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CONCURRENT USE OF DIETARY SUPPLEMENTS AND MEDICATIONS IN LONG-TERM CARE FACILITY RESIDENTS WITH ADVANCED DEMENTIA

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Abstract: Seniors residing in long-term care (LTC) facilities may suffer from nutrient deficiencies, yet supplementation may increase burden with little benefit, especially in advanced dementia with reduced life expectancy. A multidisciplinary team examined the clinical context and prescription of medications and dietary supplements to 29 LTC residents in the latest stages of dementia. All except one had problems with oral intake, and almost half had problems taking medications/supplements. The mean likelihood of death at 6 months was estimated to be 30%. Vitamin D and calcium were prescribed in 19 and 12 residents respectively. The mean (range) oral medication and supplement burden was 8.2 (0-20.5) and 1.4 (0-5) units per day, respectively, with clinical data frequently suggestive of potentially adverse outcomes. We recommend increased acquisition of knowledge and clinical expertise in the practical use of dietary supplementation in frail seniors, especially those in the latest stages of dementia.

Key words: Dietary supplements, nursing homes, older adults, dementia.

Introduction

Long-term care (LTC) residents with cognitive impairment commonly have malnutrition because of impaired absorption of nutrients, poor appetite, swallowing difficulties and poor compliance with nursing care. Unfortunately, supplementation may itself increase burden through polypharmacy and may increase mortality (1, 2). Excessive dosing and duplication of nutrients in several different dietary supplements may result in toxicity and drug interactions (3-5). Medications and supplements may have other specific adverse effects on frail individuals, such as constipation with calcium (6). Increased pill burden also increases stressful nursing interventions in residents with advanced cognitive impairment who may also have swallowing difficulties. This may contribute to increased agitation and aggression, use of psychotropic medications, and further decrease in quality of life. Finally, residents in the latest stages of dementia have limited life-expectancy (7, 8), so the lengthy times required for preventive benefit may reduce usefulness of supplementation.

Little information is available on the use of dietary supplements among LTC residents (9), especially those with cognitive impairment. We previously determined the prevalence of supplement use in LTC (10), but did not examine concomitant use of other medications or clinical context of individual participants. The aim of the current study was to assess the use of dietary supplements and medications in LTC residents in the latest stage of dementia, exploring clinical context and behavioural challenges, and assessing benefits and adverse effects.

Methods

Subjects and data collection

Appropriate ethics approval to access data was obtained from the University of Saskatchewan, Saskatoon Health Region and individual LTC facilities. Nurses on the four urban dementia units with secure dementia units in 2012 then identified residents with advanced dementia, FAST stage 7 (11). Chart data was abstracted by a senior psychiatry resident under the supervision of a geriatric psychiatrist and participants were left in the study if they still met entry criteria after this review. De-identified information was recorded, and included age, sex, medical history, diagnosis, level of functional impairment, functional health concerns, and use of prescribed agents (medications and dietary supplements). The term «agent» was used to designate a specific medication or dietary supplement type, and «unit» to indicate a discrete unit of administration, such as one tablet. This was done to facilitate separation of analysis into overall risks of polypharmacy compared to total burden of oral administration (which might have individual and nursing staff impact). For the purpose of this analysis we considered sodium and potassium ordered for the treatment of electrolyte disorders as medications rather than dietary supplements. Polypharmacy was defined as the regular concurrent prescription of five or more different types of agents. Estimated life expectancy was calculated from clinical information using methods published by Mitchell et al (12). Information was reviewed by a team with geriatric expertise including a primary care physician, pharmacist, geriatric psychiatrist, and two faculty members from the College of Pharmacy and Nutrition. Consensus decisions were made when possible about the likely benefits, adverse effects and appropriateness of each agent prescribed to individual residents.

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Analysis

The analysis examined the total number and type of agents prescribed regularly as well as the total oral discrete unit intake counts (units included tablets, liquids or powders) resulting from these prescriptions. Agents not administered orally (such as intramuscular vitamin B12) were included in the types of agents prescribed but did not contribute to the oral intake unit count. Agents administered less than daily were prorated (i.e. a weekly administration schedule resulted in a daily agent fraction of 1/7 units). Sex differences and differences between supplement and non-supplement users were explored. The data were tabulated with means (± SD) and ranges. One-tailed t-tests were performed to examine sex differences in the total number of discrete units of oral agents prescribed as well as the oral medication burden. Statistical significance was set at $P \leq 0.05$. We also examined the rate and profile of prescription of different types of vitamin and mineral supplements. Frequencies were explored by sex, supplement type and supplement users' status.

We investigated the potentially inappropriate prescription of calcium supplements by exploring use in the absence of osteoporosis or previous fractures. Concurrent prescription of calcium and iron supplements (which both have constipating effects) with laxatives/stool softeners were correlated with individual reports of constipation. We also assessed the concomitant prescription of calcium supplements with thyroid hormone replacement and with diuretics.

Results

Twenty-nine participants were included in the study, 62% female and 38% male with a mean age of 80.4 years ranging

Table 1
Medication and dietary supplement prescription in LTC participants with advanced dementia

	Female (n = 18)	Male (n = 11)	Total (n = 29)	Supplement users (n = 19)
Mean age (±SD)	83.6 (±6.3)	75.3 (±8.5)	80.4 (±8.2)	80.7 (±9.0)
Age range	72 – 97	64 – 88	64 – 97	64 – 97
Percentage likelihood of being deceased in 6 months	30.8 (±8.8)	28.3 (±10.2)	29.9 (±9.3)	30.4 (±8.7)
Number meeting criteria for polypharmacy (≥ 5 agents)	12	11	23	17
Mean total number (±SD) of agents prescribed regularly	6.0 (±3.6)	7.5 (±2.3)	6.6 (±3.2)	7.6 (±3.0)
Range in total number of agents prescribed regularly	0 – 13	5 – 12	0 – 13	3 – 13
Mean total number (±SD) of medication types prescribed regularly	4.7 (±3.1)	6.2 (±2.2)	5.3 (±2.9)	5.6 (±2.9)
Range in total number of medication types prescribed regularly	0 – 11	4 – 10	0 – 11	1 – 11
Mean total number (±SD) of supplement types prescribed regularly	1.3 (±1.1)	1.3 (±1.2)	1.3 (±1.1)	1.9 (±0.7)
Range in total number of supplement types prescribed regularly	0 – 3	0 – 3	0 – 3	1 – 3
Multivitamins	5	3	8	8
All prescriptions which include vitamin D	12	7	19	19
All prescriptions which include calcium	8	4	12	12
Vitamin D product (1000 - 2000 IU)	11	6	17	17
Calcium product (250 - 500mg)	4	2	6	6
Calcium + vitamin D product	2	0	2	2
Thiamin (100mg)	0	1	1	1
Vitamin B12	1	1	2	2
Iron (120mg)	0	1	1	1
Mean daily number (±SD) of discrete units of oral agents	8.1 (±6.2)	12.0 (±3.8)	9.6 (±5.7)	11.0 (±5.2)
Range in daily number of discrete units of oral agents	0 – 23.5	5 – 18	0 – 23.5	4 – 23.5
Mean daily number (±SD) of discrete units of oral medications	6.7 (±5.6)	10.6 (±4.1)	8.2 (±5.4)	8.9 (±5.1)
Range in daily number of discrete units of oral medications	0 – 20.5	5 – 18	0 – 20.5	1 – 20.5
Mean daily number (±SD) of discrete units of oral dietary supplements	1.4 (±1.2)	1.4 (±1.6)	1.4 (±1.3)	2.1 (±1.0)
Range in daily number of discrete units of oral dietary supplements	0 – 3	0 – 5	0 – 5	1 – 5

from 64 to 97 (Table 1). Male participants were younger than females (75.3 ± 8.5 compared to 83.6 ± 6.3 years). Because of our selection of participants in the latest stages of dementia, overall functional impairment was marked. Oral intake or swallowing problems in all except one of the participants necessitated pureed/minced diets and crushing of orally administered agents (generally mixed into food). Seventeen participants had problems with agitation and ten were aggressive. Fourteen participants had resistance and/or aggression specifically related to medication or supplement administration.

The mean total daily number of regularly prescribed agents was 6.6 (±3.2) with a range of 0-13. Twenty-three participants met our definition of polypharmacy. Supplements included multivitamins, vitamin D, calcium, thiamin, vitamin B12, and iron. Nineteen participants were taking supplements and 13 were taking more than 1 supplement. Some agents were included in more than one formulation. Almost a third of supplement users (n = 6) were taking ≥ 3 supplements per day. All supplement users took vitamin D (n = 19) while 12 took calcium. Two participants received vitamin B12 separately, one intramuscularly and one orally.

The mean daily number of orally administered units of medication was 8.2 (±5.4) with a range of 0-20.5, and the corresponding rate for supplements was 1.4 (±1.3) with a range of 0 to 5. The combined oral burden (discrete units of oral medications and supplements) was 9.6 (±5.7) mean daily units ranging from 0 to 23.5. Males were prescribed significantly more daily oral units of medications than females (10.6 vs 6.7 units, P = 0.02), and had a higher total daily oral combined burden (12.0 vs 8.1, P = 0.03).

Calcium prescription and risk of adverse effects and interactions

Seven of 12 participants prescribed calcium and 7 of 17 not prescribed calcium had a history of osteoporosis and/or fractures (Table 2). More participants prescribed calcium used laxatives or stool softeners in comparison to those not prescribed calcium (7 of 12 compared to 6 of 17). Two participants prescribed calcium and 1 participant not prescribed calcium had difficulty with constipation despite being prescribed laxatives/stool softeners. Only one person had concurrent prescription of iron and calcium supplements. Three of twelve participants prescribed calcium (all female) were also prescribed diuretics and of these, one was prescribed two different types of diuretics. One participant prescribed calcium was also on thyroid hormone replacement.

Discussion

Our results from this small study were consistent with those of Vetrano et al (1) who found polypharmacy in more than 60% of nursing home residents with advanced cognitive impairment. Result were also consistent with results of our previous study (10) in which we demonstrated concurrent prescription of supplements and medications in all older adults in LTC.

There were a sizable number of participants receiving 3-5 supplements in addition to other medications. We worry particularly about the prescription of calcium in the absence of osteoporosis or fractures because of potential adverse effects. We also suspect that the high oral agent intake burden in our population was partially responsible for agitation, aggression and increased use of psychotropic medications, as nursing staff frequently identifies resistiveness during pill administration as

Table 2
Calcium prescription in relation to osteoporosis, fractures and overall prescriptions

	Participants prescribed calcium			**Participants not prescribed calcium**		
	Female (n = 8)	**Male (n = 4)**	**Total (n = 12)**	**Female (n = 10)**	**Male (n = 7)**	**Total (n = 17)**
History of osteoporosis	5	1	6	3	1	4
History of fracture	2	1	3	6	0	6
History of osteoporosis and/or fracture	5	2	7	6	1	7
Prescribed laxatives /stool softener	4	3	7	4	2	6
Current constipation	1	1	2	1	0	1
Prescribed iron supplement	0	1	1	0	0	0
Prescribed thyroid hormone replacement treatment	1	0	1	4	0	4
Prescribed thiazide diuretics	1	0	1	1	0	1
Prescribed loop diuretics	2	0	2	0	2	2
Prescribed potassium-sparing diuretics	1	0	1	0	0	0
Mean daily number (±SD) of discrete units of oral agents	11.4 (±7.1)	12.5 (±4.1)	11.8 (±6.1)	5.4 (±3.8)	11.7 (±3.9)	8.0 (±4.9)
Range in daily number of discrete units of oral agents	4 – 23.5	8 – 16	4 – 23.5	0 – 11	5 – 18	0 – 18

a major concern. In spite of recent recommendations about the use of vitamin D in LTC as an important treatment for falls and fracture prevention (13, 14), only 17 of 29 (58%) participants were prescribed vitamin D as a separate supplement and 19 of 29 (65%) were prescribed vitamin D when all supplement sources were included.

Although this study was enriched by including detailed individual clinical information, the small sample size limited the use of statistical analysis and our ability to correlate oral agent burden with other outcomes. We also only assessed regularly prescribed medications, which would have missed some agents of importance. Lastly, if we overestimated the life expectancy of the residents, many medications with long time to benefit may have been even less useful.

Because of the increasing frailty of seniors in LTC, it is important to better understand the benefits and adverse effects of supplement use. Although general criteria exist to aid clinicians in making appropriate prescribing choices, clinical decision-making regarding supplementation is often complex and dependent on individual clinical context. We therefore believe that skilled professionals should be more available to LTC staff to help in this process. More knowledge also needs to be developed, particularly regarding the use of medications and supplements in the latest stages of dementia. Many interventions require a long time to benefit recipients (see Lee et al (15)) so more immediate adverse outcomes might not be warranted in those with short anticipated life expectancies.

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Ethical Standards: Researchers complied with research standards mandated by the University of Saskatchewan Responsible Conduct of Research policy.

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