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Can primary care record review facilitate earlier diagnosis of dementia?

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Bamford C, Eccles M, Steen N and Robinson L. Can primary care record review facilitate earlier diagnosis of dementia? *Family Practice* 2007; **24**: 108–116.

Background. There is concern over delayed diagnosis of dementia in primary care.

Objective. To determine whether primary care record review can facilitate earlier diagnosis of dementia.

Methods. Retrospective notes-based case–control study. Older people with dementia (cases) were identified through older age psychiatrists in the north-east of England. Age- and sex-matched controls were identified in primary care. Frequency and place of consultations, symptoms, presentation, tests and investigations, management, referrals and selected prescription data during the 5 years prior to the diagnosis of dementia were recorded.

Results. Relevant symptoms, involvement of family members, unpredictable consulting patterns and problems with management were more likely to be recorded in the notes of cases than controls. Key variables predicting subsequent diagnosis of dementia included the absence of nurse and outpatient consultations and the presence of cognitive symptoms, consultations with primary care physicians and referral for clarification of diagnosis or management. Regression models were better at predicting cases (sensitivity = 80.2%) than controls (specificity = 69.8%). Applying the models to a typical primary care physician's list would result in the identification of 93 false positives in order to identify two new cases 18 months earlier than currently occurs.

Conclusions. Differences in consultation patterns can be observed up to 4 years prior to formal diagnosis of dementia, indicating that primary care physicians are attending to possible signs of early dementia. However, it is not practicable to use the systematic review of primary care records to facilitate earlier diagnosis without identifying large numbers of false positives requiring investigation.

Keywords. Ageing, case–control studies, dementia, early diagnosis, primary health care.

Introduction

Concern over delays in the diagnosis of dementia in primary care has been expressed for the last 40 years.[1–5] With hindsight, carers of people with dementia have frequently expressed concern over delays in diagnosis.[6] Improving the early detection of dementia and other mental health problems in older people is highlighted in the UK National Service Framework for Older People[7] and is an implicit aim of guidelines in a number of countries.[8–11] In addition, dementia has been added to the latest criteria in the Quality Outcomes Framework of the new UK general practice contract.[12]

Possible approaches to earlier identification of people with dementia include population screening, targeted screening and case finding. Although population screening of all older patients has been advocated by a number of authors,[13–15] it is not supported by the majority of guidelines on the diagnosis and management of dementia.[16] While targeted screening is more acceptable, there are difficulties in identifying appropriate criteria for identifying patients at increased risk of dementia.[16] Studies of the preclinical phase of Alzheimer's disease (AD) have identified a number of factors associated with incident AD, for example performance on a range of neuropsychological tests[17] and physiological and anatomical changes in the brain.[18] These approaches are, however, not feasible for routine use within primary care. There is, therefore, a need to explore practical approaches to case

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finding appropriate for use in primary care. Primary care records are the repositories for the shared knowledge available for patient management. While in research terms general practice records may not be perfect, the duties of a doctor require that doctors "keep clear, accurate, legible and contemporaneous patient records which report the relevant clinical findings, the decisions made, the information given to patients and any drugs or other treatment prescribed."[19] General practice records therefore represent a potential source of data for early identification of people with dementia and are worthy of investigation.

The aim of this study was to examine whether primary care record review can facilitate the earlier diagnosis of people with dementia.

Methods

Study design and participants

The study was a retrospective case–control study. In order to identify a group of patients with a diagnosis of dementia (cases), the notes of all patients referred to any of the older age psychiatrists working in an old age psychiatry (OAP) service in the north-east of England during the preceding 12 months (2000) were reviewed. Patients were included in the study if they had a diagnosis of dementia, were aged 65 or over at the time of diagnosis and had been referred from a general practice within a geographically defined area in the north-east of England. Cases who were no longer registered with the referring practice were included if they had registered with another participating practice within the study area.

General practices were sent a letter from the principal investigator (ME) inviting them to participate in the study. This was followed up by telephone contact with the practice manager and/or a nominated doctor and a visit by a member of the research team (CB) to discuss the study in more detail. A consent form was signed by a representative of each participating practice. One control for each case, matched for date of birth, sex and general practice, was identified through the computing systems of the case's general practice. Controls were ineligible if a diagnosis of dementia or cognitive impairment was recorded in the notes or if they were not registered with the practice for the entire data collection period. Where more than one eligible control equidistant in age to the case was identified, random numbers were used to select the control.

Despite ethical committee approval to the contrary, four practices required us to seek additional explicit consent from controls and three of the four also required consent from cases. In each of these practices, a GP screened the list of cases still registered with the practice and advised whether we should write directly to the patient (n = 5) or seek proxy consent from a family member (n = 12). In each practice, we identified approximately four possible controls for each case referred by the practice. This list was also screened by a GP to identify any ineligible controls (e.g. with a diagnosis of dementia). A letter was sent from the practice with an information leaflet about the study, an opt-in form and a prepaid envelope to each case (or proxy) and potential control.

Data collection and handling

Data on age, sex, mini mental state examination (MMSE) score,[20] diagnoses and registered GP were collected from the OAP notes.

Within general practices, data were abstracted (Box 1) by trained data collectors from paper and computerized notes, tests and investigation reports, incoming letters and copies of outgoing letters retained by the practice. Data for abstraction from primary care notes were identified by the research team drawing on existing guidelines for the diagnosis of dementia[9] and studies of preclinical symptoms and signs of dementia.[17] A detailed instruction manual and training programme were developed for the data collectors. Initial training focused on developing an understanding of the study protocol, the structure of the database and the abstraction of anonymized data copied from the practice of one of the authors (LR). Each data collector abstracted the same data, followed by detailed feedback on their coding and clarification of the instructions where necessary. One author (CB) accompanied the data collectors on their first visits to practices to provide support and check coding. At this stage some data were dual abstracted to allow comparison and further feedback. This was followed by a period where two data collectors worked together in the same

Box 1 Dataitems collected from primary care notes

- Context of consultations (date, place and professional consulted)
- Involvement of family members
- Symptoms
  - Cognitive symptoms (confusion, disorientation, forgetting, language problems, memory loss, misplacing things, poor judgement and repetition)
  - Disturbances of consciousness (dizziness, fainting/blackouts, falls/collapses and funny turns)
  - Other physical symptoms (accidents, incontinence and sleep disturbances)
  - Mood symptoms (anxiety, apathy, depressed mood, low spirits, mood changes and tearfulness)
  - Perceptual symptoms (delusions, fabrication, hallucinations and paranoia)
  - Behavioural symptoms (aggression, agitation, behaviour changes, personality changes, wandering and withdrawal)
- Management (tests performed at consultation, prescribing and follow-up).
- Referrals (primary care, secondary care and other agencies)
- Selected tests and investigations (blood tests, mid-stream urine, chest X-ray)

practice to provide mutual support. Once data collectors were familiar and confident with all procedures and the abstraction manual, they worked independently. Throughout data collection, one author (CB) was usually available either by telephone or by email to respond to additional queries. Towards the end of data collection, a set of 15 records were abstracted by all data collectors and jointly by two authors (CB and LR) to assess inter-rater reliability.

Details of prescriptions of antibiotics were collected electronically by primary care trust staff using Miquest queries. Symptoms were allocated into predefined binary symptom groups (Box 1), with a positive value being assigned where one or more relevant symptoms were recorded. The notes of cases who had died were recalled by the local contractor services agency.

The data extraction end point was either when an explicit suspicion of dementia was recorded in the notes, a formal diagnosis was recorded, or 2 weeks prior to the index referral, whichever was the earliest. Formal diagnosis could be made by the GP, older age psychiatrist or other consultant. The data collection period covered the 5-year period running up to the end date; for cases who registered with the practice during this period, data collection started on the date of registration. The data collection period for controls was the same as for their matched case.

Data were entered into an Access database. Most variables were categorical (yes/no) with the absence of information about the item being coded as an implicit 'No'.

Analysis

We compared the characteristics of practices that agreed and refused to take part using *t*-tests for continuous variable, chi-square for categorical variables and Fisher's exact test for binary variables. Inter-rater reliability was assessed using the intra-class correlation coefficient for continuous variables and Cohen's kappa for binary variables. Data, aggregated to patient level, were analysed as a series of successive 6 monthly periods preceding the end date. Because of the considerable amount of missing data in the earliest time period (54–60 months prior to diagnosis), only nine time periods were included in the analysis, up to and including the period 48–54 months preceding diagnosis.

Initial analyses showed little correlation between observations for cases and their matched controls with the intra-class correlation coefficient not differing significantly from zero. Therefore, cases and controls were treated as independent samples to allow inclusion of unmatched cases and controls.

Each binary variable was cross-tabulated by whether the patient was a case or a control for each of the nine time periods and the relative risk of the variable being recorded for cases was produced with SPSSx. If a variable was significant at the 5% level in at least three of the nine time periods, it was taken forward to the next phase of the analysis. Logistic regression analysis was performed to identify combinations of variables that best distinguished between cases and controls. We compared the performance of models including and excluding recent data and also examined models including only patients aged 75 years and over. Models were developed using all variables identified as being associated with a diagnosis of dementia in the first phase. The models were then refitted using all subjects for whom there were no missing data items across the final set of variables. Thus, the measures of effect size presented in the tables were based on the largest possible numbers of subjects.

The potential utility of the models for improving detection of dementia was estimated by applying them to a typical practice population. Based on published data, we estimated the list size for a full-time GP as 1956,[21] of whom 313 will be aged 65 years or older and 149 will be aged 75 years or older.[22] We estimated the number of people at risk in each age group by applying a crude estimate of prevalence in each age category and then used age-specific incidence rates for England and Wales,[23] to estimate the number of patients who would be expected to develop dementia each year. The sensitivity and specificity rates were applied to the at-risk population.

Ethics

The study was approved by Newcastle and North Tyneside local research ethics committee and the relevant Caldicott Guardians on the basis that explicit consent would not be sought from participants.

Results

Response rates

The number of notes screened and cases eligible and abstracted are shown in Figure 1. GP training practices were more likely to participate (81.3% versus 45.2%, $P < 0.05$). Examination of referral rates of people with dementia to the OAP service, however, indicated no differences between training and non-training practices or between participating and non-participating practices. There were no significant differences in the available characteristics of cases for whom GP data were or were not abstracted (Table 1).

Data were collected on 319 cases. Eighty seven cases were no longer registered with the practice which had referred them to the OAP service; 45 had transferred to another practice within the study area, 38 had moved out of the area or could not be traced. Thirty-two of the 45 cases who had transferred within the area were included; the most common reason for not abstracting data for cases who had transferred

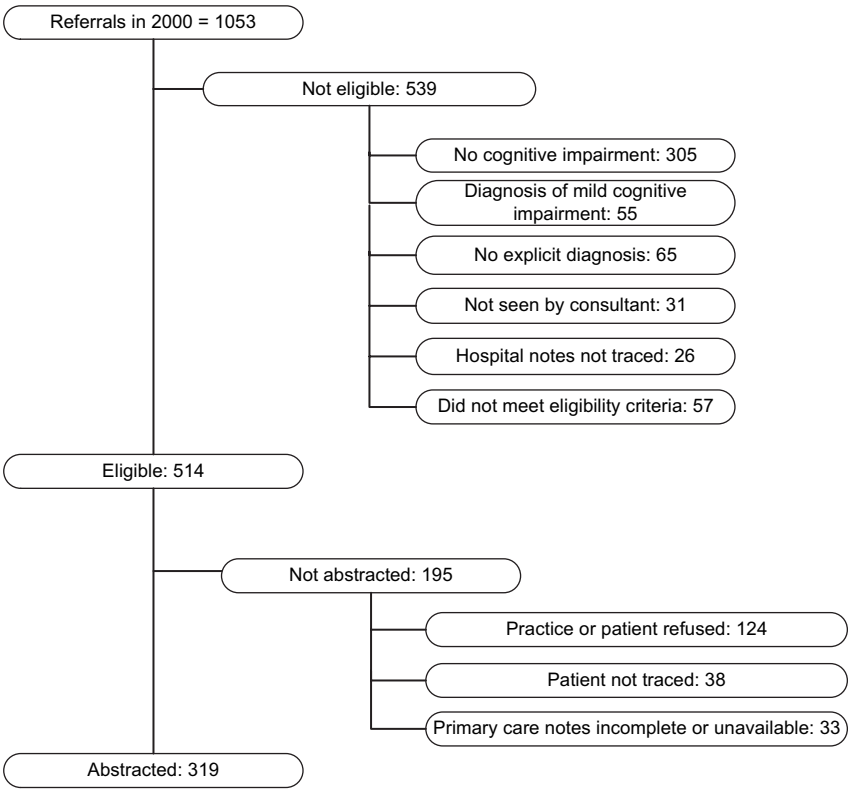

FIGURE 1 *Identification and recruitment of cases*

TABLE 1 *Comparison of cases for whom primary care data were and were not abstracted* (using data from OAP records)

	Abstracted (n = 319)	Not abstracted (n = 195)
% Female	70.1	72.6
Mean age (SD)	81.3 (6.9)	80.7 (6.0)
Mean MMSE score (SD)	18.7 (6.2)	18.2 (5.5)
Type of dementia (%)		
AD	35.2	40.6
Vascular dementia	29.6	23.4
Other specific dementia	5.0	5.6
Mixed dementia	6.0	8.6
Dementia, unspecified	24.2	21.8
% With depression	6.9	8.1
% With Parkinson's disease	2.2	2.0

was that they had moved to a practice which had refused participation. Forty-eight of the 182 cases registered with practices which had refused participation were included in the study either because they had died and their notes were available through the contractor services agency (n = 39) or because they subsequently registered with a participating practice (n = 9).

Data were collected on 249 controls. The lower number of controls was largely due to the inclusion of cases who had been registered with general practices that refused access for data collection but had died or moved to a participating practice; no controls were identifiable for these cases. Since cases were not necessarily registered for the full data collection period, the numbers of cases and controls in the analysis vary in different time periods (see Table 3). In all, 87% of controls were aged within ±3 months of the corresponding case; the maximum age difference was just over 2 years.

Of the five cases and 12 family members approached for explicit consent, two cases and two family members gave consent (24% overall). Four of the 158 potential controls identified were ineligible and were therefore excluded. Just over half (51.6%) of controls gave their consent. By sampling four controls per case, we identified at least one consenting control for 93% of cases but also identified 39 consenting controls who were not required.

Twelve practices did not provide prescription data [refused access (four), computing systems incompatible with Miquest (three), Primary Care Trust unable to support data collection (five)]. Data on prescribing were therefore available only for a subset of cases and controls.

Inter-rater reliability

The intra-class correlation coefficient for continuous variables ranged from 0.78 to 0.97. Cohen's kappa for

the 165 data items relating to binary variables (11 variables × 15 sets of notes) was 0.87.

Univariate analyses

One hundred and ten explanatory variables were included in the analyses, of which four were continuous variables and 21 were composite variables, combining two or more variables related to a similar theme. Over one-quarter of the variables showed statistically significant differences between cases and controls in the 30 months prior to diagnosis, and differences were observed for up to 16% of variables in earlier time periods. Forty-two variables (25 binary, 15 composite and two continuous) were significant in at least three of the 6-month time periods (summarized in Table 2) and therefore included as explanatory variables in the logistic regression analyses.

Further details of the univariate analyses, including relative risk, are available in Supplementary Table 1 linked to the online article. There was overlap between variables since individual variables were sometimes significant as well as the related composite variables. Furthermore, composite variables were computed in a variety of ways to attempt to maximise sensitivity in the predictive models.

In terms of the context of consultations, the most striking difference was the reduced likelihood of nurse consultations for cases, which was consistently found in all nine time periods (Table 2). In contrast, cases were more likely to have contact with social care professionals in all but one time period. A number of variables related to the use of appointments and cases were significantly more likely to have unpredictable consulting patterns (e.g. presenting out of hours, consulting the deputizing service and not attending for booked appointments). Levels of carer involvement were also significantly higher for cases as demonstrated by their presence at consultations or explicit concerns or requests relating to carers being written in the notes. In addition to a range of cognitive symptoms, cases were more likely to have symptoms relating to mood, activities of daily living, disturbances of consciousness and other physical symptoms recorded in their notes. Cognitive and physical symptoms were significantly more likely to be recorded even 48–54 months prior to diagnosis. Comments relating to management concerns were also more likely to be recorded for cases, for example concerns about compliance, comments relating to resistance to interventions or confusion about drugs or other management.

Logistic regression

Logistic regression analysis indicated considerable consistency in the terms included across a number of time periods (details of the analyses for different time periods are available in Supplementary Table 2 linked to the online article). The results based on the period 18–54 months are presented since diagnosing 18 months earlier would represent significantly earlier diagnosis of dementia (Table 3). The absence of consultations with a nurse attached to primary care and the presence of cognitive symptoms were key predictor variables. Restricting the analysis to older patients (aged 75+) had no effect on the terms included in the model and made little difference to model properties (Table 3). Sensitivity exceeded specificity and overall approximately 76% of cases and controls were correctly classified. The area under the receiver operating curve was 82.3% [95% confidence interval (CI) 78.4–86.3%] for patients aged 65 years or older and 83.4% (95% CI 79.0–87.8%) for patients aged 75 years or older.

Application of the model

Applying the sensitivity and specificity rates from the logistic regression model to a typical list of a full-time primary care physician resulted in high numbers of false positives (Table 3). This number was lower when only patients aged 75 years or older were included, a feature of the smaller numbers in this age group. If we make the assumption that half the cases of dementia in a practice will already be known, then screening the notes of all patients aged 65 (75) years and over would result in the identification of 93 (74) false positives, requiring further investigation in order to identify two new cases of dementia 18 months earlier than currently occurs. This process would also miss one case.

Discussion

This study shows that despite being able to discriminate between patients who would develop dementia and those who would not, a process of systematically reviewing patients' primary care records is likely to be of little use in facilitating the earlier diagnosis of dementia. Reviewing primary care records would accurately identify only very small numbers of patients who would develop dementia, yet result in far higher numbers of false positives, requiring further investigation with implications for the primary and secondary care workload.

Differences in the recorded consulting patterns of people developing dementia (cases) and controls were found up to 4 years prior to formal diagnosis. This is consistent with the reports of carers.[6] Our analyses are also consistent with those of other studies. An increase in service use up to 2 years prior to diagnosis has been reported by three studies conducted in the US,[24–26] although no differences between people developing dementia and controls were reported in a fourth study.[27] Our data suggest that comparison of global consulting patterns masks differences in consulting rates with different health care professionals. While people developing dementia had a higher

TABLE 2 *Summary and direction of significant differences between cases and controls on selected variables*[a]

	Months prior to end date									Number of time periods in which $P \leqslant 0.05$
	0–6	6–12	12–18	18–24	24–30	30–36	36–42	42–48	48–54	
Number of cases (controls) included in time period	307 (231)	301 (225)	297 (206)	282 (206)	277 (199)	275 (195)	269 (184)	267 (175)	258 (162)	
Context										
Consultation at outpatient clinic			-	-					-	3
Home visit	+	+	+	+		+				5
Consultation with nurse attached to primary care health team	-	-	-	-	-	-	-	-	-	9
Consultation with social care professional	+	+	+	+	+					5
Out-of-hours consultation	+		+		+					3
DNA	+				+	+	+			4
Unpredictable consulting patterns[b]	+		+	+	+	+	+	+	+	8
Unpredictable consulting patterns[c]	+		+	+	+	+	+	+	+	8
Difficulties formulating reason for consultation[d]	+	+	+						+	4
Carer involvement										
Consultation with carer only	+	+			+		+			4
Consultation with carer and patient	+	+	+	+			+		+	6
Carer present at consultation (either of the above two variables)	+	+	+	+	+		+		+	7
Patient accompanied at consultation	+	+	+	+	+		+		+	7
Any carer requests or concerns	+	+	+	+			+			5
Carer involved[e]	+	+	+	+	+		+		+	7
Carer involved[f]	+	+	+	+	+	+	+		+	8
Symptoms										
Mood symptoms	+			+			+			3
Disturbances of consciousness	+		+		+		+			4
Activities of daily living symptoms	+	+	+				+			4
Other physical symptoms	+						+	+	+	4
Cognitive symptoms	+	+	+	+	+	+	+		+	8
Any relevant symptoms[g]	+	+	+	+	+	+	+	+	+	9
Any non-cognitive symptoms[h]	+	+	+	+	+	+	+	+	+	9
Management										
Advice given	+	+	+		+	+	+		+	7
Medication changed	+		+	+			+	+		5
Medication stopped	+			+			+			3
Medication stopped or changed (either of the above two variables)	+	+		+		+	+			5
Antibiotics prescribed		-	-		-			-		4
Referred to nurse attached to primary care health team	+		+	+		+				4
Referred to social care professional	+	+	+	+		+		+		6
Any referral[i]	+		+		+		+	+		5
Any referral excluding OAP[j]	+		+		+		+	+		5
Referral for advice re-management or diagnosis	+		+		+	+	+	+		6
Any social care involvement[k]	+	+	+	+	+	+	+	+		8
Cognitive function tested	+	+	+							3
Concerns re-compliance	+	+	+	+			+			5
Resistant to interventions	+	+	+	+			+			5
Confusion re-management	+	+	+	+	+		+			6
Management problems[l]	+	+	+	+	+		+	+		7

TABLE 2 *Continued*

	Months prior to end date									Number of time periods in which $P \leqslant 0.05$
	0–6	6–12	12–18	18–24	24–30	30–36	36–42	42–48	48–54	
Management problems[m]	+	+	+	+	+		+	+		7
Continuous variables										
Square root of the number of GP consultations	+				+	+				3
Number of significant variables in time period	39	26	34	27	25	16	31	15	15	228

[a]Cases are more (less) likely to have behaviour recorded for variables marked + (-). Only variables significant in at least three time periods are included.
[b]Out-of-hours consultation, DNA or consultation with deputising service.
[c]As in the preceding footnote plus any confusion over appointments.
[d]Poor historian, vague presentation, no obvious reason for consultation and does not admit to problems.
[e]Carer present at consultation, referral for carer stress, any correspondence with carer and carer to be informed of appointments.
[f]As in the preceding footnote plus any carer requests or concerns.
[g]Any symptoms relating to mood, disturbances of consciousness, activities of daily living, other physical, cognition, perception or behaviour.
[h]As in the preceding footnote excluding symptoms relating to cognition.
[i]Any referral to.
[j]As in the preceding footnote, excluding referrals to OAP.
[k]Consultation with or referral to social care professional.
[l]Confusion in re-diagnosis, treatment or management and concerns in re-compliance.
[m]As in the preceding footnote plus resistant to interventions.

TABLE 3 *Logistic regression models predicting cases by age group using data from 18–54 months prior to diagnosis*

	65+ (n = 420)	75+ (n = 332)
Parameter estimates for variables included in the model	Odds ratio (95% CI)	
Any consultations with nurse attached to primary health care team	0.16 (0.10, 0.27)	0.15 (0.08, 0.28)
Any cognitive symptoms	3.87 (1.74, 8.62)	3.39 (1.42, 8.10)
Referral for diagnosis or management	3.22 (1.84, 5.62)	3.39 (1.82, 6.33)
DNA	2.84 (1.44, 5.63)	2.80 (1.24, 6.30)
Any social care involvement (referral or consultation)	12.76 (1.57, 103.78)	11.0 (1.30, 93.17)
Any outpatient consultations	0.51 (0.29, 0.88)	0.39 (0.20, 0.75)
Any consultations with patient and carer	2.78 (1.18, 6.58)	2.76 (1.09, 6.98)
Final model properties	Model properties (%)	
Sensitivity (cases correctly identified)	80.2	81.2
Specificity (controls correctly identified)	69.8	69.6
Positive predictive value	80.9	81.6
Negative predictive value	68.9	69.0
Overall correct classification	76.2	76.8
Area under the receiver operating curve (95% CI)	82.3 (78.4, 86.3)	83.4 (79.0, 87.8)
Application of model to a typical full-time GP's list	Number of cases and controls correctly and incorrectly identified	
	(n = 313)	(n = 149)
Cases correctly identified	4.3	3.4
Cases missed	1.0	0.8
Controls correctly identified	214.8	100.8
Controls incorrectly identified as cases	92.9	44.0

number of consultations with primary care physicians, they were less likely to have consulted a nurse attached to the primary health care team or to have been seen by a hospital specialist at an outpatient clinic. Given that the role of primary care nurses includes preventive activities (e.g. influenza vaccination) and chronic disease management (e.g. blood pressure monitoring), this raises the possibility that, for some areas, people developing dementia may be experiencing less than optimal health care, although it is also possible that some of these activities are transferred to physicians. Given that we showed that referral rates to hospital specialists were not different between the two groups, the lower likelihood of being seen by a hospital specialist could suggest problems with attendance.

Consistent with a previous notes-based study,[28] cognitive symptoms were more likely to be recorded in the notes of people developing dementia up to 4 years prior to diagnosis and were a key predictor of developing dementia. This suggests that primary care physicians are aware of the changes in cognitive function that have been documented in the preclinical phase of AD.[17,29] However, these patterns are sufficiently common in cognitively intact older people so as not to be specific enough to correctly identify the small number of people developing dementia without also wrongly identifying large numbers of cognitively intact older people as potentially having dementia. By applying the results in the context of a primary care practice population we have, for the first time, demonstrated the lack of utility of the systematic collection of such data.

The sensitivity and specificity values of an optimized model to predict developing dementia, based on recorded consulting patterns, were lower than those of existing instruments (e.g. MMSE,[20] informant questionnaire on cognitive decline in the elderly,[30] 7-minute screen,[31] general practioner assessment of cognition[32] and a range of activities of daily living and instrumental activities of daily living measures).[33,34] In addition, the variables in the model would be difficult to convert into a usable tool for primary care.

Strengths and limitations of the study

The study has a number of limitations. In view of existing evidence regarding under-diagnosis of dementia, it is possible that a small proportion of the controls were cognitively impaired. However, were this the case, it would lead to conservative estimates of the differences in consulting patterns. Given that the data collection was from routine primary care notes, it was not possible to blind the data collectors to the status of people developing dementia and controls. Without removing records from practices to abstract the data, it is hard to see how this can be avoided. While this means there could be ascertainment bias in our data, we sought to minimize this by rigorous training of the data collectors. People developing dementia and controls were matched on age, sex and general practice; there may be additional factors, such as the availability of a carer, that account for the observed differences in consultation patterns between people developing dementia and controls. However, data on these social factors are not routinely available in primary care notes. While we cannot assume that the notes are fully accurate, there is no reason to expect recording practices to be different for people developing dementia and controls. Prescription data were available for approximately half the cases and controls, which limited the power of the study to detect associations between these variables and the likelihood of a diagnosis of dementia. The extent to which the findings are generalizable to all older people with dementia is unclear. Our sample was from a single OAP service and was based on those seen and diagnosed by that service. People developing dementia referred to older age psychiatrists may differ from those diagnosed and managed within primary care. Unfortunately, we have no data on patients diagnosed and managed solely within primary care.

Despite continuing concerns over the detection of dementia in primary care, it is clear that primary care physicians attend to and record symptoms and consulting patterns associated with developing dementia. However, this study has shown that it is not practicable to use systematic primary care record review to facilitate earlier diagnosis of dementia without identifying a large number of false positives requiring further investigation. The recording of relevant symptoms and consulting patterns may nevertheless provide an opportunity for a more proactive approach to case finding within primary care. There was little evidence of the use of formal tests of cognitive function within primary care in the present study. The opportunistic use of such tests with patients presenting with relevant symptoms and consulting patterns may facilitate earlier diagnosis of dementia and merits further investigation. Earlier use of formal tests may offer an acceptable and cost-effective alternative to the strategy of watchful waiting currently adopted by primary care physicians to differentiate between older people with relevant symptoms or consulting patterns who subsequently develop dementia and those who do not.

Supplementary Data

Supplementary Tables 1 and 2 are available at *Family Practice* online (http://fampra.oupjournlas.org/).

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Declaration

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Conflicts of interest: None.

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