

The Care Pathway for Patients with Mild Cognitive Impairment in Korea: A Survey of Dementia Specialists

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Keywords

Mild cognitive impairment · Dementia · Survey · Diagnosis · Imaging

Abstract

Introduction: Mild cognitive impairment (MCI) represents a loss of memory or other cognitive function while maintaining the ability to independently perform most activities of daily living. This study assessed how Korean specialists in dementia care diagnosed and treated patients with MCI symptoms. **Methods:** A questionnaire on the current management of MCI was developed by 6 experts in MCI care. Specialists in MCI care ($n = 24$: 14 neurologists/10 psychiatrists) verbally answered questions relating to their experience/views in caring for MCI patients. **Results:** Respondents diagnosed MCI using the Seoul Neuropsychological Screening Battery (79%) and the Consortium to Establish a Registry for Alzheimer's Disease – Korea (21%) neuropsychological battery tests. All or nearly all respondents also assessed patients with Mini-Mental State Examination, Geriatric Depression Scale, Clinical

Dementia Rating, Activities of Daily Living (ADL), and Instrumental ADL tests. All respondents used MRI or CT for differential diagnosis of diseases causing MCI, about one-third used amyloid PET. Most respondents (96%) treated patients with MCI due to Alzheimer's disease (AD) with medication, commonly choline alfoscerate (71%) and donepezil (53%), mainly as combination therapy. Unmet needs included patient/caregiver education (63%) and time constraints for consulting patients (54%). Most respondents considered that increased amyloid- β testing for patients with MCI due to AD or subjective cognitive decline is likely to increase. **Conclusions:** This survey described the current management of MCI due to AD, identified unmet needs and considered possible future developments in the changing landscape of early AD treatment. Early detection and diagnosis and continued development of emerging preventative or therapeutic interventions are critical for MCI outcomes.

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Introduction

Mild cognitive impairment (MCI) is a condition of loss of memory or other cognitive function whilst maintaining the ability to independently perform most activities of daily living [1]. Due to an increasingly aging population, the number of patients in South Korea with dementia or MCI has grown rapidly over the past 10 years. According to Health Insurance Review and Assessment Service (HIRA) data, the number of people diagnosed with MCI in Korea in 2021 was 343,193 [2]. National integrated analysis of dementia-related data estimated that the number of dementia patients aged 65 years and older was 886,173 [3]. However, many people with MCI are not diagnosed: in 2020, it was estimated that 1.7 million South Koreans were currently living with MCI [4]. Diagnosing MCI is clinically important as it is associated with a 6-fold increased risk of Alzheimer's disease (AD) in elderly subjects [5] and early intervention may delay or reduce the risk of developing dementia.

In South Korea, private hospitals and clinics play a key role in healthcare delivery as about 94% of hospitals and most clinics are privately owned [6]. Compared with metropolitan areas, provincial areas have fewer private clinics and primary healthcare is generally provided by public health centers. As the primary healthcare system, such as general practitioner or family doctor services, is not well established in South Korea, much primary healthcare is provided by specialists of hospitals or private clinics. Patients have access to specialist clinics in community and general hospitals and are able to have their first consultation without a referral letter, except at tertiary hospitals designated by the South Korean Government [7].

To combat dementia, the South Korean government has developed four national dementia plans (NDPs) with the first produced in 2008 and the fourth in 2020. The first two NDPs focused on developing the infrastructure for dementia care. These include the National Institute of Dementia, 17 metropolitan or provincial dementia relief centers and 256 local dementia centers. The 3rd and 4th NDPs are community- and user-based initiatives for the prevention and management of dementia and aim to cement infrastructure connections to maximize cost effectiveness [8].

South Korea has made progress in identifying, assessing and diagnosing people with dementia, mainly through referrals and screening at local dementia centers. However, local dementia centers only provide non-

pharmacological management and referral of people with MCI to dementia specialists is variable. Consequently, there is a need for consensus on the diagnosis and treatment of patients with MCI. In addition, financial incentives for hospitals to treat dementia are limited [9]. We report results of a survey of specialists in dementia care to gain an in-depth understanding of current MCI diagnosis and treatment practice in South Korea.

Methods

Interviews and Participants

A questionnaire (online suppl. File 1; for all online suppl. material, see <https://doi.org/10.1159/000546791>) on the current management of MCI was developed by 6 experts following two rounds of meetings. Questions broadly related to (1) onset and recognition of symptoms, (2) patient pathway until referral to a specialist, (3) visit to a specialist in a tertiary/general hospital, and (4) assessment, diagnosis, and treatment of MCI. Interviews of specialists ($n = 24$), selected based on their expertise and clinical experience (all participants were board-certified neurologists or psychiatrists actively engaged in MCI and dementia care), were conducted by trained staff between 7 October 2022 and 24 November 2022. Replies were given verbally, transcribed and collated. Specialists comprised 14 neurologists and 10 psychiatrists working in tertiary hospitals ($n = 16$: 11 neurologists, 5 psychiatrists) or general hospitals ($n = 8$: 3 neurologists, 5 psychiatrists). Most specialists were based in the Seoul metropolitan area ($n = 17$) and the remainder in provincial areas of South Korea ($n = 7$).

Results

Onset and Recognition of Symptoms

Based on survey responses, symptoms were first recognized by patients themselves in approximately 50% of cases and in the remainder by other people, e.g., family members (Fig. 1). Factors for patients who self-recognized symptoms were a higher level of education, mild disease status, younger age, and living in an urban area. Some also had a family history of dementia and were more likely to have MCI due to AD. In contrast, factors for patients who had symptoms recognized by others were lower level of education, more severe disease

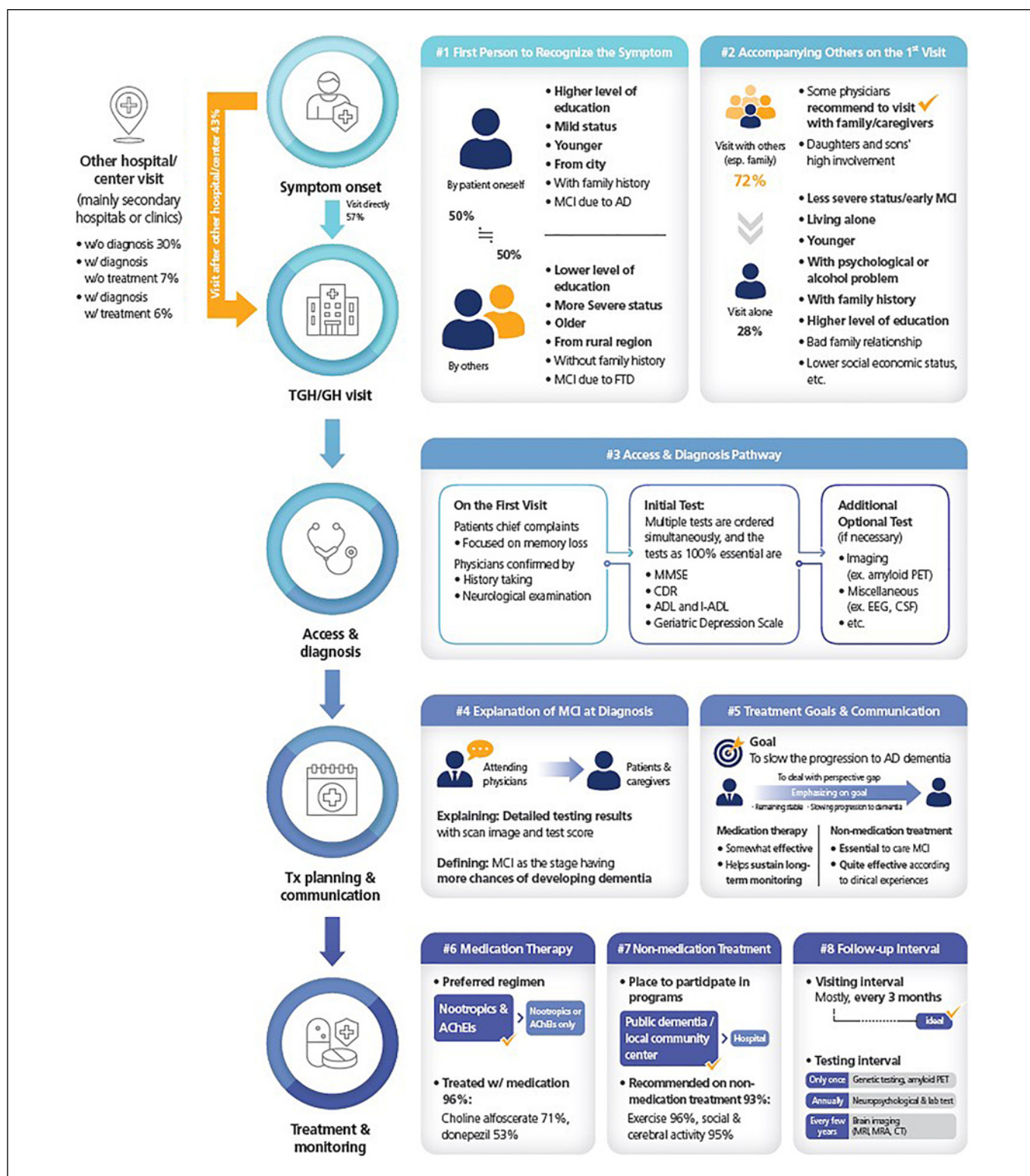


Fig. 1. The MCI patient pathway: from symptom onset to treatment and monitoring. AD, Alzheimer's disease; FM, family medicine; FTD, frontotemporal dementia; GH, general hospital; GP, general practitioner; IM, internal medicine; MCI, mild cognitive impairment; NR, neurologist; NS, neurosurgeon; Psy, psychiatrist; TGH, tertiary general hospital.

status, older age, and living in a rural region. These patients generally had no family history of dementia and were more likely to have MCI due to causes other than AD, such as frontotemporal dementia.

Patient Pathway

More than half of all patients (57%) seen by survey respondents directly visited tertiary and general hospitals for specialist evaluation and care, without any referrals. The proportion of patients who directly visited hospitals was higher in metropolitan than provincial areas (Fig. 1).

Respondents indicated that most patient visits (72%) involved a caregiver and considered that MCI patients should be accompanied, e.g., by a family member, on their first visit to a specialist. Patients who visited alone had less severe disease status or early-stage MCI, were living alone, younger, had psychological (depression, anxiety, insomnia) or alcohol problems, a family history of dementia, and a higher level of education.

Survey results indicated that nearly a quarter of patients (24%) visiting a specialist had test results from previous hospitals or clinics, and a higher proportion of patients with test results were referred from tertiary hospitals (33%) compared with general hospitals (13%). Clinical examinations conducted in previous hospitals/clinics included comprehensive neuropsychological tests (Seoul Neuropsychological Screening Battery [SNSB], Korean version of Consortium to Establish a Registry for Alzheimer’s Disease [CERAD-K] [10], or Literacy-Independent Cognitive Assessment [LICA]) [11], Mini-Mental State Examination (MMSE), Clinical Dementia Rating (CDR) scale, and Geriatric Depression Scale (GDS). However, neuropsychological examinations were conducted 6–12 months prior to referral and results were inconsistent and often did not match the patient’s condition. Testing conducted in previous hospitals/clinics also included laboratory tests (including blood tests) and imaging (magnetic resonance imaging, magnetic resonance angiography [MRA], or computed tomography [CT]), especially in secondary or tertiary hospitals. The reliability of test results from previous hospitals/clinics was assessed by respondents on a 5-point scale from 1 (very low) to 5 (very high). The most common score was 3 (“average”; $n = 13$) followed by 4 (“high”; $n = 9$), 4.5 ($n = 1$), 5 (“very high”; $n = 1$) (Table 1).

Visit to a Specialist

On a patient’s first visit to a specialist, survey results showed that all respondents conducted history taking and some (21%) performed a brief neuropsychological

Table 1. Reliability of test results from previous hospitals/clinics ($n = 24$)

Score	Respondents, n (%)
1 (very low reliability)	0
2	0
3	13 (54)
4	9 (38)
4.5	1 (4)
5 (very high reliability)	1 (4)

Survey respondents scored the reliability of test results from previous hospitals/clinics on a 5-point scale from 1 (very low) to 5 (very high).

assessment using MMSE, Korean Dementia Screening Questionnaire (KDSQ) [12], or Montreal Cognitive Assessment (MoCA). Some respondents (21%) also mentioned identifying patient changes in emotion and behavior. These initial investigations may suspect but not confirm MCI.

Assessment, Diagnosis, and Treatment
Testing for MCI

Respondents categorized MCI screening tests as essential or optional. For a comprehensive neuropsychological examination, most respondents (79%; 14 neurologists, 5 psychiatrists) used SNSB and 5 psychiatrists (21%) used CERAD-K. A third neuropsychological examination, LICA, was used selectively for some cases of illiterate patients or those with a low-education status. All or most patients were assessed with essential cognitive function and severity tests, which is covered by national insurance: MMSE (100%), Global Deterioration Scale (96%), CDR (100%); and activities of daily living (ADL; 100%) and Instrumental ADL (I-ADL; 100%) (Table 2).

Imaging and other tests ordered by specialists are summarized in Table 3. Most respondents (96%) considered MRI scans to be essential, whereas most specialists (67%) considered CT scans to be optional. One-third of specialists (33%) used essential MRA for patients with one or more vascular risk factor (hypertension, diabetes, dyslipidemia, etc.) or who had suspected vascular dementia. Currently, most specialists (88%) considered amyloid positron emission tomography (PET) to be an optional imaging modality. 33% of patients undergo amyloid PET to diagnose MCI due to AD and it is applied for patients with atypical presentation (e.g., early

Table 2. Proportion of specialists categorizing neuropsychological examinations as essential or optional ($n = 24$)

	Essential test, n (%)	Optional test, n (%)
Neuropsychological battery test		
SNSB	19 (79)	0
CERAD-K	5 (21)	1 (4)
LICA	1 (4)	12 (50)
ADAS-cog	0	7 (29)
Screening or simple cognitive function test		
MMSE	24 (100)	0
KDSQ	11 (46)	3 (13)
MoCA	2 (8)	8 (33)
Severity assessment		
CDR	24 (100)	0
GDS	23 (96)	1 (4)
Activities of daily living assessment		
ADL	24 (100)	0
I-ADL	24 (100)	0
Behavioral and psychological symptoms of dementia (BPSD) assessment		
Geriatric Depression Scale	24 (100)	0
CGA-NPI	17 (71)	1 (4)

N.B. Tests used by <6 physicians are omitted. ADAS-cog, Alzheimer's Disease Assessment Scale-Cognitive Subscale; ADL, activities of daily living; CDR, Clinical Dementia Rating; CERAD-K, Korean version of Consortium to Establish a Registry for Alzheimer's Disease; CGA-NPI, Caregiver-Administered Neuropsychiatric Inventory; GDS, Global Deterioration Scale; I-ADL, Instrumental Activities of Daily Living; KDSQ, Korean Dementia Screening Questionnaire; LICA, Literacy-Independent Cognitive Assessment; MMSE, Mini-Mental State Examination; MoCA, Montreal Cognitive Assessment; SNSB, Seoul Neuropsychological Screening Battery.

onset, unexplained or rapid progression) and patients with MCI due to AD.

Most specialists (88%) considered genetic testing for the *APOE4* gene as essential, and neurological examination and electrocardiogram were essential in most centers (71%) (Table 3). A higher proportion of neurologists used electroencephalography, amyloid- β oligomerization (A β O), and cerebrospinal fluid tests compared with psychiatrists. Oligomeric amyloid- β is a major toxic species associated with the pathogenesis of AD; we have previously reported the method used to measure A β O in the blood [13]. Most respondents ($\geq 88\%$) considered that blood tests for complete blood count, thyroid function, glucose, lipid profiling, vitamin deficiency, kidney function, liver function, electrolytes, and syphilis (VDRL test) were essential.

Patient testing rates for imaging modalities and plasma A β O, and by hospital type (tertiary or general), specialty (neurologist or psychiatrist) and area (metropolitan or provincial) are summarized in Table 4. All respondents assessed their patients by MRI (86%) or CT (14%), with higher rates of MRI found in tertiary hos-

pitals, metropolitan areas, and when ordered by psychiatrists. CT scans were performed for patients in whom MRI is contraindicated. About one-third of patients were assessed with amyloid PET of whom over half (53%) were amyloid-positive. Respondents ordered amyloid PET scans for patients with a typical MCI presentation (21%), early-onset disease (17%), unexplained or rapid progression (8%), mixed condition/multiple comorbidities (4%), suspected non-progressing AD (4%), and "patients taking too many drugs" (4%).

Rates for FP-CIT PET, FDG-PET, SPECT, and CSF testing were all less than 10%, and plasma A β O was conducted in 19% of patients (Table 4). CSF analysis was conducted in 1% of patients. Reasons for not conducting CSF testing were invasiveness (25%), patients' refusal due to its invasiveness (13%), the need for hospitalization or emergency room visit (13%), and possible complications (4%).

Time to receive diagnostic test results varied considerably depending on the test requested and demand. Receipt time was shortest for laboratory tests (within 1 week) and longest for neuropsychological examination

Table 3. Proportion of specialists categorizing imaging and other testing as essential or optional ($n = 24$)

	Essential, n (%)	Optional, n (%)
Imaging		
Brain MRI	23 (96)	1 (4)
Brain MRA	8 (33)	13 (54)
Brain CT	1 (4)	16 (67)
Amyloid PET	2 (8)	21 (88)
FP-CIT PET	0	17 (71)
FDG PET	0	15 (63)
Brain SPECT	0	7 (29)
Miscellaneous		
APOE genetic test	21 (88)	3 (12)
Neurological examination	17 (71)	5 (21)
ECG	17 (71)	4 (17)
Chest X-ray	13 (54)	1 (4)
EEG	5 (21)	13 (54)
CSF tapping	0	9 (38)
Blood test		
Plasma A β O	1 (4)	9 (38)
Urinalysis	14 (58)	4 (17)
Stool test	1 (4)	5 (21)

A β O, amyloid- β oligomerization; CT, computed tomography; CSF, cerebrospinal fluid; ECG, electrocardiogram; EEG, electroencephalography; FDG, fluorodeoxyglucose; FP-CIT, 1-n-fluoropropyl-2b-carbomethoxy-3b-(4-iodophenyl) nortropine; MRA, magnetic resonance angiography; MRI, magnetic resonance imaging; PET, positron emission tomography; SPECT, single-photon emission computed tomography; VDRL, venereal disease research laboratory.

batteries, notably SNSB (1–6 months). Intermediate turnaround times were for APOE genetic testing (2–3 weeks) and MRI (2–4 weeks) and PET (2–12 weeks) scans and CERAD-K (1–12 weeks). The mean time from first visit until MCI diagnosis was 2.8 months. Many respondents (46%) highlighted the duration from the first visit until MCI diagnosis (dependent on the neuropsychological examination time) as an area for improvement. A second area of concern was reimbursement and commercialization of tests including “reimbursement of PET” (25%), “commercialization and reimbursement of tau PET” (21%), and “commercialization of plasma tau and amyloid- β ” (17%). Respondents also mentioned limitation of MCI diagnosis criteria including limitation or ambiguity of ADL assessment (25%) and variation in interpretation of neuropsychological examination results to determine cognitive impairment (4%).

Treatment for MCI

Respondents emphasized the twin goals of remaining stable and slowing progression to dementia. Patients need to be provided with explanations about the im-

portance of medication and non-medication therapy and the limited efficacy of current medications.

Most respondents (96%) treated patients with MCI due to AD with medication, commonly choline alfoscerate (71%) and donepezil (53%), which was mainly delivered as combination therapy. Medication was prescribed as a lifelong treatment. Most respondents (93%) also recommended non-medication treatment, commonly exercise (96%), and continuous social and cognitive activity (95%) for patients with MCI due to AD. Most respondents (92%) considered that, despite insufficient evidence, medication was somewhat effective in MCI, although a placebo effect could not be excluded. One benefit of medication is sustaining long-term monitoring of patients.

Follow-Up for MCI Patients

Most respondents (96%) considered that follow-up visits conducted every 3 months were appropriate as there was little change in disease progression over 1 month. For follow-up visits, respondents considered that comprehensive neuropsychological examinations should be conducted annually for reimbursement. If there are

Table 4. Testing in MCI patients

Imaging modality/test	All respondents (n = 24)	Hospital		Specialty		Area	
		tertiary (n = 16)	general (n = 8)	neurologist (n = 14)	psychiatrist (n = 10)	metropolitan (n = 17)	provincial (n = 7)
MRI or CT	100	100	100	100	100	100	100
MRI	86	90	80	83	93	96	69
CT	14	9	20	17	7	4	30
MRA	35	35	36	39	26	29	46
Amyloid PET	33	32	36	30	42	35	31
Plasma A β O	19	8	33	17	23	21	15
FP-CIT PET	8	6	10	4	15	9	6
FDG PET	6	6	5	5	7	4	9
SPECT	6	2	12	2	15	9	1
CSF	1	1	0.1	1	1	0.3	2

Results are shown as percentage (%) of patients treated by survey respondents. Answers are based on replies to Q8 (online suppl. File 1): considering MCI patients which you are currently treating as 100%, what is the percentage of the patients conducting each brain imaging test? A β O, amyloid- β oligomerization; CT, computed tomography; CSF, cerebrospinal fluid; FDG, fluorodeoxyglucose; FP-CIT, l-n-fluoropropyl-2b-carbomethoxy-3b-(4-iodophenyl) nortropane; MRA, magnetic resonance angiography; MRI, magnetic resonance imaging; PET, positron emission tomography; SPECT, single-photon emission computed tomography.

any changes in the patient or, if necessary, additional brain imaging (MRI/MRA/CT) may be considered after 2–5 years. Respondents agreed that both neuropsychological examinations and imaging are also required for rapid symptom progression. Due to its cost, most respondents (92%) considered that amyloid PET should only be conducted once, prior to diagnosis. Respondents agreed that genetic testing should only be performed once, as the genotype is fixed and considered that laboratory tests be conducted annually or whenever deemed necessary.

Unmet Needs and Future Developments

Most respondents considered that the main unmet needs for patient consultation and monitoring were adequate patient/caregiver education (63%) and time constraints for consulting patients (54%). Currently, there are no charges for education and long-time consultation, but about half of the specialists (46%) were willing to provide educational services. In addition, to deal with the manpower shortage, about half of the respondents (46%) recognized the need for additional staff to implement in-hospital educational programs. Four specialists considered that there were no unmet needs.

Discussion

This survey of 24 specialists in dementia care covered current practice of care for patients with MCI due to AD in South Korea, and their views on the unmet needs and possible future developments in MCI management. As early treatment of MCI patients is essential, early diagnosis of the condition is a priority. SNSB was the main neuropsychological examination used by respondents, although both SNSB and CERAD-K can diagnose MCI objectively [10, 14–16]. The SNSB provides a multi-domain evaluation that enables precise differentiation of MCI subtypes. Unlike simplified cognitive screening tools, this battery comprehensively assesses multiple cognitive domains, including attention, language, visuospatial construction, memory (both linguistic and visual), and executive functions. This extensive assessment allows for a nuanced understanding of cognitive impairment mechanisms. Particularly noteworthy is the SNSB's ability to distinguish between different memory impairment patterns. The test can differentiate not only between amnesic and non-amnesic MCI but also between specific memory processing deficits such as encoding failure and retrieval failure [16].

Mandatory MMSE, GDS, CDR, ADL, I-ADL, and genetic testing for the *APOE* gene were assessed by all or nearly all respondents. All respondents used MRI or CT (which included patients contraindicated for MRI). However, a survey of 889 institutions (ranging from tertiary hospitals to primary clinics) conducted between October 2021 to March 2022 reported that the proportion of new outpatients with dementia undergoing brain imaging (CT or MRI) was 63.9% [9]. About one-third of respondents thought that amyloid PET could be used for the diagnosis of MCI due to AD. Most considered that imaging with amyloid PET or MRI is needed to make a differential diagnosis for causative diseases in MCI, but the expense of amyloid PET was a consideration in selecting patients. This may have contributed to the majority view that amyloid PET was an optional technique, whereas MRI was considered an essential imaging modality. However, following the approval of new anti-amyloid drugs such as lecanemab, the landscape of MCI or mild dementia is changing [17]. As lecanemab can be used only for amyloid-positive patients [18], discussions on screening for amyloid PET positivity are needed. Most respondents in the current survey considered that amyloid- β testing for patients with MCI due to AD or subjective cognitive decline is likely to increase. These establishments should provide a definitive diagnosis of MCI due to AD primarily using imaging (amyloid PET, MRI) and prescribe disease-modifying drugs. They regarded primary and secondary hospitals as providers of plasma biomarker testing, medical screening, prescriptions for nootropics and acetylcholinesterase inhibitors, and if possible, patient education. Finally, local dementia centers should conduct basic quality-controlled neuropsychological examinations, non-pharmacological management, and patient education including dementia prevention. Respondents recognized the need for additional staff to implement in-hospital educational programs. Timely referral between local dementia centers, primary/secondary hospitals and clinics, and tertiary/general hospitals is essential for optimal screening and diagnosis of MCI. The symptoms experienced by dementia patients are diverse and often change rapidly, so medical staff with sufficient knowledge and experience in dementia are essential for the proper treatment and management of dementia patients.

The main limitations of the study are the relatively small sample size and the data gathering methodology used (purposive sampling rather than being strictly based on convenience sampling). While we acknowledge the potential limitations of this approach, we aimed to mitigate bias by including specialists from both tertiary and general hospitals, as well as from metropolitan and provincial areas. This diversity enhances the generaliz-

ability of our findings within the specialist community. In conclusion, this survey of specialists in MCI care describes current management of MCI due to AD, identifies unmet needs, and considers possible future developments in the changing landscape of early AD treatment.

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Statement of Ethics

Ethics approval was not required due to local/national guidelines (survey research is exempt from ethical review). Consultancy agreements were received from all specialists who participated in the survey. Written informed consent to participate was not obtained directly but was inferred by completion of the questionnaire/participation in the interview.

Conflict of Interest Statement

JinRan Kim is an employee of Eisai Korea Inc. All other authors received consultancy fees from Eisai Korea Inc., for participating in the survey.

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Author Contributions

Young Chul Youn was responsible for study conception and design. Seong Hye Choi, YongSoo Shim, Dong Won Yang, Kee Hyung Park, Young Chul Youn, and SangYun Kim participated in data collection and analyses. Seong Hye Choi and YongSoo Shim contributed to statistical analysis of the data and prepared the manuscript. JinRan Kim supported collecting data and manuscript development. All authors have reviewed and approved the final version of the manuscript prior to submission.

Data Availability Statement

The data that support the findings of this study are not available publicly due to the potentially sensitive nature of information that could compromise the privacy of research participants and their patients. The data that support the findings of the study will be made available from the corresponding author (Professor Young Chul Youn; neudoc@cau.ac.kr) upon reasonable request.

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