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RESEARCH ARTICLE

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Biomarker counseling, disclosure of diagnosis and follow-up in patients with mild cognitive impairment: A European Alzheimer's disease consortium survey

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Abstract

Objectives: Mild cognitive impairment (MCI) is associated with an increased risk of further cognitive decline, partly depending on demographics and biomarker status. The aim of the present study was to survey the clinical practices of physicians in terms of biomarker counseling, management, and follow-up in European expert centers diagnosing patients with MCI.

Methods: An online email survey was distributed to physicians affiliated with European Alzheimer's disease Consortium centers (Northern Europe: 10 centers; Eastern and Central Europe: 9 centers; and Southern Europe: 15 centers) with questions on attitudes toward biomarkers and biomarker counseling in MCI and dementia. This included postbiomarker counseling and the process of diagnostic disclosure of MCI, as well as treatment and follow-up in MCI.

Results: The response rate for the survey was 80.9% (34 of 42 centers) across 20 countries. A large majority of physicians had access to biomarkers and found them useful. Pre- and postbiomarker counseling varied across centers, as did practices for referral to support groups and advice on preventive strategies. Less than half reported discussing driving and advance care planning with patients with MCI.

Conclusions: The variability in clinical practices across centers calls for better biomarker counseling and better training to improve communication skills. Future

initiatives should address the importance of communicating preventive strategies and advance planning.

KEYWORDS
Alzheimer's disease, biomarker counseling, biomarkers, dementia, diagnosis, diagnostic disclosure, mild cognitive impairment, survey

1 | INTRODUCTION

A growing number of patients are referred for diagnostic evaluation of possible cognitive impairment. This is presumably due to, in part, an increasing prevalence of dementia worldwide,[1,2] but may also be driven by an increased awareness of dementia in the population at large and among physicians.[3] Stakeholders also highlight the need for early diagnosis prior to the stage of dementia to enable adequate support and possibly, in the future, the ability to offer early disease-modifying therapy.[4] This is likely to increase the number of patients diagnosed with more subtle cognitive impairment, which include patients without dementia, but with an underlying neurodegenerative disease and other possibly non-progressive conditions.

The term mild cognitive impairment (MCI) was created to capture a group of those patients with objectively measurable cognitive impairment not fulfilling the criteria for dementia (e.g., no impairment in activities of daily living)[5–7] and not necessarily related to dementia disorders. Although initially developed as a research tool, MCI has since been adopted into clinical practice at many centers. Over the years, the concept has further evolved, especially with the introduction of Alzheimer's disease (AD) biomarkers and the subsequent addition of MCI due to AD and prodromal AD to the diagnostic criteria.[8-10] Although patients with MCI have a higher risk of progression to dementia,[11] this risk varies greatly depending on a variety factors.[12] For example, in one study, having MCI and an abnormal biomarker of amyloid and neurodegeneration was found to increase the lifetime risk of a 60-year-old from 78.1% to 95.6% versus only abnormal markers of neurodegeneration. Moreover, the risk decreased approximately 10% points for a 75-year-old compared to a 60-year-old due to shorter life expectancy.[13]

It should be kept in mind that these estimates do not convey the individual patient's risk of progression, but are estimates at group level. Another issue is that an age-dependent proportion of older people will have asymptomatic amyloidosis in the brain[14] and a relatively high incidence of other age-related conditions that is cerebrovascular disorders which may also affect biomarkers. This is also reflected in the fact that "incidental" amyloidosis can be found in an equivalent proportion of patients with dementia not usually associated with amyloid pathology.[15] This highlights the important issue of biomarker counseling prior to and following sampling in patients with MCI and the ethical dilemmas inherent to early biomarker-based diagnosis.[16] Other issues may make the term MCI difficult to administer in a clinical setting. Whereas a substantial number of patients and caregivers are familiar with the term dementia,[3] MCI is likely to be less familiar. Moreover, conveying the concept of MCI, that is, cognitive deficit but no impairment in activities of daily living, may be challenging.

Key points

- Physicians' practice regarding biomarker counseling, disclosure of diagnosis, and follow-up in patients with mild cognitive impairment is not known
- Practices varied across European centers with regards to a number of issues including biomarker counseling and preventive strategies
- Communications training and development of guidelines on these issues may help to improve practices and realize less variability

Studies have been conducted on the attitudes of physicians toward the concept of MCI,[17] the perception of patients and caregivers concerning disclosure of dementia,[18] the possible benefits of a timely diagnosis,[19] and on disclosing a positive biomarker status to patients with MCI or no cognitive impairment.[20–22] Moreover, previous surveys have examined physician practices for diagnosing MCI, including how the diagnosis was disclosed, the terms that were used, and follow-up.[23–25] However, little is known about how physicians who manage patients with MCI carry out biomarker counseling or how the results and consequences of biomarker sampling are communicated to patients. Additionally, there also is no clinical standard established for biomarker use in MCI-patients.

Thus, the primary objective of the present study was to survey the clinical practices of European physicians in terms of biomarkers and biomarker counseling in MCI. We also assessed how the concept of MCI and biomarker results were conveyed to patients, in addition to how the physician's characteristics may influence how this is done. Finally, we assessed the guidance and management, including follow-up, available to patients with MCI.

2 | METHODS

2.1 | Study design

The present study was designed as a survey of physicians working in European AD Consortium (EADC) centers. EADC is a European

network of centers of excellence working in the field of AD and was established in 2001. The centers conduct research and carry out diagnosis and treatment of patients suspected of having MCI or dementia.

For the present study, we developed two online questionnaires. One was sent to a coordinating doctor (usually a senior specialist) at participating centers and the other to individual center physicians regularly diagnosing and doing follow-up with patients with MCI. To identify centers who were interested in participating, an email was sent to the contact person at each center. Each center was asked to identify at least five physicians who were interested in participating.

The online survey was conducted from 1 February 2019 to 31 April 2019. Participants received an email with a link to the survey, and four rounds of reminders were sent. The questionnaire for coordinating physicians asked about issues on a more organizational level, while the one for individual physicians was divided into three sections addressing attitudes towards biomarkers and biomarker counseling in MCI and dementia; postbiomarker counseling and the process of diagnostic disclosure of MCI; and treatment and follow-up in MCI. The latter questionnaire also included sections on demographics, training, and experience. Physicians were explicitly asked to complete their questionnaire according to their present practice.

To facilitate the statistical analysis, the survey presented answers using a five-point Likert scale of "always/almost always" to "never/almost never"; "very well" to "not at all"; and "to a great extent" to "not at all". Where relevant, "do not know" was also an option, just as space was available to make comments. For ease of reporting, some categories were collapsed into one. The data that support the findings of this study are available from the corresponding author upon reasonable request.

2.2 | Statistical analysis

To explore the factors associated with practice and attitudes in disclosure of diagnosis, we carried out statistical analyses to assess the impact of age, years of experience, whether respondents actively recruited patients with MCI for research, and whether respondents had received training in the process of disclosing a diagnosis of dementia or similar devastating conditions. This was done using the Mann–Whitney *U*-test for independent samples. Where relevant, we also compared differences in respondent practices between patients with MCI and patients with dementia using the Wilcoxon signed-rank test for dependent samples. Statistical analyses were carried out using Intercooled Stata 9.2 for Macintosh (StataCorp LLC,). Level of significance was set at $p < 0.05$ (two-tailed test).

3 | RESULTS

All 69 EADC member centers were emailed and 42 centers agreed to participate. The response rate was 80.9% (35 out of 42) for center coordinating physicians (i.e., number of questionnaires received from the coordinating physician on organizational matters) and 50.6% (110 out of 213) of individual physicians responded to the survey. Some coordinating physicians also completed the individual physician questionnaire. There was a median of three respondents per center (Range: 1–7). Twenty-three centers (67.7 %) were based in neurology, 7 (20.6%) in geriatrics, and 4 (11.8%) in psychiatry. Centers had a median of 600 (range 200–5000) new visits per year. Among newly referred patients, a median of 31.5 % (range 15%–60%) were diagnosed with MCI per month. Every center conducted research, and 32 conducted research that recruited patients with MCI. Three European regions were represented: Northern Europe: 11 centers (Belgium 2, Denmark 1, Finland 1, Germany 3, Ireland 1, the Netherlands 1, Sweden 1, and the United Kingdom 1); Eastern and Central Europe (based on organization for Economic Cooperation and Development definition) and Turkey: 9 centers (Czech Republic 2, Poland 1, Romania 1, Serbia 1, Slovenia 1, Switzerland 2, and Turkey 1); and Southern Europe: 15 centers (France 5, Greece 1, Italy 3, Portugal 2, and Spain 4). All individual respondents reported diagnosing and following patients with MCI. The mean age of individual physicians was 42.1 years (standard deviation 10.1). Respondents reported having a mean of 95.6 (range 4–160) consultations per month. Fifteen respondents (14%) reported that they were not involved in research, and 33 (30%) reported spending 50% or more of their time on research. Table 1 reports additional baseline characteristics for individual respondents.

3.1 | Attitudes toward biomarkers and biomarker counseling in MCI

Almost all respondents had access to magnetic resonance imaging (98.2%; $n = 108$) and cerebrospinal fluid (CSF) sampling (91.8%; $n = 101$), whereas fewer had access to ^{18}F-FDG-PET (74.5%; $n = 82$) and amyloid positron emission tomography (PET; 50.9%; $n = 56$). A majority reported always or usually ordering a magnetic resonance imaging scan (MCI: 81.8%; $n = 90$, dementia: 76.4%; $n = 84$), whereas less than half always or usually ordered CSF sampling or ^{18}F-FDG-PET (Figure S1).

Respondents were also asked about the value of biomarkers. Biomarkers reflecting amyloid pathology was found to be the most valuable to predict progression and rate of progression in MCI patient. Very few found that the biomarkers had no value in this respect (Figure 1, Figure S2).

Most, but not all respondents, always or usually discussed the decision to order biomarkers with patients with MCI (85.7%; $n = 90$) and dementia (81.1%; $n = 86$). A large majority said that they discussed this more in-depth with patients with MCI. Individual physicians recruiting patients with MCI for research were more likely to do so (Table 2). Most, but not all of the respondents always or usually discussed the ability to diagnose the underlying etiology in patients suspected of having MCI (actively recruiting $p = 0.002$; Table 2). Fewer respondents always or usually discussed the ability to predict progression (MCI: 61.0%; $n = 61$, dementia: 68.1%; $n = 64$) and the uncertainties of biomarker interpretation with patients prior to sampling (MCI: 60.6%; $n = 60$, dementia: 53.3%; $n = 56$).

TABLE 1 Individual physician characteristics

Age, *n*[a] (%)	
n ≤ 40 years	50 (45.5)
n > 40 years	60 (54.5)
Sex (female), *n* (%) (*n* = 109)	64 (58.7)
Specialists, *n* (%)	
Neurologist	60 (54.6)
Geriatrician	10 (9.1)
Psychiatrist	11 (10.0)
Old age psychiatrist	8 (7.3)
Other specialty	4 (3.6)
No	17 (15.5)
Clinical experience with dementia patients, *n* (%)	
≤5 years	32 (29.1)
>5 years	78 (70.9)
Communications training	
Has received formal communications training	33 (32.4)
Has not received formal communications training	77 (67.6)

[a]*n* = 110 unless otherwise stated.

3.2 | Postbiomarker counseling and diagnostic disclosure of MCI

The diagnosis of dementia was found to be more meaningful to more respondents than MCI ($p = 0.0002$; Table 2). Most respondents (79.1%; $n = 87$) never or seldom found that the diagnosis of MCI was unethical. For MCI disclosure guidelines, 28.3% ($n = 30$) reported having access to guidelines (dementia: 46.2%; $n = 49$).

Almost all respondents disclosed the MCI diagnosis when it was suspected. Risk of progression and the probable underlying etiology but not the probable rate were often discussed with patients with MCI (Table 2). About half disclosed the risk of progression and underlying cause regardless of whether the patient asked. A substantial minority only did so if asked by the patient (Table 3). Linguistically the term reported used most often was MCI and rarely or never "a form of mild dementia" and "predementia stage" (Figure 2). Regarding tools used when disclosing the diagnosis of MCI, a little over half always or usually showed brain imaging scans, whereas about a quarter seldom or never showed brain imaging scans (communications training: $z = 0.04$; $p = 0.04$; Table 2).

3.3 | Management of patients with MCI

Almost all respondents reported following up on MCI (95.2%; $n = 100$) and patients with dementia (90.48%; $n = 95$). Half (50.5%; $n = 53$) reported following patients with MCI for ≥5 years and 45.3% ($n = 48$) for dementia. Regarding frequency of visits, 37.7% ($n = 40$) reported seeing patients with MCI twice a year, while 47.6% ($n = 50$) did so for patients with dementia. A total of 67.3% ($n = 70$) respondents reported that local support groups were available. Treatment with cholinesterase inhibitors in patients with MCI was offered always or usually by 23.6% ($n = 25$) and seldom or never by 50.0% ($n = 53$). Data on the prevalence of testing for the Butyrylcholinesterase K variant in patients started on cholinesterase inhibitors were not collected. A majority also addressed nonpharmacological treatment (Figure S3).

A little less than half always or usually reported discussing driving when giving the MCI diagnosis, whereas most discussed this with patients with dementia (Table 2). A similar pattern emerged for legal matters (Table 2).

4 | DISCUSSION

Our study presents the results of a survey of 34 EADC centers of excellence working in the field of AD and 110 individual physicians affiliated to the centers on various aspects of the diagnostic disclosure and management of MCI, including biomarker counseling. Our most important finding is that there is a high degree of heterogeneity across centers, particularly regarding counseling (e.g., prebiomarker counseling). In addition, a relatively high number of physicians did not discuss preventative measures with patients or planning for the future for instance by mentioning advance directives.

One of the arguments for early diagnosis is to offer support and possibly treatment, including the possibility of participating in trials with potentially disease-modifying therapy, to patients with MCI.[26] For this reason, all patients should ideally have the opportunity to participate in support groups, and all patients should be offered counseling on how to mitigate the risk of progression. About two-thirds of respondents reported that it was possible to refer patients to local support groups. About three-fourths mentioned physical exercise as an intervention for MCI, and fewer than three-fourths discussed other possible strategies to reduce the risk of progression. There was also a clear difference in how often respondents discussed driving and advance planning with patients diagnosed with MCI versus dementia. Although it would be logical to assume that advance planning is best handled at an early stage of cognitive impairment, reluctance to engage in possibly difficult issues may be related to the attitudes of the physician but may also be due to patient preference to avoid dealing with emotionally difficult issues. For many patients, the issue of whether the cognitive impairment may affect driving, is a sensitive one. Regardless it may be relevant even in patients with MCI to discuss driving, and possibly especially so in certain cognitive subtypes of MCI such as patients with dys-executive syndrome or prominent visuo-cognitive impairment.

A large majority of respondents found that biomarkers were helpful in predicting progression to dementia in patients with MCI. Respondents saw AD biomarkers (tau and beta-amyloid) as the most

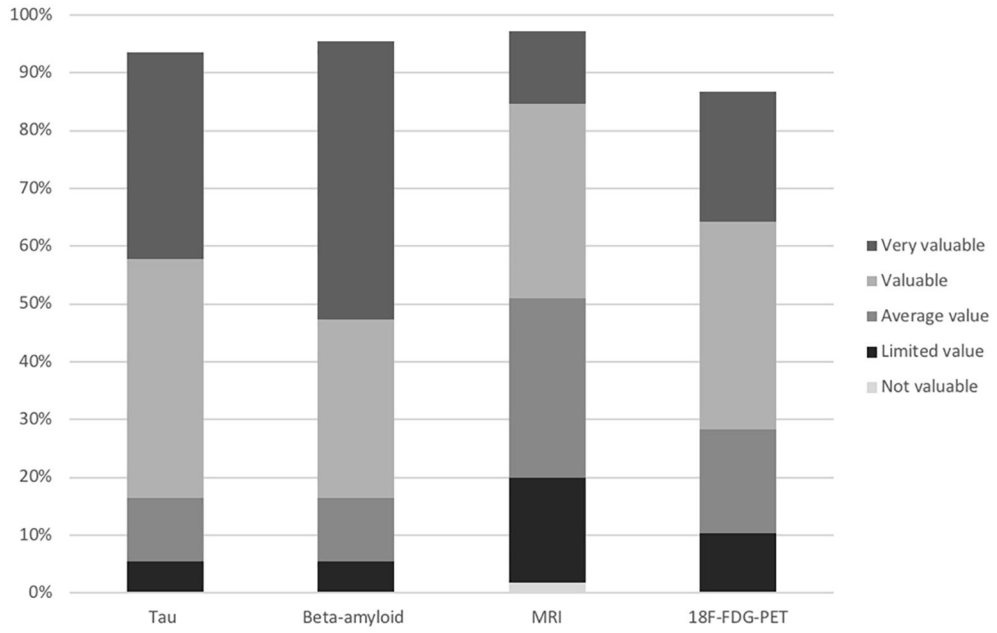

FIGURE 1 Biomarkers for predicting progression. The figure displays individual physicians' evaluation of the value of biomarkers for predicting progression from mild cognitive impairment. "Do not know" replies are not displayed for ease of interpretation

valuable, which could indicate that MCI is often seen within a clinico-biological AD framework. However, CSF sampling and amyloid PET were nevertheless reported as performed in a minority of patients suspected of MCI in our study, which is in line with previous findings.[27] This may be due to funding issues, reimbursement, and access to PET facilities and tracers. Although 85.1% of respondents reported always or usually discussing biomarker sampling with patients, it follows that 14.9% do not. This distribution was the same for patients with dementia. In patients with dementia, refraining from discussing biomarker sampling may reflect the perception that conveying this type of information is difficult due to impaired capacity to consent. However, even if the patients would be unable to give informed consent, a legal representative could substitute. Providing inadequate information to the patient prior to biomarker sampling is problematic for several reasons. For example, the patient has the right to both know and not know what their prognosis is.[16] Thus, inadequate biomarker counseling may compromise nonmaleficence or the ethical principle of autonomy.

Another issue is that biomarkers may be perceived as potentially more harmful in MCI due to the uncertainty related to individual patient prognosis. Although the probability of progression from MCI to dementia on a group level is highly increased depending on the biomarker status,[28] it is difficult to determine at the individual patient level, with some patients progressing after variable time periods, some remaining stable, and some reverting back to normal cognition.[6,29-31] Modelling of the risk of progression at the individual patient level is underway[32] and likely to improve the ability of physicians to counsel patients about the individual risks of progression. The present study found that slightly more than half of respondents always or usually discussed the uncertainty of the biomarker results with their patients. In another study, in patients suspected of having dementia, physicians did not discuss the uncertainty related to the diagnosis in about a third of consultations.[33]

Physicians in routine clinical settings may fail to undertake a discussion of the uncertainty regarding biomarkers for several different reasons. For example, they may be a lack of knowledge and unfamiliarity with (CSF) biomarker sampling, or generally a disbelieve that biomarkers are accurate, or variability in the distribution of the types of patients individual physicians are faced with. It may also be that the probability of conflicting biomarker results is high implying that the interpretation of AD biomarkers is complicated by multiple biomarker constellations.[34] Or there may be a reluctance to introduce uncertainty into the diagnosis, or a belief that uncertainty may weaken the patients' trust in the physician. In our study, around 60% always or usually included information on how biomarkers may help estimate the risk of progression. Physicians may also avoid prognostication due to various perceptions or feelings, such as a sense of discomfort in terms of uncertainty, delivering bad news, or taking away hope. However, the right to know, which derives from the moral value of respect for autonomy, is a central argument in favor of biomarker testing.[35] Furthermore, withholding information and dishonesty may have consequences for the patient–doctor relationship and thus, ultimately, for the patient.[36] Moreover, not being open about the risk of progression may deprive the patient of the chance to plan for this eventuality. Lastly, evidence suggests that disclosing amyloid biomarker status is safe,[37] which means that, with the right support and information, it is unharmful to be forthcoming about biomarker results. As always, an individualized approach is advisable as there also is a wish not to know their prognosis.[16,18,38] Indeed, comments from respondent in the present study indicate that they try to tailor information and diagnostic

TABLE 2 Results from questions on attitudes towards biomarkers

	Always/almost always (%)	Usually (%)	About half the time (%)	Seldom (%)	Never/almost never (%)	*p*-value
Tend to discuss more in-depth with MCI versus dementia[a]						
Actively recruiting MCI	43.8 ($n = 32$)	30.1 ($n = 22$)	8.2 ($n = 6$)	12.3 ($n = 9$)	5.5 ($n = 4$)	0.008*
Not actively recruiting MCI	13.3 ($n = 4$)	43.3 ($n = 13$)	10.0 ($n = 3$)	13.3 ($n = 4$)	20.0 ($n = 6$)	
Discuss ability to diagnose underlying cause of MCI						
Actively recruiting MCI	80.0 ($n = 56$)	14.3 ($n = 10$)	1.4 ($n = 1$)	4.3 ($n = 3$)	0	0.002*
Not actively recruiting MCI	45.8 ($n = 11$)	41.7 ($n = 10$)	12.5 ($n = 3$)	0	4.2 ($n = 1$)	
Meaningfulness of diagnosis (physician)						
MCI	49.5 ($n = 54$)	44.0 ($n = 48$)	2.8 ($n = 3$)	1.8 ($n = 2$)	1.8 ($n = 2$)	0.0002**
Dementia	75.5 ($n = 83$)	17.3 ($n = 19$)	0.9 ($n = 1$)	6.4 ($n = 7$)	0	
Meaningfulness of diagnosis (patient)						
MCI	29.1 ($n = 32$)	52.7 ($n = 58$)	5.5 ($n = 6$)	12.7 (14)	0	<0.00001**
Dementia	64.6 ($n = 71$)	20.9 ($n = 23$)	6.4 ($n = 7$)	6.4 ($n = 7$)	1.8 ($n = 2$)	
Meaningfulness of diagnosis (caregiver)						
MCI	30.6 ($n = 33$)	48.2 ($n = 52$)	9.3 ($n = 10$)	11.1 ($n = 12$)	0.9 ($n = 1$)	<0.00001**
Dementia	80.0 ($n = 88$)	12.7 ($n = 14$)	2.7 ($n = 3$)	3.6 ($n = 4$)	0.9 ($n = 1$)	
Discuss risk of progression						
MCI	39.8 ($n = 41$)	36.9 ($n = 38$)	11.7 ($n = 12$)	6.8 ($n = 7$)	4.9 ($n = 5$)	<0.00001**
Dementia	48.1 ($n = 50$)	30.8 ($n = 32$)	9.6 ($n = 10$)	9.6 ($n = 10$)	1.9 ($n = 2$)	
Discuss probable underlying cause						
MCI	30.7 ($n = 27$)	45.5 ($n = 40$)	13.6 ($n = 12$)	5.7 ($n = 5$)	4.6 ($n = 4$)	<0.00001**
Dementia	59.1 ($n = 62$)	27.6 ($n = 29$)	6.7 ($n = 7$)	3.8 ($n = 4$)	2.9 ($n = 3$)	
Shows brain imaging when disclosing MCI diagnosis						
Communications training	45.5 ($n = 15$)	24.2 ($n = 8$)	12.1 ($n = 4$)	3 ($n = 1$)	15.2 ($n = 5$)	0.04**
No communications training	22.9 ($n = 16$)	30.0 ($n = 21$)	14.3 ($n = 10$)	17.1 ($n = 12$)	33.3 ($n = 11$)	
Use other aids when disclosing MCI diagnosis						
Communications training	35.7 ($n = 25$)	50.0 ($n = 35$)	4.3 ($n = 3$)	7.1 ($n = 5$)	2.9 ($n = 2$)	0.002**
No communications training	14.7 ($n = 5$)	29.4 ($n = 10$)	5.9 ($n = 2$)	26.5 ($n = 9$)	23.5 ($n = 8$)	
Discuss driving						
MCI	21.0 ($n = 22$)	27.6 ($n = 29$)	17.1 ($n = 18$)	27.6 ($n = 29$)	6.7 ($n = 7$)	<0.00001
Dementia	62.7 ($n = 66$)	27.6 ($n = 29$)	7.6 ($n = 8$)	1.9 ($n = 2$)	0	
Discuss other legal matters						
MCI	14.3 ($n = 15$)	12.4 ($n = 13$)	18.1 ($n = 19$)	35.2 ($n = 37$)	20.0 ($n = 21$)	<0.00001
Dementia	29.8 ($n = 31$)	33.7 ($n = 35$)	12.5 ($n = 13$)	16.4 ($n = 17$)	7.7 ($n = 8$)	

Note: Actively recruiting refers to whether individual physicians at the time of the survey were actively recruiting patients with MCI to research trials.

Abbreviation: MCI, mild cognitive impairment.

[a]Likert scale items for this question were: very well, well, fairly well, poorly, and very poorly.

*p-values show results from Man-Whitney U-test for independent samples comparing respondents actively recruiting patients with MCI. Non-significant results were found for age and years of experience for all questions. **p-values are for results from Wilcoxon signed-rank tent for dependent samples comparing MCI versus dementia.

TABLE 3 Disclosure of diagnosis and prognosis in MCI and dementia

	Yes, regardless of whether the patient asks about it (%)	Only if the patient asks about it (%)	Never, even if the patient asks about it (%)	It depends on whether I think the patient may benefit from it (%)
Probability of progression				
MCI	54.3	35.2	0	10.5
Dementia	55.9	34.3	0	9.8
Possible/probable rate of progression				
MCI	30.5	50.5	8.6	10.5
Dementia	30.4	52.9	2.9	11.8
Possible future symptoms				
MCI	22.9	57.1	5.7	14.3
Dementia	33.3	50.0	1.0	15.7
Possible underlying pathology				
MCI	51.9	30.2	2.8	15.1
Dementia	71.8	22.3	0	5.8

Abbreviation: MCI, mild cognitive impairment.

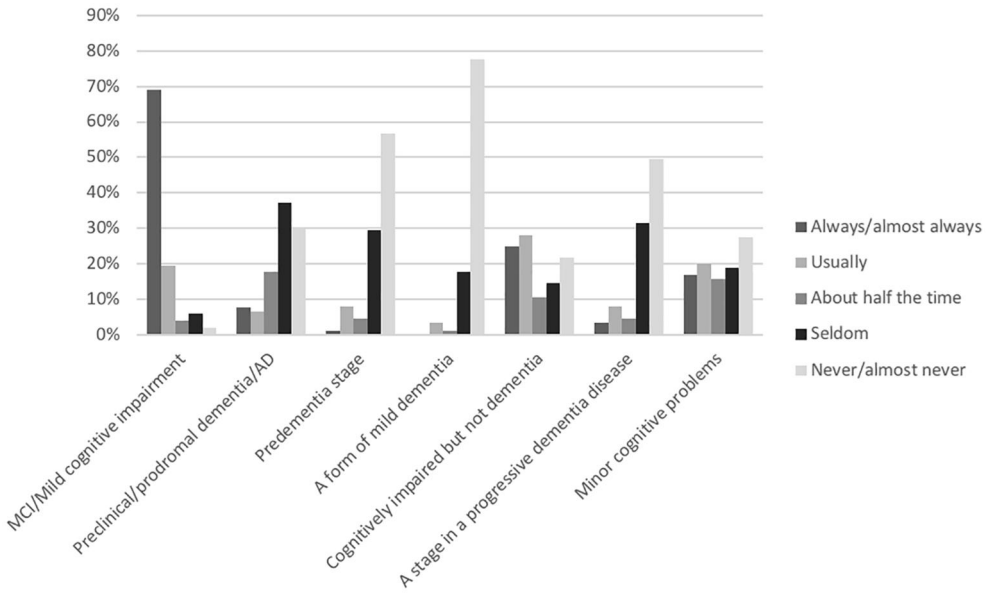

FIGURE 2 Terms used when disclosing a diagnosis of mild cognitive impairment. The figure displays individual physicians' response with regards to questions on language used when disclosing a diagnosis of MCI. AD, Alzheimer's disease; MCI, Mild cognitive impairment

disclosure to avoid, for example, not overwhelming the patient, which is a risk.[39]

One way to ensure adequate pre- and postbiomarker counseling is to have guidelines available. A total of 28.3% of respondents reported that national or local guidelines were available on diagnostic disclosure of MCI, while 46.8% reported the same for dementia. This is in line with previous findings.[23,40] To our knowledge, no international guidelines have been published on this topic, although some recommendations exist.[41,42] Such guidelines would be relevant for centers with relatively easy access to biomarkers, but less so in areas where access is limited.

Our study has limitations. Because we exclusively surveyed EADC expert centers, our findings may only be generalizable to tertiary centers with a high degree of specialization and access to biomarkers. In less specialized centers, using biomarkers may play a lesser role in diagnostic disclosure and MCI as a diagnosis may

instead primarily be used to describe the functional level of patients rather than their clinico-biological trajectory. Nevertheless, our survey sample may reflect other parameters in memory clinics, for instance distributions between medical specialties. Moreover, although we explicitly asked respondents to answer according to their actual practice, it is not possible to distinguish attitudes from actions.

In conclusion, we found that biomarkers are widely used in patients with MCI, but that not all patients receive adequate pre- and postbiomarker counseling. Clinical dementia practice varied greatly across centers, which may indicate that physicians lack guidance on issues related to diagnostic disclosure, including biomarker counseling. Training that enhances communication skills may represent one way of improving diagnostic disclosure. At present, because disease-modifying therapies are not available for patients with prodromal AD, additional emphasis must be put on preventive strategies, such as encouraging exercise and smoking cessation, but also on discussing advance planning and continued participation in clinical trials of emerging new treatments.

CONFLICT OF INTEREST

Kristian S. Frederiksen, T Rune Nielsen, Ildebrando Appollonio, Birgitte Bo Andersen, Mario Riverol, Mercè Boada, Mathieu Ceccaldi, Bruno Dubois, Sebastiaan Engelborghs, Lutz Frölich, Lucrezia Hausner, Audrey Gabelle, Tomasz Gabryelewicz, Bernard Hanseeuw, Jakub Hort, Jacques Hugon, Vesna Jelic Anne Koivisto, Milica G. Kramberger, Thibaud Lebouvier, Alberto Lleó, Alexandre de Mendonça, Flavio Nobili, Pierre-Jean Ousset, Robert Perneczky, Marcel Olde Rikkert, David Robinson, Olivier Rouaud, Elisabet Sánchez, Isabel Santana, Katerina Sheardova, Stephanie Sloan, Luiza Spiru, Elka Stefanova, Latchezar Traykov, Görsev Yener, Gunhild Waldemar have no conflicts of interest regarding this manuscript. Outside the submitted work Dr. Grimmer reported having received consulting fees from Actelion, Biogen, Eli Lilly, Iqvia/Quintiles; MSD; Novartis, Quintiles, Roche Pharma, lecture fees from Biogen, Lilly, Parexel, Roche Pharma, and grants to his institution from Actelion and PreDemTech. Outside the submitted work Dr. Scarmeas reports grants from Alzheimer's Association, grants from European Social Fund, grants from Ministry for Health Greece, during the conduct of the study; personal fees from Merck Consumer Health, personal fees from NIH, grants from EISAI, personal fees from EISAI Korea, grants from EPAD.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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