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THE CHANGING PROFILE OF PATIENTS IN A GERIATRIC MEDICINE LED MEMORY CLINIC OVER 12 YEARS

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Abstract: *Objectives:* Memory clinics play an important role in enabling early dementia diagnosis and intervention. Few studies have investigated the changing patient profiles at memory clinics over time. We studied the trend of patient characteristics in a geriatric medicine-led memory clinic over 12 years to improve services and care to meet their needs. *Setting and Participants:* Data from 2340 first-visit patients seen at a memory clinic from 2005-2017 were extracted from a registered database and analysed. *Design:* ANOVA, Pearson chi-square and non-parametric tests were used to describe and compare between patients with dementia (PWD) and patients with no dementia (PND). *Measurements:* Data included diagnoses of dementia and mild cognitive impairment, age, education, MMSE scores and comorbidities. *Results:* Patients averaged 77.2 ± 8.3 years of age with mean MMSE score of 16.2 ± 6.7. Those diagnosed with dementia were older (78.3 ± 7.9 years) and almost half (48.4%) had moderate or moderately severe dementia (FAST 5-6). Over time, there was a growing proportion of patients with mild cognitive impairment (MCI) and mild Alzheimer's dementia. Many PWD had co-morbidities of hypertension (65.9%), hyperlipidemia (55.1%), diabetes (33.5%) and 28.4% were frail. *Conclusions:* The findings call for services to better diagnose and manage patients at the earlier stages of cognitive impairment and provide holistic interventions for those with frailty and other co-morbidities. The continued rise in number of patients presenting to memory clinics provides impetus to expedite integration of tertiary-based memory clinics with primary and community care providers to better support PWD and their families.

Key words: Dementia, cognitive impairment, memory clinics, trend, patient profile, integrated care.

Introduction

The World Health Organization reported 50 million persons with dementia globally to-date, and this number is estimated to increase to 152 million by 2050 (1). Dementia is characterized by significant cognitive impairment, comorbidities and behavioral issues which substantially disrupt one's functional and social ability. It exerts considerable psychological burden on caregivers (2) as well as economic challenges to the health system (1). Early diagnosis and intervention is key to alleviate these burdens, as it reduces functional deterioration and healthcare utilization (3, 4).

The growth of memory clinics is critical in improving early diagnosis of dementia (3, 4). Generally, memory clinics achieve several objectives including early identification, diagnosis and management of dementia or other cognitive disorders, and education for healthy individuals worried about memory loss (3). Individuals suspected of having dementia or have concerns about memory deterioration are typically referred by physicians in primary care or other disciplines to specialist memory clinics for further assessment (5).

Although some outcomes of memory clinics have been examined, the characteristics of patients with dementia (PWD) at memory clinics over time have yet been well-studied. Studies in European populations observed higher numbers of patients, increasing mean cognitive assessment scores (6, 7), increasing degenerative diseases and constant numbers of cerebrovascular diseases over time (8). Younger, more educated patients as well as a more patients with earlier stages of cognitive impairment have also been observed. In Asia, a study in Hong Kong explored how culture influenced patient and caregiver profile in a memory clinic (9); while in Singapore, influence of public awareness efforts on the severity profile of patients seen in a neurology-led memory clinic in a university hospital (10) was investigated.

Dementia is a multifaceted disease and PWD often present with complex medical and social needs. Rather than single-disease specialty, geriatric medicine emphasizes comprehensive assessment of the person and empowers families, working closely with primary care and community agencies, to care for the PWD (11). We studied the demographics, diagnoses, functional status and comorbidities of first-visit patients at a geriatric medicine-led memory clinic in a developed Asian country. We aimed to understand the patients' evolving needs so as to better inform care and service planning at the regional and population level.

Methods

Participants

Medical records of 2383 first-visit patients who were managed by a geriatric medicine memory clinic from 2005 until 2017 were reviewed in the study. The patients were individuals who were suspected to have dementia or had cognitive concerns. Referrals came from primary care practitioners, physicians from other specialities, hospitals or walk-ins. Ethics

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approval was obtained from the National Healthcare Group Institutional Review Board.

Clinical Assessment

At the memory clinic, patients underwent comprehensive geriatric assessment inclusive of frailty and a multi-domain cognitive battery. Concurrently, caregivers provided information about patient's cognitive history, activities of daily living competence, personal preferences and social background, and completed baseline caregiver assessment questionnaires. The patients were then subjected to further investigations as appropriate (e.g. laboratory tests, neuroimaging or further neuropsychological assessment). An inter-disciplinary team evaluated the overall results and provided a formal diagnosis via consensus.

Diagnosis of Dementia and Mild Cognitive Impairment (MCI)

Diagnosis of dementia and its subtype was based on the following criteria: (1) DSM-IV criteria (12), (2) the National Institute of Neurological and Communicative Disorders and the Alzheimer's Disease and Related Disorders Association criteria (NINCDS-ADRDA) (13) for probable Alzheimer's dementia (AD) and AD with cerebrovascular disease, (3) the National Institute of Neurological Disorders and Stroke-Association Internationale pour la Rocherche et l'Enseignement en Neurosciences (NINDS-AIREN) (14) for Vascular Dementia (VaD). The Mini-Mental State Examination (MMSE) was used to systematically assess cognitive domains and the Functional Assessment Staging Tool (FAST) evaluated dementia stage based on function (Stage 1-2 = normal, 3 = early, 4 = mild, 5 = moderate, 6-7 = severe dementia). The diagnosis of MCI was made according to the International Working Group standards (15).

Sampling Procedures and Statistical Analysis

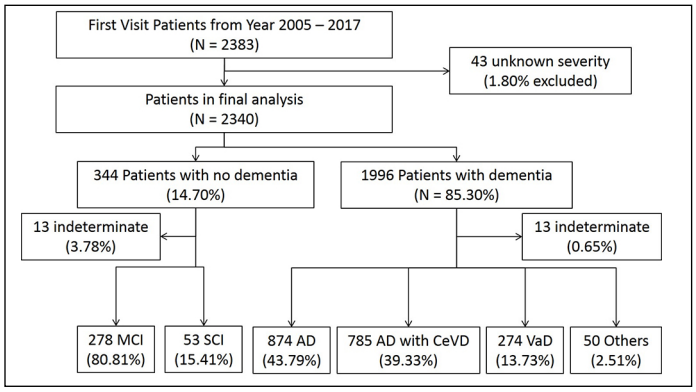
Patient records between 1 January 2005 and 31 October 2017 were extracted from a registered standing database. After excluding patients with indeterminate diagnoses (n = 43), the final dataset comprised 2340 patients (Figure 1). For normally distributed variables, ANOVA and chi-square tests were employed. For non-normally distributed variables, non-parametric tests were used. We ran descriptive analysis and compared characteristics between two groups: patients with dementia (PWD) and patients with no dementia (PND). All analyses were performed using STATA Version 14.

Results

The mean age of patients seen in the memory clinic was 77.2 ± 8.3 years, education levels ranged from no education to university level and mean MMSE score was 16.2 ± 6.7. PWD (78.3 ± 7.9 years) were older, more likely to not have beyond primary education (43.5%) compared to PND (71.1 ± 8.2 years, 15.2%) and had lower MMSE scores (14.7 ± 5.9) than PND (25.1 ± 3.3) (Table 1). Over time, there was a slight increase in proportion of PWD in the older age group (75-84 years) with a corresponding modest decrease in proportion in the younger age group (<75 years). No obvious increasing or decreasing trend was observed in education levels of patients across 12 years. (Table 2) Majority of patients (58.1%) were referred from primary care followed by referrals from the hospital (28.7%).

During the study period, 85.3% of patients were diagnosed with dementia (Figure 1). There was a decreasing proportion of PWD with a corresponding increased proportion of patients with MCI (Table 2). Among PWD, there was a significant trend towards lower proportion of AD diagnoses with higher proportion of VaD instead. Diagnoses of AD with CeVD were also noted to increase over the years, albeit the trend being non-significant (Table 2).

Figure 1
Sampling flow for first-visit patients



Among those diagnosed with dementia, 47.9% had mild, 44.8% moderate and 7.4% severe dementia. Over the study period, there was an increasing proportion of mild AD patients and a decreasing proportion of moderate AD (Table 2). However, this trend was not observed in other types of dementia.

Among the PWDs, 65.9% had a concurrent diagnosis of hypertension, 55.1% hyperlipidemia, 33.5% diabetes and 28.4% were physically frail. (Table 1)

Discussion

Memory clinics are led by psychiatry, neurology or geriatric medicine, and the profiles of patients may differ between settings, with more patients of geriatric medicine-led clinics being diagnosed with dementia and expectedly older (5, 9). Our finding is consistent with past studies with majority of our patients diagnosed with dementia at a mean age of 77.2 years, which is higher than what has been reported in other studies as well as local clinics (9, 16).

For older PWD, multi-morbidity is a concern (17, 18).

Table 1
Characteristics of first visit patients (N=2340)

	Overall	Patients with dementia	Patients with no dementia
	N = 2340	N = 1996	N = 344
Age in years (Mean (SD))	77.2 (8.3)	78.3 (7.9)	71.1 (8.2)
Primary and above education (N (%)) (N=2335)	1416 (60.6)	1125 (56.5)	291 (84.8)
DSM-IV Criteria (N (%)) (N=1983)			
Mild	-	949 (47.9)	-
Moderate	-	888 (44.8)	-
Severe	-	146 (7.4)	-
MMSE Scores (Mean (SD))	16.2 (6.7)	14.7 (5.9)	25.1 (3.3)
Co-morbidities (N (%))			
Hypertension	1511 (64.6)	1316 (65.9)	195 (56.7)
Hyperlipidemia	1294 (55.3)	1099 (55.1)	195 (56.7)
Diabetes	765 (32.7)	669 (33.5)	96 (27.9)
FAST Stage (N (%)) (N=2057)			
1	5 (0.2)	0 (0.0)	5 (1.7)
2	63 (3.1)	2 (0.1)	61 (20.7)
3	246 (12.0)	38 (2.2)	208 (70.5)
4	850 (41.3)	833 (47.3)	17 (5.8)
5	563 (27.4)	559 (31.7)	4 (1.4)
6	294 (14.3)	294 (16.7)	0 (0.0)
7	36 (1.8)	36 (2.0)	0 (0.0)
[1]FI-CGA (N (%)) (N=1129)			
≤0.4 (non-frail)	851 (75.4)	690 (71.7)	161 (97.0)
>0.4 (frail)	278 (24.6)	273 (28.4)	5 (3.0)
[1]Referral Sources (N (%)) (N=1298)			
Primary Care	754 (58.1)	634 (57.1)	120 (64.2)
Intra-hospital	373 (28.7)	338 (30.4)	35 (18.7)
Other hospitals	66 (5.1)	62 (5.6)	4 (2.1)
Self	89 (6.9)	64 (5.8)	25 (13.4)
Private Practitioner	16 (1.2)	13 (1.2)	3 (1.6)

[1]Data available only from Year 2012 onwards

Higher rates of frailty, hypertension and diabetes were observed in our study cohort compared to the national prevalence rates and those reported in other local studies (19, 20). With a growing body of knowledge that majority of PWDs have co-morbid conditions (18, 21), it is imperative to provide comprehensive assessments beyond cognition as well as holistic interventions that target both cognitive issues as well as co-morbidities. Since memory clinics are usually well-supported by multidisciplinary teams to provide medical and psychosocial interventions, and act as a pivot to other relevant resources for patients (5), it is important to tailor the services to the changes observed in patient profiles over time.

Our study shows increasingly more patients diagnosed with MCI while within PWD, the proportion of patients with mild AD also increased. This finding is consistent with other memory clinic studies which have reported more patients in the earlier stages of cognitive impairment (6, 7, 10). The observation of more MCI patients may be explained by growing public awareness of dementia and its implications. This could also potentially account for the increased preponderance of patients with mild AD but not VaD as public education efforts are often focused on the symptom of memory impairment which tends to be more prevalent and prominent in AD compared to VaD (22).

Table 2
Demographics and diagnoses of first visit patients from Year 2005 to 2017 (N=2340)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	P
	N = 88	N = 120	N = 147	N = 156	N = 150	N = 85	N = 164	N = 170	N = 206	N = 244	N = 299	N = 298	N = 213	
Age Groups (N(%))														
PWD														0.03
< 75 years	22 (27.9)	40 (39.2)	43 (33.1)	59 (43.7)	47 (37.9)	23 (30.7)	45 (34.6)	50 (34.0)	42 (25.5)	61 (28.2)	66 (24.0)	70 (27.2)	39 (24.2)	
75-84 years	40 (50.6)	41 (40.2)	67 (51.5)	54 (40.0)	50 (40.3)	39 (52.0)	64 (49.2)	65 (44.2)	91 (55.2)	109 (50.5)	152 (55.3)	131 (51.0)	88 (54.7)	
≥ 85 years	17 (21.5)	21 (20.6)	20 (15.4)	22 (16.3)	27 (21.8)	13 (17.3)	21 (16.2)	32 (21.8)	32 (19.4)	46 (21.3)	57 (20.7)	56 (21.8)	34 (21.1)	
PND														0.23
< 75 years	2 (22.2)	16 (88.9)	10 (58.8)	14 (66.7)	18 (69.2)	9 (90.0)	20 (58.8)	18 (78.3)	27 (65.9)	21 (75.0)	18 (75.0)	25 (61.0)	30 (57.7)	
75-84 years	7 (77.8)	1 (5.6)	7 (41.2)	6 (28.6)	8 (30.8)	1 (10.0)	12 (35.3)	5 (21.7)	13 (31.7)	7 (25.0)	6 (25.0)	15 (36.6)	20 (38.5)	
≥ 85 years	0	1 (5.6)	0	1 (4.8)	0	0	2 (5.9)	0	1 (2.4)	0	0	1 (2.4)	2 (3.9)	
Primary and above Education (N(%))														
PWD (N=1992)	48 (60.8)	63 (61.8)	77 (59.2)	80 (59.3)	69 (55.7)	43 (57.3)	75 (57.7)	70 (48.0)	95 (57.6)	109 (50.5)	144 (52.4)	156 (60.9)	96 (60.4)	0.23
PND (N=343)	7 (77.8)	12 (66.7)	13 (76.4)	21 (100.0)	25 (96.2)	6 (60.0)	27 (79.4)	19 (82.6)	36 (87.8)	22 (78.6)	22 (91.7)	38 (92.7)	43 (84.3)	0.04
Diagnoses (N(%))														*<0.001*
Dementia	78 (94.0)	102 (87.9)	130 (89.7)	133 (86.9)	122 (82.4)	75 (88.2)	130 (79.8)	146 (86.9)	164 (80.0)	215 (88.5)	274 (92.0)	254 (86.1)	160 (75.5)	
MCI	5 (6.0)	14 (12.1)	15 (10.3)	19 (12.4)	20 (13.5)	8 (9.4)	25 (15.3)	18 (10.7)	30 (14.6)	24 (9.9)	21 (7.1)	35 (11.9)	44 (20.8)	
SCI	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.7)	6 (4.1)	2 (2.4)	8 (4.9)	4 (2.4)	11 (5.4)	4 (1.7)	3 (1.0)	6 (2.0)	8 (3.8)	
Dementia Types (N(%))														
AD	46 (59.0)	53 (52.0)	77 (59.2)	63 (47.4)	48 (39.3)	31 (41.3)	43 (33.1)	65 (44.5)	75 (45.7)	79 (36.7)	117 (42.7)	105 (41.3)	72 (45.0)	<0.001*
AD with CeVD	23 (29.5)	34 (33.3)	40 (30.8)	48 (36.1)	44 (36.1)	32 (42.7)	66 (50.8)	59 (40.4)	66 (40.2)	89 (41.4)	109 (39.8)	105 (41.3)	70 (43.8)	0.08
VaD	5 (6.4)	12 (11.8)	11 (8.5)	15 (11.3)	29 (23.8)	9 (12.0)	16 (12.3)	19 (13.0)	21 (12.8)	42 (19.5)	43 (15.7)	35 (13.8)	17 (10.6)	0.01*
Others	4 (5.1)	3 (2.9)	2 (1.5)	7 (5.3)	1 (0.8)	3 (4.0)	5 (3.9)	3 (2.1)	2 (1.2)	5 (2.3)	5 (1.8)	9 (3.5)	1 (0.6)	0.24
DSM-IV Criteria (N(%))														*0.01*
Overall														
Mild	32 (41.0)	47 (46.1)	56 (43.1)	56 (42.1)	47 (38.5)	29 (38.7)	52 (40.0)	71 (48.6)	80 (48.8)	121 (56.3)	142 (51.8)	124 (48.8)	92 (57.5)	
Moderate	35 (44.9)	47 (46.1)	62 (47.7)	64 (48.1)	65 (53.3)	40 (53.3)	66 (50.8)	60 (41.1)	70 (42.7)	77 (35.8)	123 (44.9)	118 (26.5)	61 (38.1)	
Severe	11 (14.1)	8 (7.8)	12 (9.2)	13 (9.8)	10 (8.2)	6 (8.0)	12 (9.2)	15 (10.3)	14 (8.5)	17 (7.9)	9 (3.3)	12 (4.7)	7 (4.4)	
AD														0.02
Mild	19 (41.3)	27 (50.9)	37 (48.1)	31 (49.2)	23 (47.9)	16 (51.6)	23 (53.5)	38 (58.5)	45 (60.0)	59 (74.7)	70 (59.8)	63 (60.0)	49 (68.1)	
Moderate	21 (45.7)	23 (43.4)	34 (44.2)	29 (46.0)	24 (50.0)	15 (48.4)	19 (44.2)	23 (35.4)	23 (30.7)	16 (20.3)	44 (37.6)	35 (33.3)	20 (27.8)	
Severe	6 (13.0)	3 (5.7)	6 (7.8)	3 (4.8)	1 (2.1)	0	1 (2.3)	4 (6.2)	7 (9.3)	4 (5.1)	3 (2.6)	7 (6.7)	3 (4.2)	
AD with CeVD														0.07
Mild	9 (39.1)	12 (35.3)	13 (32.5)	21 (43.8)	15 (34.1)	7 (21.9)	25 (37.9)	23 (39.0)	27 (40.9)	39 (43.8)	53 (48.6)	37 (35.2)	35 (50.0)	
Moderate	9 (39.1)	20 (58.8)	23 (57.5)	20 (41.7)	22 (50.0)	20 (62.5)	33 (50.0)	29 (49.2)	33 (50.0)	42 (47.2)	54 (49.5)	63 (60.0)	31 (44.3)	
Severe	5 (21.7)	2 (5.9)	4 (10.0)	7 (14.6)	7 (15.9)	5 (15.6)	8 (12.1)	7 (11.9)	6 (9.1)	8 (9.0)	2 (1.8)	5 (4.8)	4 (5.7)	
VaD														0.11
Mild	2 (40.0)	7 (58.3)	5 (45.5)	2 (13.3)	8 (27.6)	5 (55.6)	4 (25.0)	8 (42.1)	7 (33.3)	21 (50.0)	18 (41.9)	17 (48.6)	8 (47.1)	
Moderate	3 (60.0)	2 (16.7)	5 (45.5)	10 (66.7)	19 (65.5)	4 (44.4)	9 (56.3)	7 (36.8)	13 (61.9)	16 (38.1)	21 (48.8)	18 (51.4)	9 (52.9)	
Severe	0	3 (25.0)	1 (9.1)	3 (20.0)	2 (6.9)	0	3 (18.8)	4 (21.1)	1 (4.8)	5 (11.9)	4 (9.3)	0	0	

*Significant at Bonferroni-adjusted p-value ≤0.0125. PWD: Patients with dementia, PND: Patients with no dementia, AD: Alzheimer's Disease, CeVD: Cerebrovascular Disease, VaD: Vascular Disease

With the increase in patients with MCI and mild dementia, it is essential for services to evolve in tandem with the trends. The function of memory clinics is not limited to clinical diagnosis and management of cognitive impairment, it extends to psychosocial issues and care (5). The memory clinic on which the study is based is part of a dementia integrated care initiative to organize care around PWD with partnerships between the tertiary hospital with primary and community care providers (11). There is a need to provide services that allow patients with MCI and mild dementia to uphold their social and emotional

wellbeing by maintaining their physical and cognitive function. Currently, community dementia care in this country use the admission criteria of ≥FAST Stage 4 for general dementia day care services and ≥FAST Stage 6 for enhanced dementia day care (23). However, our results show a substantial number of patients in FAST Stage 3 (12.0%) who can start to benefit from evidence based multi-component programmes (24) to ameliorate decline into dementia. In addition, the substantial proportion of patient with mild to moderate dementia at FAST Stage 4-5 (68.7%) call for more effective community services to meet the demands of this growing segment of patients (25).

Notably, 5.4% of the patients were diagnosed with SCI (Table 2), consistent with the findings of another local study (10). Although patients with SCI do not present with clinical symptoms and perform well on objective standardized tests, emerging evidence suggests it is not altogether benign and may represent a presymptomatic phase of AD with positive biomarkers that can progress to dementia (26). The expanding proportion of SCI patients coupled with growing knowledge and understanding of SCI provide impetus to detect the earliest markers of disease upstream, prior to the emergence of clinical symptoms. Indeed, the recent NIA-AA framework recommended a shift of AD from a syndromal definition to a biological construct to identify patients for interventions that prevent or delay clinical symptoms (27). We can be hopeful that identification of such patients can allow for disease-modifying treatments in the pipeline that target earlier presymptomatic stages of the disease (26).

Management of PWD is resource-intensive and Singapore's healthcare system is largely centred on tertiary care. With the increasing number of patients with cognitive impairment and dementia (10), there may be insufficient resources to cope with the ever-growing load of patients in tertiary care. As such, it is fitting that the primary care sector, which is often the first point of contact for patients and the key provider of chronic care, play a greater role in the care of PWD. Taking into consideration the multi-morbidity and frail condition of many PWDs, primary care is also well positioned to provide holistic care for these patients. Several countries with primary care-based management of dementia have demonstrated positive outcomes (28, 29). However, the implementation of primary care-based management may be undermined by various factors. These include physician confidence and capability, as well as system factors such as limited consultation time, insufficient community services and low financial reimbursement (30). Therefore, it may be prudent to consider a shared care model between tertiary hospitals and primary care to optimize outcomes. For instance, specialists at tertiary hospitals can share their expertise and conduct dementia training for primary care providers to enhance their confidence, knowledge and skills while primary care helps to relieve the heavy caseloads in tertiary care which may compromise care quality. In this way, tertiary care and primary care providers mutually benefit to keep stable PWD in the community, making care continuous and sustainable.

The strengths of the current study are the large number of cases and the long 12 years interval assessed. However, data of only one memory clinic are included, thus results might not be generalizable.

In conclusion, the results reflect the characteristics and changing trends in first-visit patients to a memory clinic. Our study cohort is older, and majority have dementia and multi-morbidity. There has been a steady rise in number of patients, of which an increasing proportion present at earlier stages of cognitive decline. Given these findings, integrating care and services between tertiary and primary care providers to keep up with evolving trends presents a viable way forward.

Author contributions: PLKY had full access to all of the data in the study and has primary responsibility for final content. PLKY, SLW formulated the hypothesis, designed the study, supervised, and reviewed the data analysis, and reviewed and revised the manuscript. XYC formulated the hypothesis, analyzed the data, drafted and revised the manuscript. NHLH interpreted the results, drafted and revised the manuscript. CYC interpreted the results, revised and reviewed the manuscript. All authors read and approved the final manuscript.

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Ethical standards: Ethics approval for the study was obtained from the Domain Specific Review Board, National Healthcare Group, Singapore. The study fully complied to the ethical standards set by this review board.

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