. On the other hand, these bulk delivery systems can create noise and distraction.³⁸ This last finding, points to the need to consider the physical environment more broadly and the divergent effects an intervention may have on the mealtime experience. As noted by Whear¹, considering positive behaviors such as increased social interaction rather than solely BPSD is also important when determining impact of these interventions.

The Five Aspects of Meal Model³⁹ is a conceptual framework for understanding and thus, promoting improved dining experiences, which was developed for the restaurant and food-retail sectors. In this model, eating occasions are influenced by the: room (e.g., table set up, lighting); meeting (e.g., social interaction); food product; and management control system (e.g., training, policies). All of these collectively result in the *dining atmosphere* (the 5th aspect). This framework suggests that there is an intersection of food or meal quality and mealtime experience. We contend that these two domains (meal quality and mealtime experience), are key to food intake, BPSD, and other mealtime outcomes and that a third domain of ‘food access’, which can limit or alter food intake, should also be considered when designing interventions. This understanding is consistent with Whear’s companion systematic review² focused on nutrition outcomes, which identified eating assistance and foodservice interventions, in addition to physical and psychosocial mealtime interventions, identified in the BPSD- focused review.¹

In the context of LTC, meal quality can be operationally defined as food and fluid offerings that are preferred and culturally appropriate, appealing, served at an acceptable temperature, and that meet the nutritional requirements of residents. Quality food is favored over oral nutritional supplements by residents and family for meeting nutritional needs and enhancing quality of life.⁴⁰ Regional policies and home-level practices with respect to menu planning, choice of commercial or in-house food products, food variety, food budget, and the mandated role and time allocated to clinical dietitians all have the potential to influence the types and quality of food provided in LTC, yet we know little about the associations among these factors and food intake.

Evidence to date suggests that increased funding for food improves energy intake in LTC residents.⁴¹ A shorter menu cycle length and tray service (rather than bulk food service delivery) is associated with increased malnutrition.⁴² LTC menus have also been found to be low in protein and micronutrients¹⁶ and are likely insufficient to support adequate health and function.⁴³ Of specific concern are modified-texture foods (e.g., pureed) that are frequently provided to persons with dysphagia (i.e., swallowing impairment) to manage their swallowing difficulty. These foods can have poor sensory appeal and low nutrient density.⁴⁴⁻⁴⁶

In addition to mealtime experience and meal quality, the ability to access the meal is also important when trying to influence intermediate and ultimate outcomes related to dining in LTC. This domain is operationalized as those factors that influence food/fluid access and specifically: the availability of food (e.g., meal timing, between meal snacks); the ability to taste and smell; dysphagia; dentition and oral health; eating ability; and the time provided for eating assistance.

Taste and smell are commonly affected in older adults⁶⁴ and specifically in those with dementia,⁴⁷ potentially impairing food intake and nutritional status. Dysphagia is a significant comorbidity that influences food intake and malnutrition;⁴⁸ it has been suggested that up to 70% of LTC residents experience some level of swallowing difficulty.^{38,49} Additionally, dental factors such as loose teeth, poorly fitting dentures, or poor oral health, may contribute to situations in which poorer quality (i.e., low in nutrients) regular or modified-texture foods are consumed. Oral health status of LTC populations has been rarely examined; prevalence of untreated cavities is approximated at 50%.⁵⁰ The pain and distress associated with poor oral health can consequently affect food intake and malnutrition.^{46,48} Furthermore, both dysphagia and poor oral health can also lead to aspiration pneumonia,⁵¹ with consequent poor intake, malnutrition and hospitalization.

Difficulty accessing food due to packaging, lids, and dishware causes stress at mealtimes and is associated with poor food intake.^{38,42} Agitation and decreased self-feeding capacity also result in decreased consumption.^{34,52,53} Assistance with food intake ranges from setting up the meal and opening packages, to encouragement; from partial assistance with some foods, to total eating assistance for those unable to feed themselves. For those requiring assistance, food access is influenced by the number of qualified, trained staff, the number of residents requiring assistance, the type of assistance needed, and the presence of family, volunteer or paid meal helpers who can provide one-on-one help.⁵⁴ For instance, a staffing ratio of 3:1 as compared to 5:1 significantly improves energy intake.⁴¹ Requiring assistance commonly results in inadequate food intake.^{38,48} It is anticipated that as many as 50% of LTC residents requiring total assistance could consume at least some of their food independently with environmental changes and supports for autonomy,⁵⁵ such as sufficient time to eat.⁵⁴ All of these access factors have the capacity to impact the mealtime experience and intermediate and ultimate outcomes.

This brief overview of the domains of *mealtime experience*, *meal quality* and *meal access* confirm that mealtimes are complex including factors at resident (e.g., eating ability), staff (e.g., training), LTC home (e.g., dining room environment), and system (e.g., governmental food budget allocation, regulations). The majority of intervention studies identified in Whear's systematic reviews^{1,2} were single activities or strategies that did not attempt to target more than one determinant of BPSD and food intake, nor did they consider the interplay of multi-level determinants on the success of the intervention. Lack of statistical significance in many studies conducted to date^{1,2} may, in part, be due to focusing on a single determinant (e.g., lack of social interaction) rather than developing and evaluating complex interventions with multiple active ingredients targeting more than one determinant. Family style dining with its components of social interaction, food choice, and increased independence is an example of a complex intervention, and targets factors at the resident-

and LTC-levels when physical environmental changes are also undertaken. Statistically and clinically relevant outcomes have been shown for this multi-level, complex intervention.³⁰ Innovative, multi-level (e.g., target the resident, staff, home, and/or system) interventions are needed to address the problem of inadequate food intake and consequent malnutrition in LTC, as determinants likely interact. We have developed an evidence-based conceptual framework, Making the Most of Mealtimes (M3) that integrates multiple domains targeting multiple levels (see figure 1).⁵⁶ We propose this framework to guide the development and evaluation of future multi-level, complex interventions focused on mealtimes.

The question then arises, which determinants within the domains of meal quality, mealtime experience and meal access have the potential to have the greatest effect on outcomes when incorporated into a complex intervention. Unfortunately, our understanding of why inadequate food intake occurs in LTC is fragmented; we have yet to conduct the necessary comprehensive, large observational studies to demonstrate which determinants when considered together, have the greatest association with outcomes. Few multi-level determinant studies have been conducted to date, but this literature demonstrates the importance of considering factors such as food cost and size of the LTC home^{25,41,57} as well as resident and staff-level factors. As well, much of our understanding of the potential effect of diverse determinants is limited as studies focus on factors that cannot be changed. For example, several studies have associated dementia with poor food intake,^{38,48} but we can do little to change the progression of diseases that cause cognitive impairment. Persons with dementia often require some level of eating assistance³⁸ and this determinant can be changed; staff can be trained on supportive assisting techniques,⁵⁴ and sufficient time and accommodations can be provided for eating independently (e.g., finger foods). Research guided by a conceptual framework focused on multi-level determinants that are amenable to change is needed.

Whear et al.¹ have reviewed the state of evidence with respect to mealtime interventions, focusing their search on comparator studies with an outcome of BPSD. This excellent review provides direction for developing more rigorous research and provides a basis on which to build interventions. We also recommend that: 1) research focused on food and mealtimes use a conceptual basis like the Making the Most of Mealtimes (M3) framework, 2) that comprehensive, sufficiently powered observational studies be conducted that collectively assess those determinants amenable to intervention, to identify those that are potentially most important to target in interventions, and 3) that complex interventions be developed that target multiple determinants, across multiple levels of influence, which are subsequently evaluated with rigorous research methods.

Poor food and fluid intake is a common but *preventable* problem in LTC and is likely associated with mealtime BPSD. Inadequate intake leads to malnutrition, and with its high prevalence in LTC there is a subsequent significant impact on the quality of life, health, care, and costs for residents in LTC. The anticipated increase in need for LTC residences over the next three decades²⁴ as the baby-boomers age, necessitates solutions to the problem of poor food intake in LTC. Yet, effective solutions will continue to be elusive until this problem is fully described. Translational research is required to improve LTC practice.⁵⁸ Previous research² has shown that we can improve food intake in LTC and a conceptual

basis to future investigations could result in further benefits. Feasible and cost-effective solutions that can be implemented across the current system are urgently needed and research agendas based on practicable mealtime activities that target determinants amenable to change, need to be the focus of future research.

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Figure 1.
Making the Most of Mealtimes (M3) Conceptual Model