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Original Article

Evaluation of a community-based memory clinic in collaboration with local hospitals to support patients with memory decline

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الملخص

أهداف البحث: تقيم هذه الدراسة دور فريق رعاية صحية متخصص ومتعدد التخصصات، بما في ذلك صيدلي، في عيادة الذاكرة للمرضى الذين يعانون من ضعف إدراكي خفيف والخرف.

طرق البحث: حللت الدراسة مجموعة بيانات ١٠٢ مريضا من عيادة الشيخوخة والذاكرة في منطقة ريفية في أونتاريو، كندا. تمت مراجعة تاريخ حالة المرضى قبل أسبوع من يوم العيادة وأجرى الصيدلي مطابقات للأدوية. خلال يوم العيادة، تم إجراء الاختبارات المعرفية ومناقشة النتائج مع الفريق لوضع خطة رعاية جنبا إلى جنب مع المتابعة في غضون ٣ أو ٦ أو ١٢ شهرا.

النتائج: كان لدى معظم المرضى في المتوسط ٥ وصفات طبية واثنين من الأدوية غير الموصوفة، وبدأ ٥٧٪ من المرضى في تناول الأدوية المتعلقة بالذاكرة. تم إيقاف وصف ٧١٢ دواء، ٥١٠ دواء بناء على وصفة طبية و٢٠٢ دواء بدون وصفة طبية. من بين ٧١٢ دواء موصوفا، تم إيقاف ٣٧٤ بدون بدائل علاجية، وتم تخفيض جرعة ٢٠٢ وتم تحويل ١٣٦ دواء إلى بديل أكثر أمانا. أظهر إجمالي ٤٣ مريضا تحسنا في أداء أنشطة الحياة اليومية بعد ٣ و٦ أشهر وأظهر ٦٨ مريضا تحسنا بعد ١٢ شهرا.

الاستنتاجات: تسلط هذه الدراسة الضوء على أهمية اتباع نهج متعدد التخصصات في معالجة مشاكل العلاج الدوائي، وتحسين الأدوية، وتقليل الوصف في مرضى الخرف. إن وجود صيدلي في الفريق متعدد التخصصات يُمكّن من تحسين تأثير الدواء ويؤدي إلى نتائج أفضل للمرضى. وهذا يوضح قيمة الخبرة المتخصصة في إدارة الأدوية لمرضى الخرف.

الكلمات المفتاحية: الخرف؛ إيقاف صرف الدواء؛ عيادة الذاكرة؛ ضعف إدراكي معتدل؛ نشاطات الحياة اليومية

Abstract

Objective: This study evaluates the role of a specialised and multidisciplinary healthcare team, including a pharmacist, in providing medication management for patients with mild cognitive impairment (MCI) and dementia, in a memory clinic.

Methods: The study analysed the dataset of 102 patients of a geriatric and memory clinic in a rural area of Ontario, Canada. The case histories of the patients were reviewed a week before the clinic day and a pharmacist performed medication reconciliations. During the clinic day, cognitive tests were conducted and outcomes were discussed with the team, to create a care plan and schedule a follow-up within 3, 6 or 12 months.

Results: Most patients had an average of 5 prescriptions and 2 non-prescription medications deprescribed, and 57% of patients were started on memory-related medications. A total of 712 medications (p-value 0.001) were deprescribed, with 510 prescriptions and 202 non-prescription items. Out of the 712 deprescribed drugs, 374 were discontinued with no therapeutic substitutions, 202 were reduced in dosage and 136 were switched to a safer alternative. A total of 43 patients showed improved Activities of Daily Living (ADL) performance after 3 and

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6 months and 68 patients showed improvement after 12 months.

Conclusion: This study highlights the importance of a multidisciplinary approach in addressing drug-therapy problems, medication optimisation, and deprescription in patients with dementia. The presence of a pharmacist in the multidisciplinary team enables impactful medication optimisation and leads to improved patient outcomes. This demonstrates the value of specialised expertise in medication management for patients with dementia.

Keywords: Activities of daily living; Dementia; Deprescribing; Memory clinic; Mild cognitive impairment

Introduction

Dementia is a syndrome that affects many facets of cognitive function including memory, learning, and thinking. Alzheimer's disease (AD), the most common cause of dementia, is a neurodegenerative brain disease primarily seen in the elderly population.[1] As the sixth leading cause of death in the United States, AD is associated with significant disability and morbidity. The average lifetime cost of care for patients with dementia was $357,297 in 2019.[2] The neurological changes leading to AD start about 20 years before symptoms are observed.[2] The pathology and aetiology of AD lack clarity. However, the accumulation of beta-amyloid plaques outside the neurons and the presence of tau tangles inside neurons have been reported in AD patients, ultimately hindering neuronal communication and reducing cognitive function..[2]

Diagnosis of AD typically involves collecting comprehensive patient history, including changes in behaviour and cognition, psychiatric history, medication use, caregivers' and family members' perspective of patient's behaviour, cognitive testing, and neurological and physical examinations. In some circumstances, a positron emission tomography (PET) scan of the brain and a lumbar puncture to find beta-amyloid plaques and tau tangles in cerebrospinal fluid are also used for diagnosis.[2]

Cognitive changes may be a result of age, genetics, sex, medications, comorbidities, diet, physical activity, smoking, and alcohol use. Risk factors such as medications and social history are modifiable, however, some of the damage to brain function might have accumulated over the patient's lifetime and cannot be reversed.[3] The temporary effect of drugs on attention, memory, language, and executive and cognitive functions are often reversible upon discontinuation or tapering of drugs. Therefore, many elderly patients are suitable candidates for deprescribing programmes. Deprescribing is the supervised process of tapering down doses or discontinuing drugs when the risk of side effects outweighs the benefits. The goal is to minimise harm while simultaneously improving patient health outcomes, by identifying potentially inappropriate medications (PIM). Different tools can be used for identifying PIMs, including The Beers Criteria, Screening Tool for Older People's Prescriptions (STOPP), and the Medication Appropriateness Index.[3,6–8] However, all manifestations of memory impairment are not signs of AD.[3] Other causes of memory impairment can be mild cognitive impairment, forgetfulness due to ageing, emotional problems, or different types of dementia. Mild cognitive impairment (MCI) is seen in 15–20% of adults aged above 65 years. MCI is considered an early sign of dementia, although not all patients with MCI develop dementia later in life.[9]

There are currently no pharmacological treatments for altering the progression of dementia or its damage to the neurons. The U.S. Food and Drug Administration (FDA) has approved treatments that temporarily improve cognitive symptoms through altering the brain neurotransmitters (listed in Table 1); however, the extent and the duration of efficacy are limited.[2,10,13,14]

Cholinesterase inhibitors (ChEIs) are the mainstay of treatment for cognitive and functional symptoms of AD and may help manage behavioural and psychological symptoms in mild to moderate dementia. There is no evidence for the superiority of one agent; however, donepezil is usually better tolerated by patients compared to both galantamine and rivastigmine. The DOMINO-AD (Donepezil and Memantine in Moderate to Severe Alzheimer's Disease) trial in patients with moderate to severe AD taking donepezil showed there was a benefit in continuing donepezil or starting memantine if the former was discontinued. Memantine has demonstrated a small clinical benefit on cognition, activities of daily living (ADLs), behaviour, and mood. It is given with donepezil; however, there is a lack of evidence on the mechanism of their synergistic activity. For those who cannot tolerate ChEIs, memantine monotherapy is considered. The cost of these drugs is covered under Ontario's public drug plan, under the condition that the patient's cognitive test results meet a certain coverage criteria. However, cognitive test results are poor indicators of memory function[10]

Although the cost-effectiveness of these agents has historically been a barrier to treatment, this has become less of an issue with the introduction of lower-cost generic alternatives and the emergence of better efficacy data.[11] There is no cost-effective evidence on the combination of donepezil and memantine.[12]

To address gaps in care for those living with memory impairments, such as dementia in an ageing population, Dr.Lee and her team from Ontario created MINT Memory Clinics. The main focus of memory clinics was to create an environment that facilitates specialised and multidisciplinary team-based approaches to address patients' concerns and promote accessibility to equitable healthcare, especially for those who may be underserved due to physical location or those who lack a primary physician. As of today, MINT (Multi-specialty Interprofessional Team-Based) Memory Clinics have established 110 different clinics across Ontario, Canada, many of which are in rural or remote communities. Of these, Nation River Memory Clinic, which serves patients in a rural area of the Ottawa district, is the focus in this study. The clinic runs for 8 h each month, focusing on four patients at a time to provide a patient-centred service that empowers them through education on medication efficacy and safety. Furthermore, the clinic team assesses the presence of potentially inappropriate medications that may be contributing to memory loss, cognitive impairment, and increased risk of falls to the elderly. Patients can contact team members for any concerns outside of clinic days, which reduces the difficulties that patients in remote areas usually face when accessing care. Memory clinics aim to stop the progression of memory decline by addressing divers contributing factors, such as medications, living environment, and comorbidities.

The clinic's primary goal is to provide quality care that helps patients cope with their medical conditions and increase independence in performing functional activities. By creating an environment that facilitates interprofessional care, a multidisciplinary approach can be taken to create a care plan for patients to manage geriatric syndromes, such as cognitive decline. Other activities include preventing harm to patients or the public on the roads, by informing the Ministry of Transportation about the patient's condition, or collaborating with other institutions such as long-term care homes, hospitals, or other memory clinics, to ensure continuity of care.

The clinic's multidisciplinary team includes two physicians, two nurses, a pharmacist, a medical resident, an Alzheimer's specialist, and a social worker, who are trained in geriatric care. The clinic accepts patients with impaired memory function referred by their family physician, and the hospital also provides financial and medical resources and referrals. Team members meet a week before the clinic day to review patient case and assess their medical history, medications, lab results, cognitive assessments, and medical imaging and radiology results. Following patient examination, the clinic team meets again during the clinic day to create a care plan.

The primary objective of this study is to evaluate the role of a specialised and multidisciplinary healthcare team in a memory clinic and their contributions in providing care and managing patients suffering from MCI and dementia. There is a special focus on the role of the pharmacist and the medication management contributions, such as deprescribing. Using the results of the study, we hope to improve the quality of care provided to this patient population, decrease the progression of dementia, and support the families involved in the process.

Materials and Methods

Memory clinic data collection

This study obtained the dataset for the geriatric and memory clinic in a rural area in Ontario, Canada, from 102 patients between January 2017 to January 2019. The clinic runs once a month for 8 h, in which four patients are examined and cared for. On two occasions, an additional patient was added to the clinic day due to an urgent impromptu physician referral. Patient cases are reviewed a week before the clinic day and discussed among the multidisciplinary team. We excluded alcohol dementia, post-anaesthetic memory impairment, post-traumatic memory impairment, and unclear diagnoses. We included patients with MCI and specific dementia subtypes including frontotemporal lobar dementia (FTLD), Parkinson's disease dementia (PDD), mixed dementia (MD), vascular dementia (VD), AD, and Lewy body dementia (LBD). The data were analysed using Stata Data Analysis software. T-test was used to calculate the p-values and confidence intervals.

Patient assessment

During the patient's visit, further testing and examinations are performed to make accurate assessments and plans. After conducting the tests and speaking to the patient and caregivers, the team of healthcare professionals meets to discuss each case. By the end of the appointment, the patient receives a comprehensive care plan and education on medication management, ADL management, available resources, and follow-up plans. The care plan is communicated to the patient's primary care provider, who will manage and monitor the patient's medication changes and inform the original prescriber about any discontinued medications. Additionally, the patient or caregiver is instructed to self-monitor for any adverse effects or changes in their comorbid condition during the deprescribing process and to report any changes to us or their primary care provider. The patient may receive instructions on avoiding operating heavy machinery and the start of blister packaging to improve their compliance and adherence.

Cognitive function testing

The relevant laboratory and radiological results are obtained in advance, and a thorough patient history is taken during the appointment. Patients fill the Functional Activities Questionnaire (FAQ)[15] and Lawton and Brody's Activity of Daily Living[16] to determine the impact of

cognitive impairment in completing daily tasks. The patients' cognitive functions are assessed using different tools in the following order: Brain Maps, Montreal Cognitive Assessment (MoCA), Pentagons, Trail Testing and CLOX (clock drawing test), Animal list generation, Executive Function Test, Cornell Scale for Depression in Dementia, gait and neurological assessment. Other miscellaneous tests that may be conducted are MoCA version 2 and version 3, Frontal Behavioural Inventory (FBI), gait quality, praxis, and physical exam. The descriptions of these tests are included in Table 2.[15,16,18–20] The test findings are documented, interpreted, reviewed by the entire team and shared with the patient, caregiver, and primary physician.

Role of pharmacists in medication management

The week before the memory clinic, the pharmacist looks into multiple sources of information to collect a Best Possible Medication History (BPMH) which includes obtaining community pharmacy records, looking up electronic health records, calling family members, and contacting the family physician's office. The pharmacist will then perform medication reconciliation and verify the appropriateness of therapy through assessing doses based on liver and kidney function, indication, and safety. Pharmacists consider geriatric syndromes, such as frailty, dehydration, and confusion, as well as assess potential areas of deprescribing, to improve cognition and reduce undesired side effects. The pharmacist may also choose to reach out to specialists for consultation.

When the patient visits the clinic, the pharmacist reviews their medications with the patient, family members, and caregivers to make sure there are no discrepancies. The pharmacist must also verify if the patient is taking any herbals, supplements, vitamins, and over-the-counter medications. During their session, the pharmacist assesses the patient's medication adherence and addresses any side effects or medication-related questions. Patients are also educated on five questions to ask their physicians about their medications, which are summarised in a handout. These questions address changes to the patient's medication, proper use of drugs, monitoring for efficacy, drug side effects and followup procedures.[17] Through these questions, patients can become more involved in their care and gain a better understanding of their medication regimen. By the end of the session, the pharmacist contacts the patient's community pharmacy to discuss ways to improve patient medication compliance, such as the preparation of medication in blister packages.

Follow-up plan

Based on the outcome of the first visit, the patient is followed up in 3, 6, or 12 months. Depending on the patient case, they may also be referred to a specialist. The social worker plays a critical role in home or nursing home safety assessment as well as offering resources and support groups. During the follow-up, the memory clinic team typically monitors the progression of diseases, any improvement of symptoms, adherence to medications, and side effect management. Memory enhancers may be discontinued if the risks outweigh the benefits and if there is no improvement following a year of administration. Other follow-up assessments include ensuring the patient is demonstrating good compliance with medications, as well as ensuring that patients have not been driving or operating heavy machinery against the physician's advice.

Results

Patient demographics

Based on the data in Table 3, the patients' median age was 67, and almost all were above 65 years. Most of the patients were married males, aged 65–74 years. About 86% were retired and about 90% did not have a university or college degree. The majority of patients had vascular, frontotemporal, and Alzheimer's dementia, together forming more than 80% of the cases. Patients with MCI formed a minority of the cases, with only 5 out of 102 cases. Most patients had an average of seven different comorbid medical conditions (see Figures 1–6).

Pharmacy services at the memory clinic

Most patients had an average of 5 prescription and 2 non-prescription medications deprescribed, and 57% of the patients were started on memory-related medications. A total of 712 medications (p-value of 0.001) were deprescribed, with 510 prescription and 202 non-prescription items. Out of the 712 deprescribed drugs, 374 were discontinued with no therapeutic substitution, 202 were reduced in dosage and 136 were switched to a safer alternative. Antidepressants and opioids were the most common drugs to be deprescribed, forming 31% and 18% of prescription medication deprescribing, respectively. These were followed by benzodiazepines and anticholinergics. The data includes drugs that were reduced in dose, switched to a safer alternative, or discontinued altogether with no alternative given. 58 patients were started on memory enhancers, and 13 were referred to a specialist.

Follow-up outcomes

A total of 43 patients showed improved ADL performance after 3 and 6 months and 68 patients showed improvement after 12 months. At a three-month follow-up, 32 patients were experiencing common side effects from memory enhancers such as nausea, vomiting, and headaches. This number decreased to 26 and 14 after six and 12 months, respectively. In the first three months, only five patients had their memory enhancers discontinued due to intolerance and seven patients had them discontinued after a year of no

Table 1: FDA-approved drugs for dementia.

Drug Name	Mechanism of Action[13]	Dose[10]	Onset[10]	Side effects[10]	Cost[a,10]	Place in Therapy[14]
Memantine	Non-competitive NMDA antagonist	Initial: 5 mg daily Target: 10 mg twice daily	1–3 months	Dizziness, headache, confusion, nausea, and vomiting	$30-60	Alzheimer's dementia
Donepezil	Reversible non-competitive acetylcholinesterase inhibitor	Initial: 5 mg daily Target: 10 mg daily	12–24 weeks	**Nausea and vomiting, bradycardia**, headache, anorexia, weight loss, diarrhoea	<$30	Lewy Body, Parkinson's, Alzheimer's dementia, mixed vascular dementia (VD) and AD
Galantamine	Reversible, competitive acetylcholinesterase inhibitor and modulator of nicotinic acetylcholine receptor	Initial: 8 mg daily Target: 16–24 mg daily	1–3 months	**Nausea and vomiting, bradycardia**, headache, anorexia, weight loss, diarrhoea	Oral $30-60 Transdermal patch $90-120	Alzheimer's dementia, mixed VD and AD, Mild to moderate Lewy body dementia if rivastigmine and donepezil are not tolerated
Rivastigmine	Acetylcholinesterase inhibitor and butyl cholinesterase inhibitor	Initial: 1.5 mg twice daily Target: 6–12 mg daily divided in 2–3 doses	1–3 months	**Nausea and vomiting, bradycardia**, headache, anorexia, weight loss, diarrhoea	$30-60	Lewy Body, Parkinson's, Alzheimer's dementia, mixed VD and AD

[a] Cost of a 30-day supply of target or usual dose in Canadian dollars.

Table 2: Examination processes for patients, parameters tested, and analysis of the test results.

Test Name	Parameters Assessed	Result Analysis
Activities of Daily Living (ADLs)[16]	1. Basic (Dressing, Eating, Ambulation, Toileting, Hygiene) 2. Instrumental (Shopping, Housework/hobby, Accounting/banking/bills/taxes, Food preparation, telephone/tools/transportation)	Observing changes from a normal baseline (yes/no)
Functional Activities Questionnaire (FAQ)[15]	3. Writing cheques and paying bills 4. Business affairs and tax assembling 5. Shopping for clothes and groceries 6. Playing games or working on a hobby 7. Heating water and using stove 8. Preparing meals 9. Keeping track of current events 10. Paying attention to and understanding movies, TV shows, books 11. Remembering appointments and family occasions 12. Travelling outside the neighbourhood, taking buses	Total score out of 30
Executive Function and Praxis	1. Months of the year backwards 2. Go-no-go 3. Luria 4. Pantomime tool use 5. Gestures 6. Bucco facial	Impaired vs intact and scoring using the number of errors
Cornell Scale for Depression in Dementia[18]	7. Mood-related signs 8. Behavioural disturbances 9. Physical signs 10. Cyclic functions 11. Ideational disturbances	A score of >10/38 is probable and a score of >18/38 indicates definite major depressive episode
Montreal Cognitive Assessment (MoCA)[19]	1. Visuospatial/executive 2. Naming 3. Memory 4. Attention 5. Language 6. Abstraction 7. Delayed recall 8. Orientation	The average MoCA score for MCI is 22/30 (range 19–25) and for Mild AD is 16/30 (11–21). The cut-off to distinguish between MCI and AD is 18/30

Table 2 (*continued*)

Test Name	Parameters Assessed	Result Analysis
Animal list generation	1. 15 sec 2. 30 sec 3. 45 sec 4. 60 sec	Count the number recalled in these timeframes. Less than 11 to 13 is below normal limits
Trail A and B	5. Record the time it takes for the patient to connect numbered dots/circles	Impaired vs intact
CLOX 1 and 2	6. Patient to draw a clock and show 1:45 1. Assess for number ordering, spacing, hour and minute hands, and correct orientation of hands	Impaired vs intact
Frontal Behavioural Inventory (FBI)[20]	7. Negative behaviour (Apathy, aspontaneity, indifference, inflexibility, disorganisation, inattention, personal neglect, loss of insight, logopenic, aphasia, comprehension deficit, apraxia) 8. Disinhibition (preservation, hoarding, inappropriateness, excessive jocularity, poor judgement, restlessness, irritability, aggression, hyperorality, hypersexuality, utilisation behaviour, incontinence)	>30/72 is frontotemporal dementia
Gait Assessment	9. Step length 10. Step width 11. Step height 12. Hip/pelvis 13. Symmetry	Used to assess for ataxic, parkinsonian, hemiparetic, frontal, neuropathic or spastic gaits
Neurological assessment	14. Parkinsonism 15. Asterixis 16. Cerebellar findings 17. Ideomotor apraxia 18. Rhomberg	Refer cognitively- impaired patients to specialist if unexplained neurological findings or Parkinsonism

Table 3: Patient characteristics.

Variable	(n = 102)	*p*-value
Mean age (years)	**67**	**0.909**
Age category		
54 years and below	0	0.000
55–64 years	1	0.748
65–74 years	59	0.500
75 years and above	42	
Gender		
Male	63	0.090
Female	39	0.251
Marital status		
Married	77	0.900
Divorced/widowed	11	0.000
Single	14	0.251
Employment status		
Employed/Self-employed	13	0.090
Unemployed	2	0.500
Retired	87	0.909
Education		
Primary school	34	0.251
Lower secondary school	6	0.748
Upper secondary school	50	0.041
Tertiary education	12	0.999
Average number of comorbidities per patient	7	1.120

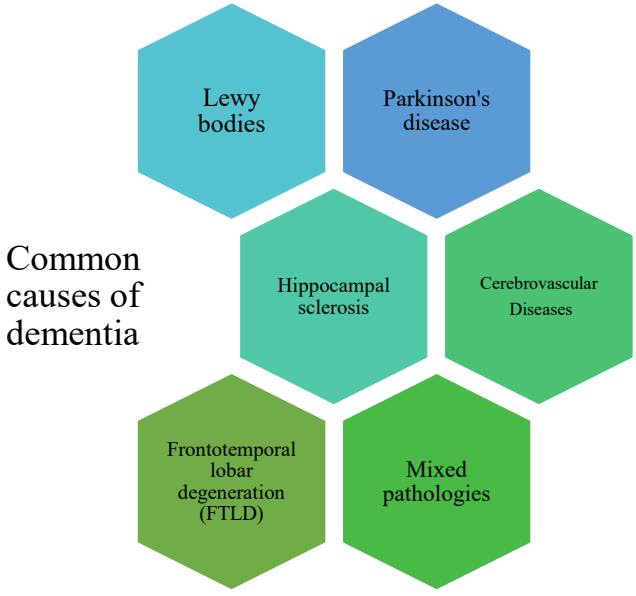

Figure 1: Common causes of dementia.[2]

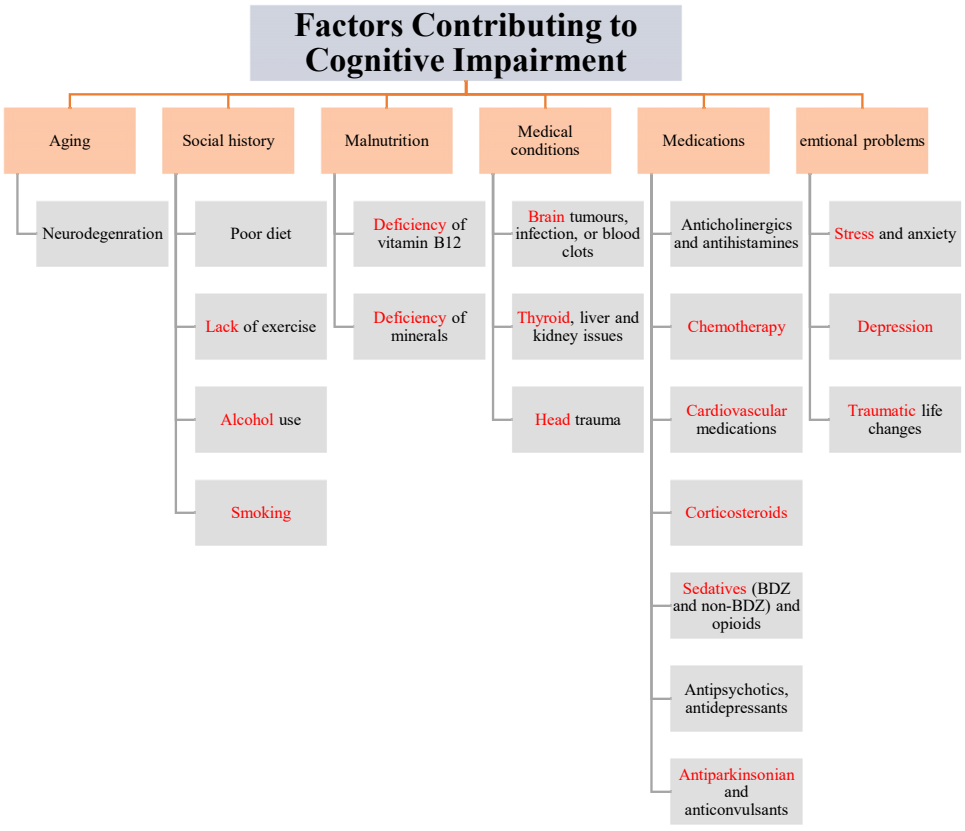

Figure 2: Risk factors associated with cognitive impairment.[2–5]

Figure 3: Alzheimer's disease neurodegeneration continuum.[2]

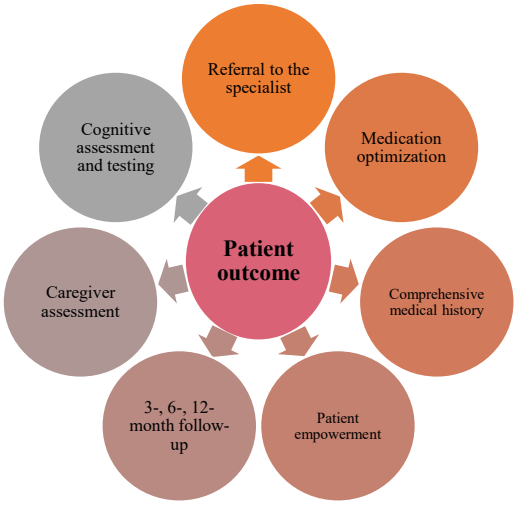

Figure 4: Services offered at the memory clinic that can positively impact dementia patients' health outcomes.

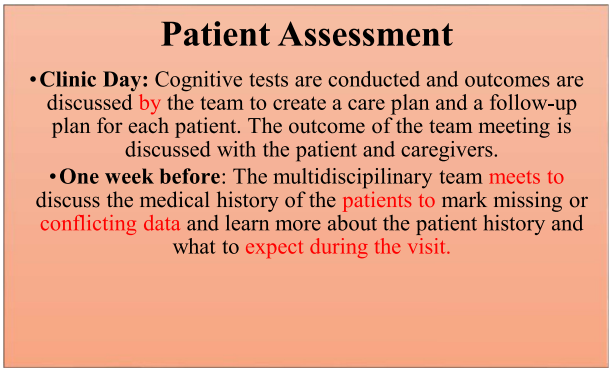

Figure 5: Steps involved in patient assessment at the memory clinic.

improvement in dementia symptoms. About 80% of the patients were adherent to their blister packs in the first 3 and 6 months post-visit, but this number decreased to 68% by 12 months.

Figure 6: Summary of the steps and professionals involved in patient referral to the clinic, patient and caregiver assessments, care plan generation, patient counselling, and follow-up.[21]

Table 4: Classification of diagnosis.

Diagnosis	N = 102	Average age	*p*-value	95% confidence interval
MCI	5	68	0.6611	0.49-0.86
FTLD	22	78	0.8206	0.71-0.84
VD	35	82	0.7753	0.76-0.87
PDD	5	73	0.6611	0.54-0.91
LBD	8	68	0.7054	0.55-0.80
Mixed dementia	8	65	0.5000	0.52-0.77
AD	19	78	0.8026	0.70-0.85

Table 5: Medication changes and other services performed at the clinic.

Parameter	Value	*p*-value	95% confidence interval
Total number of drugs deprescribed	712	0.001	0.53-0.64
Total number of discontinued drugs	374	0.002	0.65-0.78
Total number of drugs switched to a safer alternative	136	0.054	0.92-1.1
Total number of drugs reduced in dose	202	0.005	0.32-0.40
Total number of patients prescribed memory enhancers	58	0.007	0.50-0.64
Total number of patients referred to a specialist	13	0.041	0.55-0. 60

Table 6: Medication changes per patient.

Parameter	(n = 102)	*p*-value	95% confidence interval
Average number of prescription drugs deprescribed per patient	5	0.009	0.20-0.79
Average number of non-prescription drugs deprescribed per patient	2	0.002	0.94-1.49
Average number of medications deprescribed per patient	7	0.004	0.21-0.39
Average number of medications introduced as safer substitute per patient	2	0.251	0.94-1.49

Table 7: Medication deprescribed sorted by pharmacological categories.

Drug Class	Total deprescribed	Dose reduced	Discontinued	Safer alternative chosen	*p*-value
Antidepressants	154	49	81	24	0.079
Antipsychotics	54	11	29	14	0.165
Anticholinergics	72	3	53	16	0.011
Antihistamines	54	8	31	15	0.120
Anti-emetics	14	0	4	10	1.030
Benzodiazepines/Z-drugs	69	51	6	12	0.010
Opioids	93	24	39	30	0.050
OTC/herbals	202	56	131	15	0.002

Table 8: Follow-up outcomes.

Parameter	3 months	6 months	1 year
Total number of patients at follow-ups	45	50	70
Total number of patients with positive experience	45 (100%)	50 (100%)	55 (79%)
Total number of patients with improved physical abilities and independence	43 (96%)	43 (86%)	67 (96%)
Total number of patients experiencing common side-effects from memory enhancers	32 (71%)	24 (48%)	14 (20%)
50. Nausea and vomiting	26 (58%)	20 (40%)	13 (19%)
51. Headache	5 (11.1%)	3 (6%)	0 (0%)
52. Weight loss	1 (2.2%)	1 (2%)	1 (1.4%)
Number of patients who stopped memory enhancers due to intolerability	5 (11.1%)	0 (0%)	0 (0%)
Number of patients being deprescribed memory enhancers due to lack of efficacy	0 (0%)	0 (0%)	7 (10%)

Table 9: Summary of additional literature.

Author	Objectives	Design	Sample	Country	Summary of Results
Meeuwsen et al., 2012[39]	Compare the effectiveness of the treatment and coordination of care following the dementia diagnosis in memory clinics compared to general practitioners.	Randomised controlled trial	Patients newly diagnosed with mild to moderate dementia living in the community (n = 175)	Netherlands	No evidence demonstrating that the treatment and coordination of care in memory clinics is superior to general practitioners following dementia diagnosis.
Gustafsson et al., 2017[40]	Assess the effect of comprehensive medication reviews performed by pharmacists that are part of a multidisciplinary team on drug-related hospital readmission rates among patients with dementia or cognitive impairment.	Randomised controlled trial	Patients ≥65 years with dementia or cognitive impairment admitted to three wards at two hospitals in Sweden (n = 460)	Sweden	Comprehensive medication reviews conducted by pharmacists significantly reduced the risk of drug-related hospital readmissions (HR = 0.49, 95% CI: 0.27−0.90).

Table 9 (*continued*)

Author	Objectives	Design	Sample	Country	Summary of Results
Elliott et al., 2010[41]	Measure the occurrence of drug-related problems (DRPs) in aged care and memory clinic patients and assess the potential role of a pharmacists in the resolution of these problems.	Interviews, DRPs rated by independent expert panel using validated criteria	Aged care and memory clinic patients at a tertiary care hospital (n = 46)	Australia	113 total DRPs were identified by the pharmacist. Of the, 33% were not found in the medical record and 35% were rated by the expert panel as high or extreme risk. Pharmacist involvement resulted in more comprehensive medication histories and an increased rate of identifying unresolved DRPs.
Cross et al., 2017[42]	Assess the association between PIM and anticholinergic cognitive burden to mortality in older patients attending memory clinics	Cross-sectional and longitudinal analysis	Patients living in the community attending nine memory clinics with mild cognitive impairment or dementia (n = 964)	Australia	Potentially inappropriate medications (HR = 1.42, 95% CI: 1.12−1.80) and higher anticholinergic cognitive burden (HR = 1.18, 95% CI: 1.06−1.32) was associated with mortality.
Robertshaw et al., 2017[43]	Understand the views of caregivers, family members, and health care professionals on integrated health and social care for dementia.	Framework analysis of qualitative data	Online discussion posts of caregivers, family members and healthcare professionals in the "Bridging the Dementia Divide", online course at the University of Derby (n = 847)	UK	General consensus of online posts called for the holistic care of dementia patients that involves not only an interprofessional team of health and social care practitioners but family members and patients.
Mansfield et al., 2018[44]	Understand the perspective of primary care providers on the barriers in providing optimised care for dementia patients.	Review of quantitative studies	Studies rated as "moderate" or "strong" in terms of methodological quality based on rating criteria for quantitative studies (n = 16)	US	Three types of barriers were identified: Patient, provider, and system related. Barriers of note include: patient non-adherence to management plans, lack of time during consultations, and lack of support services.
Rousseau et al., 2019[45]	Measure the efficacy of a specialised, interprofessional care unit in reducing severe BPSD	Retrospective chart review	Patients with severe BPSD symptoms are a part of the specialised interprofessional care unit admitted at IUSMQ in Quebec City (n = 54)	Canada	Neuropsychiatric inventory (NPI) was significantly reduced at discharge compared to at admission (p = <0.001, 95% CI: −13.30 to −4.99)

(*continued on next page*)

Table 9 (*continued*)

Author	Objectives	Design	Sample	Country	Summary of Results
Galvin et al., 2014[46]	Review collaborative care models and provide evidence for improving dementia care	Review of collaborative care models and empirical evidence	Not applicable	US	Ratings comparing a collaborative team model to a single physician model were shown to be statistically different in many avenues, some of which include overall quality of care ($p = 0.014$), overall experience ($p = 0.001$) and desire to recommend clinic to others ($p = 0.009$).

Discussion

Data analysis

This study highlights some important differences observed in the demographics of dementia patients. Based on statistics by the Government of Canada, the prevalence of dementia is highest among female patients older than 85 years.[22] Most dementia patients attended university or college.[23] However, a majority of male patients aged between 65 and 74 years were retired and did not attend post-secondary school. Another demographic discrepancy is that the most common type of dementia in Canada is AD,[22] but this study indicates it as VD. The difference in these demographics of the patients in this clinic can be attributed to the clinic's geographic rural setting.

From the results, it is evident that the memory clinic had a significant effect on patients' drug regimens. A total of 712 drugs from the Beers Criteria of inappropriate medicines for the elderly were deprescribed from 2017 to 2019. On average, each patient had five prescription and two non-prescription medications deprescribed. More than half of the patients were found to be candidates for starting memory medications, and 13 were referred to specialists. Some patients had their memory enhancers discontinued after a while due to intolerance or inefficacy.

Significance of medication optimisation in memory clinics

An increasing number of Canadians are living with dementia, with currently half a million people with an official diagnosis. The mortality rate is about 75 per 1,000 patients aged between 65 and 69 years and 207 per 1000 patients for those above 85 years.[22] The numbers are expected to reach 937,000 cases, and the associated cost to be $16.6 billion in 2031. The cost of care for these patients currently is about $10.4 billion, which burdens the healthcare system and patient caregivers.[21,23] Given that more than half the patients are facing struggles regarding access to care and support,[23] investing in a care system that helps them increase their independence by improving their cognitive and functional abilities, will enhance their quality of life, life expectancy, and psychological well-being. The memory clinics in Canada aim to increase the primary care practice's capacity to assess and manage patients dealing with cognitive impairment.[24]

In this retrospective study, we demonstrate the services provided at a memory clinic in a rural area of Canada. The results of this study highlight the role of pharmacists in medication optimisation and improved patient outcomes. Their role in caring for dementia patients extends beyond the assessment of memory enhancer appropriateness. Pharmacists are medication experts who take a holistic approach in assessing medications and addressing safety concerns, adherence issues, cost burdens, and comorbidities.

The safety and tolerability of all the medications of the patient impact their cognitive and overall well-being. Most patients in this clinic were deprescribed an average of seven medications, highlighting the importance of medication management in this population. Polypharmacy, which is defined as being on five or more chronic medications, is common among the elderly and puts patients at a higher risk of memory impairment, as it is likely that they are on one or more problematic medications.[25,26] For instance, anticholinergics are associated with undesired side effects in the elderly including urinary retention, constipation, and dry mouth. At the neurological level, they cause confusion, memory impairment, delirium, and agitation. Other agents associated with falls and fractures in the elderly are also subjected to deprescribing.[27]

The Beers criteria for inappropriate drug use in the elderly describes the list of potential agents that contribute to poorer outcomes in geriatric patients.[4] Among the most common drug classes subjected to deprescribing in patients with dementia are the antipsychotics and antidepressants used for insomnia or behavioural and psychological symptoms

of dementia (BPSD). Antipsychotics are associated with serious side effects like extrapyramidal syndrome (EPS), anticholinergic side effects, and metabolic diseases. There is a lack of efficacy with these agents for BPSD, and therefore, antipsychotics should typically be deprescribed.[28] Other classes of drugs that can cause an altered mental state and are subjected to deprescribing are benzodiazepines and Z-drugs. These are mostly used for insomnia and agitation in the elderly population. They can cause sedation, delirium, and memory impairment. Benzodiazepines need to be tapered by prescribers in the elderly, regardless of the duration of use.[29] Opioids that are used for acute or chronic pain are highly sedative and cause brain fogginess and should be used at the lowest effective dose and for the shortest duration. Most doses can be tapered down to lower doses or be discontinued. Over-the-counter and self-care medications and herbals that may also be subjected to deprescribing include dextromethorphan, antihistamines, and Ginkgo Biloba. First-generation antihistamines and dextromethorphan with sedative and anticholinergic effects, which are used for cold and allergies or as a sleep aid (e.g. diphenhydramine), can cause cognition impairment.[26,29] Ginkgo Biloba extract is used by the elderly to help with symptoms of dementia; however, evidence regarding its clinical benefit is inconsistent. Therefore, based on a lack of evidence of efficacy and potential interaction with other drugs, Ginkgo can be deprescribed in this population.[9,30]

Drugs used in dementia are also candidates for deprescribing, if efficacy is not observed, cognition is significantly declined, or the patient is at end-stage AD after a year of taking the medication. Deprescribing memory medications is also recommended if the patient has other terminal illnesses, is not adherent to the medication, in cases of severe agitation, and potentially risky drug interactions. The dose is lowered every four weeks with close monitoring.[29,31]

Elderly patients with dementia have low adherence to medications.[32] The memory clinic's follow-ups aim to flag any non-compliance to the medication regimen by collaborating with community pharmacists and tracking blister packs. Adherence to medications is particularly important in improving patient health outcomes including cognitive function, psychological well-being, and behaviour. Most of the patients in this study remained relatively compliant to their blister packages in the first three and six months; however, adherence levels decreased after 12 months. The pharmacist at the clinic addresses adherence issues by following up with the patient, maintaining electronic health records and communicating with the caregiver, family physician and community pharmacy. More than half of the patient population was started on memory enhancers based on the assessment criteria. Some had to discontinue the drug due to intolerance in the first three months, and only a few stopped taking it after a year of no improvement. This means that most patients who were prescribed memory enhancers benefited from their use and with the majority not experiencing major side effects. Deprescription of memory enhancers was based on an algorithm that assessed symptom improvement in these patients after a year of taking the medication, side effect tolerance, and other comorbidities.[33]

Based on the survey results collected from the patients, 45 patients had a positive experience from their visit. They felt safer going home and felt empowered by the information provided to them about their medications.

Based on the follow-up assessment, 65% of the patients had improved physical abilities and independence in performance by the end of the year, emphasising the importance of the memory clinic in improving patient health outcomes.

Literature review

Memory clinics serve as an important setting for pharmacists to effectively collaborate with other healthcare professionals to improve dementia patient outcomes and also highlight the important role of pharmacists in an interprofessional team. A systematic review of existing literature studied the effectiveness of pharmacist-led interventions on the quality use of medications as well as the quality of life and health outcomes of those with cognitive impairment. This review reinforces the benefits of proper medication-related services that may be provided by the healthcare team including medication reconciliation, reviews, and adherence, all of which have been shown to have beneficial health outcomes and cost savings.[34] Other studies, one using semi-structured interviews and another using qualitative data, found comparable conclusions that highlight the importance of medication management of dementia patients; however, concerns were raised over the need for better interprofessional collaboration and care during transitions.[35,36] By evaluating the services provided by memory clinics and pharmacists, this study demonstrates the added potential capabilities of pharmacists in the management of dementia patients in a multidisciplinary environment. A randomised control trial exploring the effectiveness of pharmacist interventions in the elderly with dementia had outcomes in which, deprescribing was the most common action in response to the identified drug-therapy problems, most of which were inappropriate drug usage and unnecessary drug therapy.[37] For patients affected by dementia or memory deficits, deprescribing is an important aspect to address the side effects that unnecessary medications may have on memory and overall cognitive function. These are often reversible following its discontinuation or reduction in dose. A study conducted at Winchester hospital, Canada, followed 11 patients in a deprescribing pilot program that compared hospital admissions 6 months before and after deprescription. The majority of patients saw an improvement in cognitive function, higher alertness, and less confusion. With the successful implementation of a deprescribing programme and coordination with an interprofessional team, the potential positive impact pharmacists may have when caring for patients suffering from MCI or dementia can be observed.[38] Further studies related to the importance of deprescribing and multidisciplinary models are highlighted in Table 4 (see Tables 5–9).

Future directions for pharmacists

Over the years, the role of a pharmacist has evolved and shifted away from solely a medication dispenser to a more clinical role engaged in patient medication management.[49] There are limited studies with a primary focus on the clinical role of a pharmacist and more specifically, their role within an interprofessional team. With the development of their

role, it is important to provide supporting evidence from pharmacy practice research to assist in the discovery of new avenues that would allow for optimised patient care.[47,50,51,53] More research is required to produce evidence-based guidelines and policies to support pharmacists and the multidisciplinary healthcare team, especially when caring for an older population suffering from MCI or dementia. Furthermore, higher quality research and implementation of more rigorous methodologies should be undertaken so that the literature may be gathered and systematically evaluated.[54] Of the different designs, randomised control trials (RCTs) are one of the more robust methods of conducting research.[55] A systematic review consisting of 54 different RCTs has been published that focuses on pharmaceutical care and medicine management. Although the overall amount of research is lacking, this review demonstrates the potential benefits of pharmacists and different pathways for research. Pharmaceutical care was shown to be effective in improving the short-term health outcomes for patients with a variety of comorbidities such as diabetes and other cardiovascular conditions. There is a need for future research to evaluate other disease states where data is lacking and to evaluate the persistence of the positive effects of pharmaceutical care beyond cessation of interventions in the long term.[56] In our study, although medication compliance decreased from 80% in the first 3−6 months post-clinic visit to 68% after a year, patients still reported an increasing improvement in their physical abilities and independence as time from their visit progressed. It would be valuable to study the long-term clinical outcomes beyond one year and how pharmacists can tailor their care to retain long-term positive outcomes.

A multidisciplinary team allows for more effective collaboration between professions that can strengthen health systems and improve health outcomes.[57] There is still a need for high-quality research in this area. Of 38 RCTs studying the clinical services provided by pharmacists working together with other specialities, positive outcomes were highest when interventions involved interprofessional collaboration and face-to-face verbal communication among team members.[57] This knowledge, along with the significance of a pharmacist's role within these teams, may be useful in determining how to provide efficient and effective care for patients suffering from dementia, as well as other comorbid diseases. Given that multiple healthcare providers in the patient's circle of care were involved in this clinic, a key barrier in implementing this program was difficulty contacting healthcare providers in a timely manner, which contributed to delay in care. Strategies for more efficient communication within the circle of care needs to be explored. With more methodologically sound studies and sufficient patient follow-ups, the validity of these studies may be enhanced and would be valuable to explore in future research.

Conclusion

This study highlighted the role of memory clinics in increasing the capacity of primary care for managing dementia. The services provided in the memory clinic in this study included referrals to specialists, medication optimisation, cognitive testing, obtaining medical history, prescribing memory enhancers, offering follow-ups, and providing resources and support to caregivers. The findings of this study highlight the significant role of the pharmacist in medication optimisation for dementia patients. The limitations of this study included its retrospective nature, which lacked control and randomisation. In future studies, prospective studies with bigger sample sizes should be performed to confirm the significance of the results.

Recommendations

Based on our study, we recommend a multidisciplinary team approach in the context of memory clinics to optimise patient care for MCI or dementia. This approach allows for a thorough assessment of the patient, where drug-therapy problems are addressed upon discussion with the team and providing different perspectives in a holistic approach to care. The pharmacist has a vital role in ensuring medications are indicated, effective, safe, and appropriate which might otherwise be deprescribed to sustain better patient outcomes.

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Conflict of interest

The authors have no conflict of interest to declare.

Authors contributions

AE worked on the original manuscript preparation, conceptualisation, data curation, analysis of the paper, literature search, data collection, and wrote, reviewed and edited the ideas. YT and JJV conducted research, provided research materials, and collected and organised data, and literature review. AEL analysed, interpreted data, conducted literature review, and edited the final draft. ZY assisted in writing initial and the final draft of article, and provided logistic support. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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