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# Prevalence and Persistence of Mild Cognitive Impairment among Elderly Patients in General Hospitals

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**Key Words**
Mild cognitive impairment, prevalence · General hospitals · Early detection of cognitive disorders

**Abstract**
The aim of the present study was to determine the prevalence of mild cognitive impairment (MCI) in elderly patients in general hospitals and to investigate the persistence of the cognitive deficits after discharge from the hospital. In a sample consisting of 794 non-demented patients in general hospitals aged 65–85 years, we found an MCI prevalence of 36.1%. The positive predictive value for cognitive impairment 3.5 months after hospital discharge was 61.0%. The deficits in multiple-domain MCI proved to be particularly stable with a positive predictive value of 82.9%. Elderly patients in general hospitals represent a high-risk group for MCI. These results indicate that general hospitals offer an opportunity for the early detection of incipient dementia.



## Introduction

Most forms of dementia develop gradually and have a preclinical stage during which they are heralded by a mild decline in cognitive performance several years prior to the clinical diagnosis [1]. The concept of mild cognitive impairment (MCI) aims at identifying these prodromal symptoms and distinguishing them from normal age-related cognitive decline [2]. In spite of considerable differences in the diagnostic criteria and operational definitions, the high risk of developing dementia has been confirmed in numerous studies on elderly persons with MCI [3–10].

Associations between MCI and cardiovascular risk factors and diseases [11–17] as well as the general state of health [18] have been repeatedly described. It must therefore be suspected that MCI is more frequently present among the elderly patients in general hospitals than in the general population. From a practical point of view, hospitals offer several advantages for the early detection of cognitive disorders, since they provide easy access to a large number of elderly patients and also provide an opportunity for the diagnostic work-up during the hospital stay. Several studies on elderly patients in general hospitals demonstrate a high prevalence of severe cognitive impairment, dementia and delirium [19–21], but to our knowledge no study on the presence of MCI has yet been undertaken.

The aims of the present study were first to describe the prevalence of MCI among patients in general hospitals and then to investigate prospectively whether MCI identified in the hospital are mostly transitory disturbances or whether the deficits persist and indicate a high-risk group for the development of dementing illnesses.

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## Materials and Methods

*Sample*

The sample consisted of elderly patients in the internal wards of three general hospitals in the city of Munich. The inclusion criteria were age between 65 and 85 years and residence in the greater Munich area. The age limit of 85 years was introduced since otherwise a very high attrition rate due to mortality would be expected in this prospective study, which is designed to run over several years.

Exclusion criteria were very severe physical illnesses which according to the physician in charge would prove fatal within a year or in which complications were to be expected due to participation in the study; previously extant dementia; residence in a nursing home; the need for nursing care according to the criteria of the German long-term care insurance plan; blindness or deafness; inadequate facility in German; imminent release within 48 h.

In all, 2,741 patients fulfilled the inclusion criteria, 1,515 (55.3%), however, exhibited one or more reasons for exclusion. The main reasons were: (1) severe or fatal illnesses (21.2%), (2) a need for long-term care (9.4%), (3) pre-existing dementia (8.2%), (4) discharge within 48 h (7.3%), (5) severe sensory impairments (4.3%), (6) institutional care in a nursing home (2.8%) and (7) insufficient language competence (2.1%).

Of the 1,226 patients available who did not meet any exclusion criteria, 809 (66.0%) participated in the study and 417 (34.0%) refused to participate.

The refusal rate did not differ significantly among the three hospitals. There was no difference in age between decliners and participants, but women refused to participate significantly more frequently than men (40.2 vs. 28.7%; $p < 0.001$).

*Course of the Study*

The study protocol was approved by the institutional review board of the faculty of medicine at the Technical University of Munich, and written informed consent was obtained from the participants. The patients were examined personally twice by physicians trained in psychiatry or by psychologists using standardised methods. The first examination took place during the hospital stay, the second examination approximately 15 weeks after discharge from the hospital. Five hundred and sixty-two of the total of 809 participants participated in the follow-up after discharge. Fifty-nine had already been excluded from further examination during their hospital stay since it had been noticed that they already suffered from manifest dementia or because a fatal illness had been diagnosed during their hospital stay. Twenty-one patients died after discharge and 36 could not be reached due to change of address or illnesses which arose during the interim period requiring longer-term hospital treatment. Of the 693 patients who were eligible for the follow-up, 131 (18.9%) refused to participate, whereas it was possible to examine 562 (81.1%).

*Assessment Procedures*

During the hospital stay, the essential instrument was the Structured Interview for the Diagnosis of Dementia of the Alzheimer Type, Multi-Infarct Dementia, and Dementias of other Aetiology according to DSM-III-R, DSM-IV and ICD-10 (SIDAM) [22]. The SIDAM is a brief procedure not only for the diagnosis of dementias, but also for the diagnosis of MCI [23]. In addition to a detailed part for clinical evaluation and diagnosis, it consists of a battery of tests with 55 items for testing cognitive abilities including the Mini Mental State Examination (MMSE) [24]. The total SIDAM test score (SISCO) ranges from 0 to 55 points. A SISCO lower than 34 indicates a dementia syndrome; values between 34 and 47 points are reported for MCI [23]. The items measure various cognitive domains and can be grouped into different subscales such as orientation, memory, intellectual abilities and higher cortical functioning (table 1).

Subjective memory problems were measured using the five questions of the Cambridge Examination for Mental Disorders of the Elderly [25], which are to be answered by yes or no and which in addition to a general self-rating relate to memory problems in four different everyday situations. In case of a positive reply, it was asked whether problems in coping with everyday life were the result [26]. Informant reports were not available during the hospital stay.

The brief scales 'mood/activation' (KUSTA) [27] were used to measure depression. The severity of the physical illnesses was rated with the Comorbidity Index [28]. Moreover, socio-demographic variables, medication prior to hospitalisation and discharge diagnoses according to ICD-10 were recorded.

In the follow-up after discharge from the hospital, a battery of tests was used which consisted of the syndrome short test (Syndrom-Kurztest, SKT) [29, 30], the MMSE, a verbal fluency test (the number of animals named within 60 s) and a clock drawing test in the version of Manos and Wu [31].

The SKT measures various functions of memory and attention and is well established in the examination of the elderly. The scoring of the SKT takes account of age and educational norms. Data analysis was based on the total test score (SKT total) as well as the sum scores for 3 memory tests (SKT memory) and the 6 remaining subtests (SKT non-memory).

Depression was again measured using the brief KUSTA scales and additionally using the Geriatric Depression Scale [32].

Knowledgeable informants were questioned with the help of the Bayer Activities of Daily Living Scale [33] and the Informant Questionnaire on Cognitive Decline in the Elderly [34].

The severity of cognitive impairment was rated on the Clinical Dementia Rating Scale (CDR) based on all available information [35].

*Diagnosis of MCI*

We diagnosed MCI according to the consensus criteria recently proposed by the International Working Group on Mild Cognitive Impairment [36]. These require that a person should exhibit cognitive impairment but not fulfill the criteria for a diagnosis of dementia; that the functional activities be mainly preserved or only minimally impaired, and that there be evidence of cognitive decline, measured either by self-rating or informant report.

Dementia was excluded with the SIDAM. As there has not yet been reached an agreement as to how subjective memory disturbances should be operationalised in field studies, we decided to define memory complaints very broadly and considered this criterion to be fulfilled when at least one of the five questions regarding memory problems was answered positively. The objective impairment of cognitive functions was derived from the SIDAM test battery. For this purpose, the norm values of cognitively unimpaired patients from the present study were determined in four cognitive domains (table 1). Participants with MMSE scores of 28–30 [23] were considered cognitively unimpaired. We established the means

**Table 1.** Cognitive domains of the SIDAM test battery and operational definition of impairment for the present study

| Domain | Test items | Impairment score |
|---|---|---|
| Memory | 20 items measuring immediate and delayed verbal recall, visual reproduction and remote memory (score range 0–20) | ≤ 14 |
| Orientation | 10 items measuring orientation for time and place (score range 0–10) | ≤ 8 |
| Intellectual ability | 5 items measuring abstract thinking and judgement (score range 0–5) | ≤ 3 |
| Higher cortical functioning | 20 items measuring verbal ability, calculation, constructional ability, denomination, writing, and praxis (score range 0–20) | ≤ 15 |

and standard deviations for these 387 participants as norm values in the four domains and defined a value of at least 1.96 standard deviations below the mean value of the norm sample as objective cognitive impairment for each domain. This led to the scores for impaired test performance shown in table 1. Then it was determined for the total sample which participants were impaired in which domains. Following the proposals of Winblad et al. [36], we distinguished four categories of MCI depending on whether deficits are present in only one or in several domains and depending on whether memory disturbances were also present or whether the deficits occurred exclusively in other domains. In what follows, the four groups of MCI defined by this classification will be called 'amnestic MCI single domain', 'amnestic MCI multiple domain', 'non-amnestic MCI multiple domain' and 'non-amnestic MCI single domain'.

For comparison with the resultant prevalence rates, diagnoses were made according to the algorithm for DSM-IV 'mild neurocognitive disorder' implemented in the SIDAM and according to a SISCO of less than 47 points as proposed by Zaudig and Hiller [22].

In the follow-up, a rating in the CDR of 0.5 (questionable dementia) or higher served as a criterion for cognitive impairment.

*Statistical Analysis*

SPSS version 12.0 for Windows was used to analyse the data. The prevalence of MCI is represented as the percentage of the non-demented patients examined. The test performance of the groups of participants with and without MCI is described in terms of means and standard deviations. Differences in the test performance were checked for significance using ANOVA. The $\chi^2$ test was used for the comparison of categorical variables. The relationships between MCI and covariates such as age, sex and education as well as the relationships between MCI during the hospital stay and cognitive disturbances in the follow-up were analysed using logistic regression models. The results are illustrated in the form of odds ratios (ORs) and 95% confidence intervals (95% CIs).

## Results

*Sample Description*

After the exclusion of 15 patients with manifest dementia, the study sample consisted of 794 participants in the age bracket between 65 and 85 years. The average age of the participants was 75.2 years (SD = 5.5). Four hundred and seventy-eight participants were women (59.1%), 331 (40.9%) were men. The mean MMSE score was 27.1 points (SD = 2.3). 98.5% of the participants were German citizens. On average, the participants had attended school for 9.5 years. 1.9% had not graduated; 62.2% graduated with low qualification; 21.7% with intermediate qualification and 14.3%, among them 10.1% university students, graduated with high qualification. 44.7% lived alone in single households, 50.8% in two-person households and 4.5% in multiple-person households. Of the participants, 48.6% were married, 34.0% were widowed, 9.1% were divorced and 8.3% had never been married.

The average hospital stay amounted to 20.0 days (SD = 16.1); the cognitive examination was performed on average 7.5 days after admission.

*Prevalence of MCI*

The total prevalence of MCI was 36.1% (table 2). A similar rate was found according to the algorithm for DSM-IV 'mild neurocognitive disorder' (35.0%) or according to SISCO scores of 34–46 points (40.8%). In both, men and women, MCI was most frequently characterised by memory impairment. The category 'non-amnestic MCI single domain', which accounted for 12.6% of the patients, resulted almost exclusively from a low test per-

**Table 2.** Prevalence of MCI among elderly patients in general hospitals according to different subtypes

| Diagnosis | Men, % (n = 323) | Women, % (n = 471) | Total, % (n = 794) |
|---|---|---|---|
| Non-MCI | 71.5 | 58.6 | 63.9 |
| No memory complaint, no cognitive impairment | 14.9 | 13.0 | 13.7 |
| Minor memory complaint, no cognitive impairment | 48.3 | 38.0 | 42.2 |
| Mild objective impairment, no memory complaint | 8.4 | 7.6 | 7.9 |
| MCI | 28.5 | 41.4 | 36.1 |
| Amnestic MCI single domain | 6.8 | 9.3 | 8.3 |
| Amnestic MCI multiple domain | 9.9 | 15.9 | 13.5 |
| Non-amnestic MCI multiple domain | 2.5 | 1.3 | 1.8 |
| Non-amnestic MCI single domain | 9.3 | 14.9 | 12.6 |

**Table 3.** Prevalence of MCI in relation to age and sex

| Age group | Men, % | Women, % | Total, % |
|---|---|---|---|
| 65–69 | 19.3 | 34.1 | 26.6 |
| 70–74 | 27.7 | 35.1 | 31.7 |
| 75–79 | 27.7 | 43.2 | 37.2 |
| 80–85 | 48.9 | 49.6 | 49.4 |
| Total | 28.5 | 41.4 | 36.1 |

formance in the domain of 'higher cortical function'. According to the broad definition of memory complaints, the majority of the sample fulfilled this criterion by not replying negatively to all questions. The general question posed initially (Do you suffer from memory disturbances?) was answered positively by 48.0%; at least one of the five questions was answered positively by 78.3%, with 50.8% claiming that the disturbances caused only minor problems in everyday life and 27.5% reporting significant difficulties in coping with everyday life.

In table 2, the participants who were not diagnosed as having MCI are also classified into three groups. As can be seen, persons who were completely free of objective as well as subjective disturbances constituted only 13.7% of the sample. Participants were much more frequent who in spite of normal test performance complained of slight memory problems (42.2%). 7.9% of the sample noticed no subjective disturbance in spite of objective impairments and therefore do not fulfill the diagnostic criteria of MCI.

Table 3 shows that the prevalence of MCI increases with age, in particular in men. MCI is more prevalent in women than in men in all age groups. After adjustment for sex, each additional year of age yields an OR = 1.07 (95% CI 1.04–1.10). After adjustment for age, women prevail in comparison with men (OR = 1.60; 95% CI 1.18–2.18). There were no significant differences between participants with and without MCI with regard to the number of discharge diagnoses and no significant differences in the number of medications prescribed. The comorbidity index according to Charlson et al. [28] was likewise not significantly associated with MCI. A dichotomisation of the index into values of 0 and into values of 1 and more resulted in an age-adjusted OR = 1.31 (95% CI 0.91–1.88). However, patients with an intermediate or high education suffered less often from MCI than patients with a low education after adjustment for age and sex (OR = 0.55; 95% CI 0.40–0.75).

Table 4 characterises the test performance of the participants without MCI and the four subtypes of MCI according to the MMSE, SISCO and the four cognitive domains. In all test variables, there was a highly significant difference ($p < 0.001$) between the groups. The differences between non-MCI and single-domain MCI are the lowest. The participants with a multiple-domain MCI showed the worst test performance.

The test performance of the 7.9% of patients who did not complain of memory impairment and were therefore not classified as having MCI in spite of objective cognitive impairments was similar to the performance of the patients with MCI. In the MMSE, they achieved, for example, a score of 25.8 points (SD = 1.8) and in the SISCO a score of 43.4 points (SD = 3.4).

**Table 4.** Cognitive test performance during hospital stay in relation to MCI subtypes

| MCI subtype | MMSE | SISCO-total | SISCO-ME | SISCO-OR | SISCO-IN | SISCO-HI |
|---|---|---|---|---|---|---|
| non-MCI | 28.1 (1.6) | 49.6 (3.5) | 17.2 (2.0) | 9.7 (0.5) | 4.9 (0.4) | 17.7 (1.7) |
| a-MCI-sd | 27.0 (1.5) | 44.6 (2.3) | 12.7 (1.5) | 9.5 (0.5) | 4.7 (0.4) | 17.7 (1.3) |
| a-MCI-md | 23.8 (2.0) | 39.6 (2.5) | 12.4 (1.4) | 8.8 (1.2) | 4.4 (0.8) | 14.1 (1.9) |
| na-MCI-md | 23.4 (2.0) | 41.5 (2.8) | 16.4 (1.2) | 7.5 (0.9) | 3.9 (1.2) | 13.8 (1.8) |
| na-MCI-sd | 26.1 (1.8) | 45.8 (2.3) | 16.5 (1.3) | 9.3 (0.9) | 4.7 (0.6) | 15.3 (2.0) |
| Total | 27.1 (2.3) | 47.2 (4.7) | 16.1 (2.6) | 9.5 (0.8) | 4.8 (0.6) | 16.8 (2.3) |

non-MCI = No memory complaint or no cognitive impairment or both; a-MCI-sd = amnestic MCI single domain; a-MCI-md = amnestic MCI multiple domain; na-MCI-md = non-amnestic MCI multiple domain; na-MCI-sd = non-amnestic MCI single domain; SISCO-ME = SISCO memory; SISCO-OR = SISCO orientation; SISCO-IN = SISCO intellectual abilities; SISCO-HI = SISCO higher cortical functioning. Significance of differences between group means was calculated using ANOVA; all comparisons yielded highly significant group differences ($p < 0.001$). Figures are means, with SD in parentheses.

**Table 5.** Discharge diagnoses of patients with and without MCI during hospital stay

| Discharge diagnoses (ICD-10 categories) | Patients without MCI, % (n = 507) | Patients with MCI, % (n = 287) | p values |
|---|---|---|---|
| Infectious and parasitic diseases (A00-B99) | 6.9 | 4.2 | n.s. |
| Neoplasms (C00-D48) | 21.7 | 16.7 | n.s. |
| Diseases of the blood (D50-D89) | 5.3 | 6.6 | n.s. |
| Endocrine, nutritional and metabolic diseases (E00-E90) | 57.0 | 58.5 | n.s. |
| Mental and behavioural disorders (F00-F99) | 22.3 | 28.9 | <0.05 |
| Diseases of the nervous system (G00-G99) | 17.9 | 28.6 | <0.001 |
| Diseases of eyes and ears (H00-H95) | 20.5 | 20.6 | n.s. |
| Diseases of the circulatory system, except I60-I69 (I00-I52, I70-I99) | 79.9 | 87.5 | <0.01 |
| Cerebrovascular diseases (I60-I69) | 17.6 | 22.6 | n.s. |
| Diseases of the respiratory system (J00-J99) | 19.1 | 12.5 | <0.05 |
| Diseases of the digestive system (K00-K93) | 33.7 | 33.8 | n.s. |
| Diseases of the skin and subcutaneous tissue (L00-L99) | 3.2 | 3.5 | n.s. |
| Diseases of the musculoskeletal system (M00-M99) | 34.5 | 36.2 | n.s. |
| Diseases of the genitourinary system (Q00-Q99) | 23.9 | 18.8 | n.s. |
| Injury, poisoning, consequences of external causes (S00-T98) | 7.5 | 7.3 | n.s. |

Data are given as proportion of patients with one or more diagnoses from the respective category. Significance of differences between proportions was calculated by two-sided $\chi^2$ test. n.s. = Not significant ($p > 0.05$).

*MCI and Discharge Diagnoses*

On average, the patients had 6.6 diagnoses on discharge. The number of diagnoses did not differ between patients with MCI and cognitively unimpaired patients. There were, however, significant differences in several diagnostic groups (table 5).

The difference in the group of the psychiatric diagnoses resulted from the fact that an affective disturbance (F30–39) was diagnosed more frequently in patients with MCI (OR = 1.36; 95% CI 1.04–1.78) and that a mild cognitive disorder (F06.7) was observed more frequently (OR = 3.10; 95% CI 1.80–5.33). Among patients with diseases of the nervous system, in particular those with Parkinson's disease (OR = 2.54; 95% CI 1.11–5.54) suffered from MCI. In the group of the diseases of the respiratory system and similarly in the group of the dis-

**Table 6.** Association between MCI subtype during hospital stay and cognitive impairment (CDR >0) after discharge

| Diagnosis | Odds ratio (95% CI) | Positive predictive value, % |
|---|---|---|
| MCI | 5.7 (3.9–8.4) | 61.0 |
| Amnestic MCI single domain | 3.4 (1.8–6.4) | 47.8 |
| Amnestic MCI multiple domain | 16.4 (8.4–31.2) | 81.5 |
| Non-amnestic MCI multiple domain | ●●[1] | 100.0 |
| Non-amnestic MCI single domain | 3.3 (2.0–5.6) | 47.2 |

[1] Only 5 patients in this diagnostic group, all of them cognitively impaired at follow-up.

**Table 7.** MCI during hospital stay in relation to cognitive test performance after discharge

| MCI subtype | Test performance after discharge | | | | | |
|---|---|---|---|---|---|---|
| | MMSE | SKT total | SKT memory | SKT non-memory | verbal fluency | clock drawing |
| non-MCI (n = 373) | 27.2 (2.2) | 2.7 (2.9) | 1.0 (1.4) | 1.7 (2.2) | 17.3 (5.5) | 8.4 (2.4) |
| a-MCI-sd (n = 46) | 25.9 (2.0) | 5.0 (3.9) | 1.9 (1.7) | 3.1 (3.1) | 14.3 (4.8) | 8.5 (6.8) |
| a-MCI-md (n = 64) | 23.6 (2.8) | 8.0 (4.8) | 2.6 (2.0) | 5.5 (3.9) | 11.9 (4.2) | 6.3 (3.2) |
| na-MCI-md (n = 5) | 25.6 (0.9) | 5.6 (4.8) | 1.8 (1.6) | 3.6 (3.8) | 15.0 (3.9) | 7.0 (2.2) |
| na-MCI-sd (n = 72) | 25.8 (2.8) | 4.9 (3.8) | 1.5 (1.7) | 3.5 (3.3) | 15.1 (4.4) | 7.1 (3.0) |
| Total (n = 560) | 26.5 (2.6) | 3.8 (3.8) | 1.3 (1.6) | 2.5 (2.9) | 16.1 (5.5) | 8.0 (3.2) |

non-MCI = No memory complaint, no cognitive impairment; a-MCI-sd = amnestic MCI single domain; a-MCI-md = amnestic MCI multiple domain; na-MCI-md = non-amnestic MCI multiple domain; na-MCI-sd = non-amnestic MCI single domain. Higher SKT scores indicate worse performance, higher scores in other tests indicate better performance. Figures are means, with SD in parentheses.

eases of the circulatory system, there was no individual diagnosis with significantly different frequency. However, transitory ischaemic attacks (OR = 2.03; 95% CI 1.06–3.90), sequelae of a stroke (OR = 2.67; 95% CI 1.39–5.14) as well as diabetes mellitus (OR = 1.55; 95% CI 1.32–1.82) were recorded more frequently among the patients with MCI in spite of the overall lack of significance of differences for the diagnostic group of cerebrovascular and endocrine diseases.

*Persistence of Cognitive Impairment*

In the follow-up 3.5 months after discharge from the hospital, 65.6% of the patients were rated as cognitively unimpaired, having a CDR rating of 0, and 31.5% as slightly impaired, having a rating of 0.5. 2.9% had already developed dementia; in 14 patients, it corresponded to a mild degree of severity, in 2 patients to a higher degree of severity.

Table 6 illustrates the relationship between MCI during the hospital stay and a cognitive impairment in the follow-up (CDR >0). As seen there, patients with MCI run a highly significantly increased risk of suffering from cognitive disturbances after discharge from the hospital as well. The odds are the greatest for patients with multiple-domain MCI, who already showed the poorest test performance in the hospital; they are however also significantly increased for the patients with single-domain MCI. In all, 61.0% of the patients who proved cognitively impaired in the hospital were rated as impaired following discharge. Among the 70 persons with multiple-domain MCI who were followed up, this proportion amounted to a total of 82.9%; among the 118 patients with single-domain MCI, to 47.5%.

Table 7 shows the relationship of the test performances achieved in the follow-up to the cognitive status during the hospital stay. All group comparisons showed highly significant differences. The differences in performance between the groups persisted over time and showed a pattern similar to that during the hospital stay.

## Discussion

The present study is to our knowledge the first to investigate the prevalence of MCI among elderly patients in general hospitals. MCI was diagnosed according to the consensus criteria of the International Working Group on Mild Cognitive Impairment [36]. We found a prevalence rate of 36.1% among participating non-demented patients aged 65–85 years. Application of the criteria proposed for the diagnostic instrument SIDAM [22] led to similar results. For the diagnosis of a mild neurocognitive disorder according to DSM-IV, there was a prevalence rate of 35.0%; for a cut-off of 47 points in the SISCO, there was a prevalence rate of 40.8%. Representative field studies in the elderly population using similar diagnostic criteria generally led to substantially lower prevalence rates. In the Cardiovascular Health Study [37], there was a prevalence rate of 18.8%; in several other studies, the rates for MCI ranged only from 1 to 5% [38–41]. The comparability of the studies is rather limited, but this result nevertheless indicates that elderly patients in general hospitals represent a high-risk group for MCI. Whether the comparatively high non-participation rate of 34% caused a systematic bias is difficult to assess. In view of the high prevalence of MCI, a severe underestimation due to higher refusal rates of cognitively impaired patients appears unlikely.

The high prevalence of MCI is not unexpected, since hospital patients frequently suffer from cardiovascular risk factors and illnesses such as diabetes mellitus, transitory ischaemic attacks and stroke which had already been identified as risk factors for MCI and dementia [11–17]. The same illnesses were also associated with MCI in the present study. As in other studies [12, 14, 16, 42], a better education proved to be a protective factor against MCI, whereas increasing age was associated with a moderate increase in its prevalence. In contradiction to most previous studies, which found only slight sex-related differences in the prevalence of MCI [12, 14, 43], we found higher rates of MCI in female patients during hospital stays. However, in the case of women, the disorders improved more frequently, so that the rates of cognitive impairment of men and women became similar following discharge. This gives rise to the conjecture that women do not have a higher prevalence of MCI than men, but that they possibly develop mild transitory cognitive impairments more frequently during a hospital stay.

The requirement of subjective memory problems as a necessary condition for the diagnosis of MCI creates problems in field studies [38, 43]. The recording of memory complaints will certainly not be dispensed with, since they can significantly improve the prediction of dementia [44, 45] and in the case of highly educated persons are often the only indication of incipient neurodegenerative processes. The lack of agreement on the mode of measurement and the subjective severity of the disorder can however lead to large discrepancies in the operational definition of memory complaints and thus to highly divergent prevalence estimates. Little study has as yet been dedicated to the reliability of instruments for measuring subjective disorders as well as the temporal stability of the complaints. Hardly anything is known about the prognostic validity of different operational definitions of subjective memory problems for conversion to dementia. Furthermore, it is presumably quite a different matter to express complaints in the framework of a research project than to seek medical advice in everyday life due to them.

We decided on a broad definition, according to which 78.3% of the patients fulfilled the criterion for subjective disorders. Had we chosen a more restrictive definition, according to which the subjective memory problems caused difficulties in coping with everyday life, this criterion would have been fulfilled by only 27.5% of the patients and would have considerably reduced the prevalence rates. In spite of the broad definition, however, we also identified a group comprising 7.9% of the patients who exhibited objective cognitive impairments but made not the slightest complaints about memory problems. Vogel et al. [46] have recently reported that only 40% of their patients with MCI were fully aware of their cognitive deficits. They therefore proposed abandoning subjective memory problems as a mandatory prerequisite for MCI. Since anosognosia is possibly frequent among persons with incipient neurodegenerative illnesses, it appears indicated to pay special attention, in prospective studies, to the dementia risk of that group of persons suffering objectively but not subjectively from cognitive deficits.

MCI is a quite heterogeneous clinical syndrome, which can have a progressive, stable or remittent course. Improvements in up to 50% of the persons with MCI over a period of 1–3 years are reported from field studies [7, 13, 40, 47]. The recovery rate of 39% observed in the present study is similar to the rates from field studies and does not appear to be specific to the hospital patients we studied. Persons with single-domain MCI improved in more than 50% of the cases, which speaks in favour of a low symptom stability in this group and is presumably due in part to insufficient reliability of the test battery. Persons with multiple-domain MCI, however, exhibited a high persistence of symptoms and improved in only 12% of the cases.

In summary, it can be stated that elderly hospital patients are a high-risk group for MCI and thus probably also for dementing illnesses. The general hospital could provide a suitable pick-up point for the early detection of patients with a high risk for a conversion to dementia and for initiating intervention measures. A further significance of the results could be seen in the incorporation of the knowledge of the high percentage of elderly patients with mild cognitive disorders into the care of and communication with the patients.


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