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Diagnosis of dementia in primary care: results of a representative survey in Lower Saxony, Germany

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Abstract To investigate whether an early diagnosis of dementia is established, whether a differentiation is made between vascular and primary degenerative etiology, and whether treatable causes of dementia are considered in primary care, we performed a survey using three written sample case histories describing slight memory impairment (case 1) or moderate dementia (case 2a: vascular dementia; case 2b: degenerative dementia of Alzheimer type). The combinations 1 and 2a or 1 and 2b were randomly assigned and presented to ambulatory-care physicians (145 general practitioners and primary care internists and 14 neuropsychiatrists in private practice) in Göttingen and rural surroundings by a trained investigator who then performed a standardized interview. The study was representative (response rate 83.2%). For the sample case with slight memory complaints 13.8% of all physicians arrived at a primary diagnosis of depression and 44.0% considered depression for differential diagnosis. Senile dementia of Alzheimer type was considered less often. In the sample cases with moderate dementia according to established scientific criteria, there was a striking under-diagnosis of dementia, and in both cases an over-diagnosis of underlying vascular etiology. Treatable causes of dementia, such as possible drug interactions and substance abuse, were considered only by a minority of physicians. In conclusion, memory deficits seem to be regarded mainly as consequences of disturbed cerebral perfusion, and dementia as well as depression and drug adverse effects seem to be under-diagnosed in primary care.

Key words Memory disorders · Dementia · Depression
Diagnosis · Primary care

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Introduction

In the industrialized countries epidemiological studies reveal growing numbers of both elderly and demented patients. The economic burden imposed by dementing illnesses on society will continue to increase in the coming years [13, 25]. Among the elderly the diagnostic spectrum includes senile primary degenerative dementia of Alzheimer type (SDAT), which comprises more than 50% of all cases, vascular dementias (VDs), which make up about 15%, mixed forms of both in approximately 20% of all cases, and other forms of dementia in a minority of cases [19, 42]. Especially in the early stages of SDAT its differentiation from normal aging and from old-age depression may be difficult, due to a large syndromatic overlap [5, 18, 40]. Because depression and drug side effects – another significant cause of memory disorders in the elderly – can be treated well, and because the course of dementias might be best influenced when treatment starts in the initial stages, early differentiation is of primary importance. The introduction of specific treatments for SDAT with significant potential for side effects [8, 14, 39], and the amelioration of the course and progression of vascular dementias by treating underlying risk factors and prescribing aspirin [7, 31], makes a differentiation between SDAT and VD essential. However, in the absence of specific diagnostic markers the (differential) diagnosis of DAT and VD is based mainly upon clinical criteria. Because the majority of elderly patients are diagnosed and treated by their family physicians, we were interested in investigating the early and differential diagnostic accuracy regarding memory impairment achieved by primary-care physicians. In the following we present the results of a representative survey.

Materials and methods

We performed a survey using sample case histories (case vignettes). On the basis of two pilot studies we developed the following design: two trained investigators (J.K. and S.W.) phoned

all primary-care physicians (in the German health system these are all general practitioners and many internal-medicine specialists) and specialists for nervous disorders (neurologists and psychiatrists) who maintain private practices in Göttingen (a university town with approximately 120,000 inhabitants) and vicinity (including largely rural areas and two smaller towns of approximately 11,000 and 19,000 inhabitants). A face-to-face interview was requested. In the practice they asked the physicians to fill out a short questionnaire concerning statistical data: age, gender, medical education, list size, etc. Then the interviewers presented two written case vignettes to each physician, one describing a slight and nonspecific memory problem (case 1) and the other describing a moderate dementia in a multimorbid patient who is also on continuous drug therapy (case 2). From the latter, one version (case 2a) described the characteristics of VD, the other (case 2b) described those of SDAT. Both versions were randomly assigned (1 + 2a or 1 + 2b). Afterwards, the interviewers asked them standardized questions and categorized the answers. Thus suggestive effects of given answer categories were avoided and clarifying questions were possible, especially concerning the term *cerebral sclerosis*, which is quite popular in Germany. For example, when this diagnosis was mentioned the interviewers asked whether this would implicate dementia, and if the physician though that cerebrovascular disorders are the reason for this syndrome. If the patient was diagnosed as not demented, but the symptoms were nonetheless attributed to vascular etiology, we used the term *vascular encephalopathy* for categorization. The interview had a mean duration of 15 min. The study was performed from February to July 1993.

Case vignettes

Case one

Case one was designed in order to investigate early differential diagnostic considerations. It describes a common but unspecific memory problem in a patient free of other diseases or vascular risk factors.

Text. A 70-year-old woman whom you have known for several years presents at your clinic. Severe diseases are not known to you. She takes no medication on a regular basis. Following the death of her husband 5 years ago, she has been living alone in a three-bedroom apartment and caring for the household on her own. Her only daughter works full-time and lives with her husband and children in the same community. The patient reports progressive complaints noted over the past 6 months, which she describes in the following way: "I often misplace my keys. When I am shopping, I sometimes don't know what I should buy. When I read a book, I often have difficulties remembering the last couple of pages. When I talk with others I often have trouble following the gist of the conversation. This is embarrassing and makes me nervous and insecure. My concentration is getting steadily worse."

Case two

Case two describes a patient with the same social characteristics as the patient in case 1. She suffers, however, from common diseases of the aged and is treated with medication on a regular basis. This patient is clearly demented. Based on clinical dementia criteria, case 2a describes a vascular dementia and case 2b describes a SDAT.

Text. A 70-year-old woman whom you have known for several years presents at your clinic accompanied by her daughter-in-law. She suffers from adiposity (75 kg body weight and 160 cm height), hypercholesteremia (values of approximately 300 mg%) and type-II diabetes mellitus, which is well managed with oral anti-diabetics. Her arthrosis is treated occasionally depending on the presence of symptoms. Because of a myocardial insufficiency and arterial hypertension (blood pressure approximately 200/100 mmHg) you treat her with a diuretic and digitalis.

Two years ago the patient experienced an acute loss of hearing; 1 year ago she had a transitory weakness of the right arm. Since then she has complained of diffuse dizziness, headache, a declining ability to concentrate, and a worsening memory. Her daughter-in-law tells you that recently she has often been delirious during the night and has wandered through the house. The patient has also misplaced her purse or other items on several occasions and placed the blame on others. Her daughter-in-law remembers that the patient's deterioration occurred stepwise. There have also been periods, however, in which she behaved as before. The patient lives in her own apartment within her son's house. Her husband died 5 years ago. Your examination reveals disorientation to time and, to some degree, to place. Neurological examination reveals a slight right-sided accentuation of tendon reflexes in the upper extremities.

Case report 2b differs only in the information contained within the previous paragraph: The patient complains about progressive concentration and memory deficits. They began about 2 years ago and have progressed continuously. She has become increasingly insecure as she is unable to process new information or solve new problems on her own. Her daughter-in-law reports that she often leaves the oven on, misplaces items, and that she has become less active. Conversation has become more and more difficult, because she has difficulty in finding words and repeats the same questions 5 min later. The patient lives in her own apartment within her son's house. Her husband died 5 years ago. Your examination reveals disorientation to time and, to some degree, to place. Neurological examination reveals no remarkable pathology.

The responses to the following questions are discussed in this paper: (1) What disorder do you think the patient has (primary diagnosis, one answer possible)? and (2) What is your differential diagnosis (multiple answers possible)? Neuropsychiatrists and family physicians (general practitioners and primary-care internists) were compared on a statistical basis with regard to their responses pertaining to case 1 using the χ^2 test. The responses to versions 2a and 2b on the part of all physicians were also analyzed using the χ^2 test. A comparison of the two physician groups with regard to case 2 was not suitable, because of the small number of neuropsychiatrists in each group. Because each physician got case 1 and one of the two versions of case 2, the responses to cases 1 and 2 were not independent, and we therefore used the McNemar test for the comparisons between cases 1 and 2. Results were regarded as significant at a level of $P < 0.05$.

Results

In the investigation area 258 physicians (178 family doctors, 48 internal-medicine specialists, and 32 neuropsychiatrists) are in private practice. A total of 67 physicians were excluded, because they had no contact with elderly patients on the basis of a certain specialization (e.g., neuropsychiatrists working exclusively as psychotherapists or psychoanalysts, and internal-medicine specialists not working as primary-care physicians). From the remaining physicians 83.2% took part in the study. The responder group and the nonresponder group did not differ significantly on the basis of any of the available data (age, gender, list size, specialization, and location). Thus, criteria for a representative study were achieved.

Primary diagnoses for case I were classified as follows: most of the family physicians diagnosed vascular encephalopathy (36.6%) followed by age-associated memory impairment (AAMI), depression, and SDAT. Of the family physicians 10.3% considered the patient to have no disease at all, whereas none of the neuropsychiatrists arrived at that diagnosis. Most neuropsychiatrists considered depression (42.9%), followed by SDAT and vascular

Table 1 Case 1, primary diagnosis and differential diagnosis (includes primary diagnosis), main results. AAMI age-associated memory impairment; VD vascular dementia; SDAT senile dementia of Alzheimer's type

Diagnosis	Primary diagnosis (%)*		Differential diagnosis (%)	
	Neuro-psychiatrists (n = 14)	Family physicians (n = 145)	Neuro-psychiatrists (n = 14)	Family physicians (n = 145)
No disease	0.0	10.3	0.0	24.1*
AAMI	7.1	24.1	7.1	31.7
Vascular encephalopathy	14.3	36.6	50.0	55.9
VD	7.1	2.1	14.3	5.5
SDAT	21.4	11.0	42.9	36.6
Depression	42.9	11.0	78.6	40.7*
Others	7.1	4.9		

* $P < 0.05$ (χ^2 test)

Table 2 Case 2, primary diagnosis and differential diagnosis (includes primary diagnosis)

Diagnosis	Primary diagnosis (%)		Differential diagnosis (%)	
	Case 2a (n = 78)	Case 2b (n = 81)	Case 2a (n = 78)	Case 2b (n = 81)
No disease	0.0	1.2	6.4	4.9
AAMI	0.0	0.0	0.0	2.5
Vascular encephalopathy	51.3	43.2	66.7	63.0
VD	37.2	14.8*	48.7	28.4*
SDAT	5.1	25.9*	21.8	50.6*
Depression	0.0	0.0	5.1	14.8*
Drug side effects	1.3	2.5	1.3	7.4
Thyroid dysfunction	5.1[a]	11.1[a]	15.4	30.9*

* $P < 0.05$ (χ^2 test)
[a] All extracerebral disorders

encephalopathy. Diagnostic considerations differed significantly between the physicians' groups (Table 1).

The range of differential diagnoses includes those cited as primary diagnoses, and thus covers the whole spectrum of differential diagnostic thoughts. Data regarding primary and differential diagnoses must therefore not be added. The differential diagnosis of most family physicians included vascular encephalopathy (55.9%), followed by depression and SDAT. Many of these physicians considered that the patient might have no disease (24.1%) or AAMI (31.7%), whereas again the neuropsychiatrists almost never thought the symptoms to be indicative of normal aging or AAMI. A significantly higher percentage of specialists (78.6%) compared to family physicians (40.7%) included depression in their differential diagnosis. Two of the neuropsychiatrists (14.3%) considered myocardial insufficiency or thyroid dysfunction compared to 6.9 and 8.3%, respectively, of the family physicians. Other cerebral diseases were discussed by more than 20% of both groups; other psychiatric disorders by 21.4% of the neuropsychiatrists and 9% of the family physicians. No significant difference was observed between the two groups with regard to the following differential diagnoses (data are given as the sum of both groups together): Parkinson's syndrome (2.5%), anemia (2.5%), renal insufficiency (2.5%), diabetes mellitus (7.5%), cardial arrhythmia (3.8%), liver disease (5.0%), alcoholic disorder (3.8%), and drug-induced disorder (1.3%). Detailed data are shown in Table 1.

As for case 2 primary diagnosis differed between version 2a and 2b only with regard to the VD and SDAT frequency: SDAT was diagnosed in 5.1% of version a cases and in 25.9% of version b cases ($P = 0.001$); VD was diagnosed in 37.2% (2a) and 14.8% (2b) of cases, respectively ($P = 0.001$). The majority of physicians diagnosed a vascular encephalopathy – meaning no dementia – in both cases (51.3% [2a] and 43.2% [2b]), only a negligible minority considered drug adverse effects as a primary diagnosis (1.3% [2a] and 2.5% [2b]). Depression, AAMI, or other psychiatric disorders were not mentioned as primary diagnoses and "no disease" or "other cerebral diseases" only once each.

Because multiple answers were possible for differential diagnosis, the spectrum of etiological considerations was far more variable. Just as in case 1 the most frequent differential diagnosis for case 2 was vascular encephalopathy (66.7% [2a] and 63.0% [2b]) followed by dementia(s), brain tumors, and other cerebral diseases (27.7% [2a and 2b together]), diabetes mellitus (27%), thyroid dysfunction, heart disease (myocardial insufficiency [16.4%], cardial arrhythmia [6.3%]), and liver disease (11.3%). Even as differential diagnosis only a small number of physicians considered drug side effects (4.4%), although the patient in case 2 was on multiple drug therapy. Regarding differential diagnosis as it varied between the two versions, again significantly more physicians chose SDAT in case 2b (50.6% [2b] vs 21.8% [2a]; $P < 0.0002$) and VD in case 2a (48.7% [2a] vs 28.4% [2b]; $P < 0.01$), which confirms the tendency of primary diagnosis. Other significant differences between the two versions were observed for depression and thyroid dysfunction, which were both regarded as being more probable in the

continuously progressive dementia of case 2b. Detailed data are given in Table 2. Only rarely (less than 5% each) were the following disorders considered for differential diagnosis, however, again without significant differences between the physician groups (the percentage given for case 2a and 2b together): Parkinson's syndrome (2.5%), anemia (0.6%), avitaminosis (1.9%), renal insufficiency (3.1%), alcoholic disorder (2.5%), and other psychiatric disorders (3.8%).

The comparison between neuropsychiatrists and family physicians in case 2 (a and b combined) revealed significant differences in as much as the neuropsychiatrists diagnosed dementia (92.9 vs 60.0%; $P < 0.02$) and VD (71.4 vs 35.2%; $P < 0.008$) more often. Given the small number of neuropsychiatrists a differentiation was not possible between versions a and b in this regard.

Interestingly, we did not find any association between diagnostic behavior and physician and practice criteria (age, gender, and years of education of the physician; size and location of the practice) or a presumed interest in geriatric (psychiatric) topics.

Discussion

Our study focused on all physicians who are responsible for diagnostic and therapeutic decisions regarding psychiatric disorders in the elderly. In the German health care system there is no designated "gate keeper," and physicians are allowed to practice in the community in a very specialized setting. Family physician functions are normally taken care of by general practitioners and many internal-medicine specialists. We therefore focused on these physicians and used the neuropsychiatrists working in private practice for comparison purposes. Some subspecialties were excluded.

The method we used is well known in epidemiological research. Previous studies have shown that the responses to these fictional cases are comparable to the behavior in reality [22, 27]. The possible counter-argument, that nonverbal information derived from gesture and visual impression, and the style of communication is missing [35], is balanced by advantages concerning standardization. We also tried to design typical and frequently occurring histories, the success of which was confirmed by many of the physicians taking part in this study who said that they had no difficulty in imagining such a patient. Because our goal was to measure diagnostic competence, the argument that experimental studies measure competence better than actual behavior was of no major importance [35]. The use of open questions instead of potentially suggestive questionnaires also served to minimize the risk of responses being influenced by presumed expectations of the investigators [35].

The differential diagnosis of memory disorders remains a clinical task, because there are as yet no diagnostic markers specific for the most frequent dementias. Diagnosis should be carried out in three steps: First, a dementia syndrome has to be diagnosed. The second step is to recognize the underlying condition. The third step should clarify whether underlying conditions and dementia are reasonably related [17, 33, 36]. Criteria for the diagnosis of a dementia syndrome are outlined in the DSM-III-R [1] and ICD–10 [43]. Our case vignettes were designed according to these criteria, and if we apply them to our cases we have no signs of certain dementia in case 1, but regarding the progressive 6-month course there is a potential prodromal syndrome. In case 2 criteria for moderate dementia are fulfilled. Bereavement was 5 years prior in both cases, excluding acute grief reactions. In case 1, where the patient complains of disturbances of memory, concentration, and a progressive irritability, the main differential diagnosis should be geriatric depression. Case 2a and 2b, which describes a multimorbid demented patient on continuous drug treatment, should provide evidence of whether the physicians have possible interactions of systemic disorders and adverse drug effects in mind. Thus, the two main causes of treatable dementias in old age were covered by the case vignettes.

The results of this study show unequivocally that dementia is widely under-diagnosed. As a primary diagnosis dementia was diagnosed significantly more often in case 2 (a and b) than in case 1 ($P < 0.01$, McNemar test), but more physicians would term this disorder "nonspecific" cerebrovascular encephalopathy (for definition see *Materials and methods*) than dementia. This trend is more pronounced in the differential diagnosis, where more than 50% (case 1) and 60% (case 2) of both physician groups considered this diagnosis, although, at least in case 1, there were no cerebrovascular risk factors present. The specialists diagnosed dementia significantly more often than the family physicians in both cases, which indicates the importance of knowledge acquired through specialization. The argument that dementia diagnosis represents a stigma, and is therefore avoided, is in our opinion irrelevant to this study situation, because neither the patient nor the relatives were present.

Two other important disorders were also under-diagnosed: depression and adverse drug effects. For primary diagnosis in case 1, which focused on the first of these, 11% of the family physicians and 42.9% of the neuropsychiatrists considered depression as the probable diagnosis, which again demonstrates how important the knowledge acquired through specialization may be. Recently, the NIH Consensus Development Panel on Depression in Late Life [18] stated that most elderly depressives (approximately 90%) remain untreated, although there are effective treatments available. As our results show under-diagnosis in primary care seems to be a major contributing factor. Reasons for this seem to be, on one hand, that the psychopathology of depression in old age often differs from that seen in younger years by exhibiting more somatic complaints, memory disturbances, loss of self-esteem, and agitation; and on the other hand, that these symptoms are often attributed to normal aging by physicians, relatives, and the patients themselves [5, 18]. The latter argument is substantiated by the results of our study: 34.4% of the family physicians considered no disease or

AAMI in case 1. This clearly implicates a potential for under-treatment of old-age depression. Results of another investigation in primary care, which revealed that 10% of elderly men seen suffered from major depression, but only 1% were receiving specialist treatment [4], are also in agreement with our data.

Possible adverse drug effects were also widely underdiagnosed, although they are a major cause of treatable (!) dementive, and/or depressive syndromes in late life. In case 1 the patient was not on drug therapy, meaning that this differential diagnosis could be neglected. In case 2, however, the patient was polymorbid and received various drugs on a regular basis. Even in this case only a minority of the physicians considered possible drug adverse effects either for primary or differential diagnosis. These results are in agreement with a recent report from Australia, demonstrating a major neglect of drug problems in the elderly [28].

The second step in dementia diagnosis, the recognition of the underlying disorder, should be examined closely in case 2a and 2b, where the two versions described the most frequent dementias occurring in old age. Because our intention was to investigate to what degree the presence of risk factors influences the differential diagnosis, we designed two different dementia histories (a and b) for an otherwise identical patient suffering from hypertension, hypercholesteremia, and diabetes mellitus. Case 2b was designed according to the criteria of DSM-III-R [1], ICD-10 [43], and the NINCDS-ADRDA [29] for SDAT. The latter defined criteria for possible, probable, and definite SDAT, which revealed a clinicopathological correlation of more than 85% [3, 24, 41], which is very high considering the neuropathological interrater reliability for this diagnosis [34]. For the diagnosis of vascular dementia international criteria have been defined recently [36] and are still being strongly debated [9]. They imply a wide spectrum of disorders like dementia following hypoxia, or the "classical" vascular dementias (multi-infarct dementia [21], Binswanger's disease [2], lacunar dementia [16], cerebral amyloid angiopathy [44]).

Case 2a of our study fulfills these and the largely identical criteria of DSM-III-R [1] and ICD-10 [43] for vascular dementia. It scores 15 points on the Hachinski [20] and 11 points on the Rosen [37] ischemic scales, which is highly indicative of this diagnosis. The confirmation of either type of dementia should include the integration of brain-imaging examinations [29, 36]. We did not mention results of neuroimaging in the case vignettes, because we wanted to investigate when and whether primary-care physicians would perform such an examination (data not given here). Another argument is the potential for confusion based on such data, especially regarding lesions of the white matter as seen in MRI [12, 23, 38]. Although the presence of vascular lesions indicated by ischemic scores or shown by radiological imaging is not absolute proof that the patient's dementia is exclusively linked to a vascular process, recent clinicopathological studies revealed an average accuracy of 73–85% for vascular dementia diagnosis [10, 11, 17, 32]. The diagnostic considerations observed in this study should demonstrate the extent to which these criteria are used in primary care.

The results of our study show that vascular mechanisms are believed to be responsible for the development of dementia by most physicians. Although there was a significant tendency toward "correct" diagnoses of case 2a and 2b, with SDAT being more often diagnosed for version 2b and VD more often for version 2a, the diagnosis of vascular encephalopathy remains the most frequent. In the absence of the comparison to case 1, we might have been led to the conclusion that the presence of risk factors, such as moderate hypertension, diabetes mellitus, and hypercholesteremia, guides the diagnosis into a cerebrovascular direction. Although hypertension is the most powerful contributor to the incidence of cerebrovascular diseases and the risk of vascular dementia doubles when risk factors for stroke are present [17, 30], hypertension and arteriosclerosis may also be present in DAT [26, 37]. Therefore, the diagnosis of dementia should not be made on the basis of risk factors. Assuming that this was the case in our study we should have had no "vascular" diagnoses in case 1, where no risk factors were present. The only explanation for this phenomenon seems to be the conceptualization of senile dementia as a synonym for atherosclerotic dementia, which was indeed the concept several decades ago [15, 33]. Most of the primary-care physicians may have attended medical school at a time when arteriosclerosis was thought to be the primary cause of dementia and the term Alzheimer's disease was used only in rare cases of presenile dementia., This again points out the importance of specialized knowledge and continuing education to primary care. The question of whether vascular dementia is over- or under-diagnosed [6, 33] can be clearly answered on the basis of our study, at least for the primary-care setting in Germany. The special design of our study also allows us to draw conclusions about the reasons for this. Whether these results are also to be seen in other countries with other systems of medical care and education would be an interesting topic for further study. Our results imply that the scientific diagnostic criteria are far from being applied in primary care. If one regards the potential helpfulness of antidepressant therapies in geriatric depression, the risks of drug therapy with, for example, cholinesterase inhibitors together with the high probability that the "wrong" patients may receive them, whereas others who could profit would not, and the benefits of aspirin in vascular dementias, new areas become open for discussion.

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