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Comorbidity and polypharmacy in people with dementia: insights from a large, population-based cross-sectional analysis of primary care data

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Abstract

Background: the care of older people with dementia is often complicated by physical comorbidity and polypharmacy, but the extent and patterns of these have not been well described. This paper reports analysis of these factors within a large, cross-sectional primary care data set.
Methods: data were extracted for 291,169 people aged 65 years or older registered with 314 general practices in the UK, of whom 10,258 had an electronically recorded dementia diagnosis. Differences in the number and type of 32 physical conditions and the number of repeat prescriptions in those with and without dementia were examined. Age–gender standardised rates were used to calculate odds ratios (ORs) of physical comorbidity and polypharmacy.
Results: people with dementia, after controlling for age and sex, had on average more physical conditions than controls (mean number of conditions 2.9 versus 2.4; $P < 0.001$) and were on more repeat medication (mean number of repeats 5.4 versus 4.2; $P < 0.001$). Those with dementia were more likely to have 5 or more physical conditions (age–sex standardised OR [sOR] 1.42, 95% confidence interval (CI) 1.35–1.50; $P < 0.001$) and were also more likely to be on 5 or more (sOR 1.46; 95% CI 1.40–1.52; $P < 0.001$) or 10 or more repeat prescriptions (sOR 2.01; 95% CI 1.90–2.12; $P < 0.001$).
Conclusions: people with dementia have a higher burden of comorbid physical disease and polypharmacy than those without dementia, even after accounting for age and sex differences. Such complex needs require an integrated response from general health professionals and multidisciplinary dementia specialists.

Keywords: *older people, comorbidity, multi-morbidity, dementia, Alzheimer's disease, polypharmacy*

Background

Ageing populations are driving large increases in the prevalence of dementia, posing major challenges to healthcare systems internationally [1]. However, dementia and the healthcare of people living with dementia is often viewed in isolation by policymakers and healthcare providers. Health services are typically organised around single conditions, leading to people with multiple conditions often receiving uncoordinated or fragmented care. This is particularly true for people with physical–mental health comorbidity, since physical and mental health services in most countries are not well integrated [2]. For people with dementia, older people's mental health teams focus almost exclusively on mental healthcare, and there may be a range of physical specialists involved in care in addition to geriatricians and primary care physicians.

A number of studies have reported the prevalence of comorbidity in older people with dementia, but the evidence base is inconsistent due to limited sample size and selection bias (e.g. specialist or inpatient cohorts, specific dementia

types) and the way in which comorbidity is measured [3–9]. The extent of multiple medication use (polypharmacy) in dementia has been little studied. To our knowledge, only one population-based study has examined polypharmacy, which reported that people with Alzheimer's disease took statistically significantly higher numbers of medication compared to controls when adjusted for gender and age (5.1 versus 2.9) [10].

Comorbidity and polypharmacy are both associated with worsening effects on cognition, functional ability and survival of individuals with dementia [11, 12]. This paper examines a large population sample of people aged 65 years and older, examining prevalence of physical comorbidity and polypharmacy in people with and without dementia. We have used similar methods to explore comorbidity and polypharmacy in schizophrenia [13] and bipolar disorder [14] in the same population data set.

Methods

Data for this cross-sectional study was provided by the Primary Care Clinical Informatics Unit at the University of Aberdeen for all registered patients who were alive and permanently registered with 314 general practices on 31 March 2007. The 1,751,841 people registered with these practices are a representative sample of approximately one-third of the Scottish population, and 291,169 people aged 65 years and older are included in this analysis.

People were identified as having dementia based on recording at any point of a relevant Read Code (the standard clinical coding system in use in the UK primary care) including Alzheimer's disease, vascular dementia, Lewy Body dementia, dementia associated with other conditions such as Parkinson's Disease and unspecified dementia. The two outcomes examined were measures of physical comorbidity and number of repeat prescriptions. Data on the presence of 32 chronic physical health conditions were extracted (Table 1). A more detailed explanation of how these conditions were selected and defined is available elsewhere [15].

Data on the number of drugs authorised for repeat prescription and issued to the patient in the previous 84 days were extracted. The count of number of repeat prescription drugs includes all pharmacologically active drugs but excludes devices, dressings and topical preparations without significant systemic effects. Deprivation status was measured using the Carstairs' deprivation score, which is widely used in healthcare research and was grouped into quintiles [16]. Age was categorised into 5-year bands from age 65–69 years to age 95 years and older.

Differences between individuals with dementia and all other individuals (controls) were calculated for age, deprivation status, number of physical conditions and number of repeat prescriptions as defined above. *T*-tests were used to analyse differences between groups and one-way ANOVA for differences across age groups and deprivation quintiles. As with previous papers, to control for differences between the two populations in age, gender and deprivation levels, we generated standardised prevalence rates by age group (65–69 years; 70–74; 75–79; 80–84 and 85 and older), gender and deprivation quintile using the direct method [17]. These age–gender standardised rates were then used to calculate

Table 1. Age, gender, deprivation and number of conditions with CIs and ORs shown

	People with dementia N = 10,528, No. (%) unless stated	People without dementia N = 280,641, No. (%) unless stated	Difference 95% CI ($P < t$)
Female	7428 (70.6)	159,028 (56.7)	13.9 ($P < 0.001$)
Mean age (SD)	82.6 (7.4)	74.7 (7.2)	7.9 ($P < 0.001$)
Age group			
65–69	579 (5.5)	83,023 (29.6)	−24.1 ($P < 0.001$)
70–74	986 (9.4)	70,692 (25.2)	−15.8 ($P < 0.001$)
75–79	1,832 (17.4)	56,369 (20.1)	−2.7 ($P < 0.001$)
80–84	2,650 (25.2)	38,469 (13.7)	11.5 ($P < 0.001$)
85–89	2,575 (24.5)	21,985 (7.8)	16.6 ($P < 0.001$)
90–94	1,417 (13.5)	7,864 (2.8)	10.7 ($P < 0.001$)
≥95	489 (4.6)	2,239 (0.8)	3.8 ($P < 0.001$)
Deprivation Quintile			
1 (least deprived)	2,130 (20.2)	52,978 (18.9)	1.3 ($P < 0.001$)
2	2,400 (22.8)	65,255 (23.3)	−0.5 ($P = 0.27$)
3	2,459 (23.4)	64,634 (23.0)	0.4 ($P = 0.43$)
4	1,815 (17.2)	51,936 (18.5)	−1.3 ($P = 0.01$)
5 (most deprived)	1,724 (16.4)	45,838 (16.3)	0.01 ($P = 0.98$)
			Odds ratio (95% CI) Directly standardised for age and sex
No. of physical comorbidities			
None	912 (8.7)	44,654 (15.9)	0.62 (0.58–0.66), $P < 0.001$
1	1,894 (18.0)	60,596 (21.6)	0.83 (0.79–0.87), $P < 0.001$
2	2,202 (20.9)	59,922 (21.4)	0.92 (0.88–0.97), $P = 0.01$
3	2,010 (19.1)	46,638 (16.6)	1.19 (1.14–1.25), $P < 0.001$
4	1,508 (14.3)	31,278 (11.2)	1.20 (1.13–1.27), $P < 0.001$
5 or more	2,005 (19.0)	37,553 (13.4)	1.42 (1.35–1.50), $P < 0.001$

odds ratio (ORs) and 95% confidence intervals (CIs) in those with dementia compared with those without for the prevalence of all 32 physical conditions, as well as no physical condition, one physical condition, two physical conditions, three, four and five or more physical conditions. Age–gender standardised rates were calculated in a similar fashion for the number of repeat prescriptions. All quoted odds ratios in the results are age–sex standardised. The NHS National Research Ethics Service had previously approved the use of these data for research purposes; therefore this study did not need individual ethical approval.

Results

There were 10,528 people with dementia recorded in the GP electronic medical record, 3.6% (95% CI 3.5–3.7) of those aged 65 years and older (Table 1). People with dementia were more likely to be women (70.6% versus 56.7% of controls; $P < 0.001$) and were on average older (mean age 82.6 versus 74.7 years; $P < 0.001$). Only 14.9% of people with dementia were aged between 65 and 74 years compared to 54.8% of those without, while 42.6% of people with dementia were 85 and older compared to 11.4% (difference 31.2%; $P < 0.001$). No substantial or consistent differences were found by deprivation.

Physical comorbidity in people with dementia versus controls

People with dementia had on average 2.9 physical conditions compared to 2.4 for controls ($P < 0.001$) (Table 1). Only 8.7% of those with dementia had no physical condition compared to 15.9% of controls (OR 0.62, 95% CI 0.58–0.66), while 19% with dementia had five or more physical conditions compared to 13.4% of controls (OR 1.42, 95% CI 1.35–1.50).

Table 2 shows that the most commonly diagnosed condition for individuals with dementia was hypertension with a prevalence rate of 43.2% followed by constipation (25.9%), coronary heart disease (22.8%), stroke (19.4%) and pain (16.0%). For each of the 32 individual physical conditions assessed, age–sex standardised prevalence was significantly higher for dementia for 16 conditions, lower for 3 conditions and no difference was found for the remaining 13 conditions (Table 2). Relative prevalence was the highest for dementia versus controls for Parkinson's

Table 2. Prevalence and odds ratios for individual conditions, standardised by age and gender

Individual conditions	People with dementia, No. (%) $N = 10,528$	People without dementia, No. (%) $N = 280,641$	Odds ratio (95% CI); directly standardised for age and sex, P
Parkinson's disease/Parkinsonism	310 (2.9)	2,022 (0.7)	4.32 (3.84–4.29), <0.001
Epilepsy	226 (2.1)	2,704 (1.0)	3.26 (2.90–3.67), <0.001
Constipation	2,728 (25.9)	22,788 (8.1)	2.65 (2.52–2.79), <0.001
Inflammatory arthritis, connective tissue disorders and gout	1,433 (13.6)	27,442 (9.8)	2.23 (2.12–2.34), <0.001
Stroke/TIA	2,038 (19.4)	25,634 (9.1)	2.13 (2.02–2.13), <0.001
Multiple sclerosis	23 (0.2)	702 (0.3)	2.07 (1.57–2.74), <0.001
Liver Disease	25 (0.2)	769 (0.3)	1.80 (1.35–2.39), <0.001
Viral Hepatitis	2 (0.0)	46 (0.0)	1.77 (0.55–5.72), 0.33
Psoriasis or eczema	131 (1.2)	2,882 (1.0)	1.69 (1.46–1.97), <0.001
Inflammatory bowel disease	98 (0.9)	2,659 (1.0)	1.50 (1.27–1.77), <0.001
Blindness or low vision	418 (4.0)	4,930 (1.8)	1.48 (1.31–1.68), <0.001
Pain	1,684 (16.0)	53,590 (19.1)	1.16 (1.10–1.21), <0.001
Atrial fibrillation	1,124 (10.7)	18,583 (6.6)	1.13 (1.05–1.22), 0.01
Thyroid Disorders	1,526 (14.5)	30,955 (11.0)	1.14 (1.07–1.21), <0.001
Diabetes	1,397 (13.3)	37,347 (13.3)	1.14 (1.08–1.21), <0.001
Hearing Loss	1,454 (13.8)	26,122 (9.3)	1.11 (1.04–1.18), 0.01
Peripheral vascular disease	547 (5.2)	14,108 (5.0)	1.07 (0.98–1.17), 0.10
Coronary heart disease	2,399 (22.8)	57,303 (20.4)	1.06 (1.01–1.11), 0.01
Prostate	357 (3.4)	10,069 (3.6)	1.06 (0.96–1.17), 0.23
Diverticular	1,196 (11.4)	23,521 (8.4)	1.04 (0.97–1.11), 0.21
Bronchiectasis	51 (0.5)	1,560 (0.6)	1.04 (0.80–1.35), 0.72
COPD	976 (9.3)	28,562 (10.2)	1.03 (0.96–1.10), 0.33
Chronic kidney disease	1,304 (12.4)	27,108 (9.7)	1.03 (0.96–1.10), 0.34
Irritable bowel syndrome	361 (3.4)	11,332 (4.0)	0.99 (0.89–1.09), 0.98
Glaucoma	590 (5.6)	11,127 (4.0)	0.99 (0.90–1.10), 0.99
Heart Failure	727 (6.9)	14,041 (5.0)	0.98 (0.89–1.07), 0.68
Dyspepsia	1,225 (11.6)	32,352 (11.5)	0.96 (0.90–1.02), 0.09
Chronic sinusitis	55 (0.5)	2,097 (0.8)	0.89 (0.70–1.13), 0.36
Any cancer last 5 years	863 (8.2)	23,353 (8.3)	0.88 (0.82–0.95) <0.001
Migraine	20 (0.2)	1,203 (0.4)	0.83 (0.59–1.15), 0.27
Hypertension	4,548 (43.2)	131,853 (47.0)	0.81 (0.78–0.85) <0.001
Asthma	363 (3.5)	18,639 (6.6)	0.73 (0.67–0.80) <0.001

disease (OR 4.32, 95% CI 3.84–4.29), epilepsy (OR 3.26, 95% CI 2.90–3.67) and constipation (OR 2.65, 95% CI 2.52–2.79). The three physical conditions in which the prevalence for dementia patients was significantly lower following standardisation were cancer (OR 0.88, 95% CI 0.82–0.95), hypertension (OR 0.81, 95% CI 0.78–0.85) and asthma (OR 0.73, 95% CI 0.67–0.80).

Polypharmacy in people with dementia versus controls

People with dementia were on average on more active repeat prescriptions (mean number of repeats 5.4 versus 4.2; $P < 0.001$). Table 3 shows that only 10.9% of those with dementia were not on a repeat prescription compared to 18.3% of controls (OR 0.54; 95% CI 0.51–0.58; $P < 0.001$). Over half of those with dementia were on 5 or more repeat prescriptions with 43.2% on 5–9 repeat prescriptions compared to 32.4% of controls (OR 1.46; 95% CI 1.40–1.52; $P < 0.001$) and 14% on 10 or more compared to 8.4% of controls (OR 2.01; 95% CI 1.90–2.12; $P < 0.001$). Apparent differences were reduced after standardising for number of physical conditions. For example, the odds ratios for those on 5–9 repeat prescriptions fell to 1.23 (1.18–1.29) and 1.47 (1.38–1.58) for 10 or more.

Discussion

Main findings

This study of a large, non-selected general practice population sample shows that older people with dementia had more physical comorbidity and polypharmacy than those without dementia. Those with dementia were more likely to have five or more physical conditions (not including dementia) and to be on five or more repeat prescriptions. The age–sex standardised prevalence of individual physical conditions was significantly higher in dementia for 16 conditions, lower for 3 conditions and not different from the controls for the remaining 13 conditions.

Limitations

One of the strengths of this study is the large sample size (291,691 community living people aged 65 years and older), which is representative of the wider population in terms of age, sex and deprivation and avoids the biases that are inevitable in clinic- or hospital-based cohorts. However, the study relies on routine clinical recording of dementia diagnosis, which is known to be lower than expected, although recording in Scotland has historically been better than elsewhere in the UK [18]. Dementia diagnosis appeared to be under-recorded compared to the expected prevalence in the people older than 65 years. Given known difficulties with early dementia identification and recording in general practice [19], this sample may therefore be more likely to describe comorbidity among 'diagnosed' patients with moderate-to-severe dementia. Thus, the data may underspecify the comorbidity patterns present among patients with earlier stage disease or among undiagnosed patients in residential care, with potentially higher comorbidity burden. The extent and range of comorbidity may also be underestimated due to dementia-related difficulties with communication and symptom self-report.

Comparison with related work

Other studies have also shown high rates of physical comorbidity and medication use in people with dementia, [3–5, 9, 20] although not all studies find this [6–8], and the current sample is more representative than many of those studied previously. Disease stage and the care setting from which patients are recruited are likely to influence the prevalence of and identification of physical conditions across different study populations [4, 6–8]. For comorbidity, these results broadly agree with the findings of the only other large routine health data set published to date, which described administrative claims data and recorded higher comorbid conditions among people with dementia than their matched controls [9]. The same authors note that even when illness burden is controlled for, the care costs of patients with dementia may be up to 34% higher than those of age-matched controls, with outpatient pharmaceuticals being the key driver of cost difference [21]. A recent Spanish primary care-based study found increased rates of Parkinson's disease and cerebrovascular disease, consistent with this data set [22] but additionally reported higher rates of thyroid conditions, heart disease, retinal disorder and prostatic hypertrophy.

Table 3. Prevalence and odds ratios for repeat prescribing, standardised by age, gender and number of physical conditions

Number of active repeat medications[a]	People with dementia, No. (%) $N = 10,528$	People without dementia, No. (%) $N = 280,641$	Odds ratio (95% CI), directly standardised for age and sex, P	Odds ratio (95% CI), directly standardised for age, sex, and number of physical conditions, P
No repeats	1,145 (10.9)	51,209 (18.3)	0.54 (0.51–0.58), <0.001	0.74 (0.69–0.74), <0.001
One repeats	542 (5.2)	25,345 (9.0)	0.59 (0.54–0.64), <0.001	0.73 (0.67–0.80), <0.001
Two repeats	759 (7.2)	29,477 (10.5)	0.77 (0.71–0.82), <0.001	0.77 (0.71–0.83), <0.001
Three repeats	971 (9.2)	30,431 (10.8)	0.79 (0.74–0.85), <0.001	0.87 (0.82–0.93), <0.001
Four repeats	1,098 (10.4)	29,782 (10.6)	0.88 (0.82–0.94), <0.001	0.94 (0.88–1.01), 0.10
Five to nine repeats	4,544 (43.2)	90,896 (32.4)	1.46 (1.40–1.52), <0.001	1.23 (1.18–1.29), <0.001
Ten or more repeats	1,469 (14.0)	23,501 (8.4)	2.01 (1.90–2.12), <0.001	1.47 (1.38–1.58), <0.001

[a]Authorised for repeat issue without a consultation and issued in the last 84 days.

This sample of 3,971 people with dementia was however, considerably smaller than the population reported here. Other studies report variation in condition prevalence between populations with or without dementia, suggestive of additional moderating factors. In a cross-sectional study of seven US primary care centres by Schubert and colleagues, medical comorbidity was equally common in people with and without dementia [6]. Lyketsos and colleagues, however, reported more comorbidity among people with cognitive impairment and no dementia and individuals with dementia compared to those without these conditions in a population-based study [5]. Equivalent comorbidity was similarly found in an inpatient study comparing very old (mean age 85.2 years) people with and without cognitive impairment [8], but this, like other inpatient studies, is unlikely to be representative of the whole population of older people with and without dementia [23]. Similar issues apply to studies in specialist clinics, such as an earlier report in 1988 examining outpatients with Alzheimer's disease, which concluded that this patient group were healthier than those without dementia [7]. Bunn and colleagues review the dementia comorbidity literature with a focused exploration of disease prevalence in stroke, diabetes and visual impairment [20]. They note studies reporting both elevated and equivalent prevalence of stroke and diabetes relative to controls, suggestive of some data variability related to population selection and representativeness.

This study found that polypharmacy is more common among people with dementia, even after age, gender and comorbidity adjustment, similar to other studies that have found polypharmacy to be common in people with dementia. A large Swedish data set reported that 33.5% of patients were receiving five or more regular medications [24]. In a study of nursing home residents with advanced cognitive impairment, 13.9% of the population were on 10 or more regular prescribed medications [12]. Another study in Norway reported that participants with Alzheimer's disease were treated with a significantly higher number of medications as compared to controls (5.1 versus 2.9, respectively), even after adjustment for comorbidity [10]. In particular, previous work using the same data set as this analysis has shown that people with dementia are 17 times more likely to be prescribed an antipsychotic and twice as likely to be prescribed an antidepressant or a hypnotic/anxiolytic than older people without dementia [25].

Relevance to practice and policy

These findings have a number of implications for the development of policy and dementia care pathways. Both comorbidity and polypharmacy may individually have a detrimental effect on outcomes of people with dementia. Research indicates that comorbidity may have a direct negative effect on the clinical manifestation of dementia [12, 25–27] including the potential to increase rate of cognitive decline and accelerate functional decline, up to 2 years before patients without comorbidity [27, 28]. Polypharmacy has also been shown to be associated with negative outcomes in people with dementia. In the SHELTER study, in patients with severe dementia, polypharmacy (defined as 10 medications or more) was associated with increased mortality [12].

Emergent evidence indicates that multidisciplinary treatment strategies may have the potential to reduce rates of antipsychotic prescription. Approaches that have been evaluated include timely screening of short-term health conditions, systematic pain management protocols and appropriately targeted psychosocial intervention [29]. Clodomiro and colleagues explore the possibility of applying risk benefit approaches to prescription according to factors such as frailty and multi-morbidity, highlighting in particular the incompatibility of anticholinergic treatments with many other medications commonly prescribed in elderly care settings [30].

Conclusions

This analysis, describing one of the largest population samples described to date, has shown high rates of physical comorbidity and polypharmacy in older people with dementia, which are both increased compared to the age–sex standardised control population. Given increasingly evidenced indications of the detrimental impact of comorbidity and polypharmacy, these findings highlight the need to re-evaluate and improve multidisciplinary integration of physical and mental health across a wide spectrum of care provision. Future research might usefully evaluate strategies for the active management of comorbidity and medication review to see whether it slows decline or improves function in people with dementia.

Key points

- This paper reports a large cross-sectional study of polypharmacy and physical comorbidity among older people with dementia.
- People with dementia had more physical conditions and were also prescribed more medications than those without dementia.
- These data highlight the importance of integrating specialist and non-specialist care to support complex symptom management.

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Authors' contributions

B.G. and S.W.M. conceived the idea of the study. G.Mc.L. carried out statistical analysis and drafting of the results and methodology with B.G. F.C. drafted literature review and interpretation of findings with B.G., E.R. and S.W.M. All authors contributed to draft revisions. All authors approved the final version before submission. S.W.M. is the guarantor for this study.

Conflicts of interest

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References

1. Ferri C, Prince M, Brayne C *et al*. Global prevalence of dementia: a delphi consensus study. Lancet 2005; 366: 2112–17.
2. Prince M, Patel V, Saxena S *et al*. No health without mental health. Lancet 2007; 370: 859–77.
3. Duthie A, Chew D, Soiza RL. Non-psychiatric comorbidity associated with Alzheimer's disease. QJM 2011; 104: 913–20.
4. Formiga F, Fort I, Robles MJ *et al*. Comorbidity and clinical features in elderly patients with dementia: differences according to dementia severity. J Nutr Health Aging 2009; 13: 423–7.
5. Lyketsos CGI, Toone L, Tschanz J *et al*. Population-based study of medical comorbidity in early dementia and 'cognitive impairment, no dementia (CIND)': association with functional and cognitive impairment: the Cache County Study. Am J Geriatr Psychiat 2005; 13: 656–4.
6. Schubert CC, Boustani M, Callahan CM *et al*. Comorbidity Profile of dementia patients in primary care: are they sicker? JAGS 2006; 54: 104–9.
7. Wolf-Klein GP, Siverstone FA, Brod MS *et al*. Are Alzheimer patients healthier? J Am Geriatr Soc 1988; 36: 219–24.
8. Zekry D, Hermann FR, Grandjean R. Demented versus non-demented very old inpatients: the same comorbidities but poorer functional and nutritional status. Age Ageing 2008; 37: 83–9.
9. Zhao Y, Kuo TC, Weir S, Kramer MS, Ash AS. Healthcare costs and utilization for Medicare beneficiaries with Alzheimer's. BMC Health Serv Res 2008; 8: 108.
10. Andersen F, Viitanen M, Halvorsen DS, Straume B, Engstad TA. Co-morbidity and drug treatment in Alzheimer's disease. A cross sectional study of participants in the Dementia Study in Northern Norway. BMC Geriatr 2011; 11: 58.
11. Doraiswamy PM, Leon J, Cummings JL, Marin D, Neumann PJ. Prevalence and impact of medical comorbidity in Alzheimer's disease. J Gerontol 2002; 57A: M173–7.
12. Onder GI, Liperoti R, Foebel A *et al*. Polypharmacy and mortality among nursing home residents with advanced cognitive impairment: results from the SHELTER study. J Am Med Dir Assoc 2013; 14: 450.e457–12.
13. Smith DJ, Langan J, Maclean G, Guthrie B, Mercer SW. Schizophrenia is associated with excess multiple physical-health comorbidities but low levels of recorded cardiovascular disease in primary care: cross sectional study. BMJ Open 2013; 3: e002808.
14. Smith DJ, Martin D, Maclean G, Langan J, Guthrie B, Mercer SW. Multimorbidity in bipolar disorder and undertreatment of cardiovascular disease: a cross sectional study. BMC Med; 11: 263.
15. Barnet K, Mercer SW, Norbury M, Watt G, Wyke S, Guthrie B. Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. Lancet 2012; 380: 37–43.
16. Carstairs VMR. Deprivation and Health in Scotland. Aberdeen: Aberdeen University Press, 1991.
17. Court H, McLean G, Guthrie B, Mercer SW, Smith DJ. Visual impairment and physical and mental health comorbidities in older adults: a cross-sectional study. BMC Med 2014; 12: 181.
18. Alzheimer's Society Mapping the Dementia Gap 2012: Progress on Improving Diagnosis of Dementia 2011–2012. London: Alzheimer's Society, 2013.
19. Bradford A, Kunik ME, Schulz P, Singh H. Missed and delayed diagnosis of dementia in primary care: prevalence and contributing factors. Alzheimer Dis Assoc Disord 2009; 23: 306–14.
20. Bunn F, Burn A, Goodman C *et al*. Comorbidity and dementia: a scoping review of the literature. BMC Med 2014; 12.
21. Kuo TC, Zhao Y, Weir S, Kramer MS, Ash A. Implications of comorbidity on costs for patients with Alzheimer's disease. Med Care 2008; 46: 839–46.
22. Pobladour-Plou B, Calderon-Larranaga A, Marta-Moreno J *et al*. Comorbidity of dementia: a cross sectional study of primary care older patients. BMC Psychiatry 2014; 14: 84.
23. Van den Berg S, Spaine M. Policy brief: risk factors for dementia. Alzheimer's Disease International; 2012 April.
24. Fereshtehnejad SM, Johnell K, Eriksdotter M. Anti-dementia drugs and co-medication among patients with Alzheimer's disease : investigating real-world drug use in clinical practice using the Swedish Dementia Quality Registry (SveDem). Drugs Aging 2014; 31: 215–24.
25. Guthrie B, Clark SA, McCowan C. The burden of psychotropic drug prescribing in people with dementia: a population database study. Age Ageing 2010; 39: 637–42.
26. Leoutsakos JM, Han D, Mielke MM *et al*. Effects of general medical health on Alzheimer's progression: the Cache County Dementia Progression Study. Int Psychogeriatr 2012; 24: 1561–70.
27. Melis RJ, Marengoni A, Rizzuto D, Teerenstra S, Kivipelto M, Angleman SB *et al*. The influence of multimorbidity on clinical

progression of dementia in a population-based cohort. PLoS One 2013; 8: e84014.
28. Solomon AI, Dobranici L, Kåreholt I, Tudose C, Lăzărescu M. Comorbidity and the rate of cognitive decline in patients with Alzheimer dementia. Int J Geriatr Psychiat 2011; 26: 1244–51.
29. Brechin D, Murphy G, James IA, Codner J. Briefing Paper: Alternatives to antipsychotic medication: psychological approaches in managing psychological and behavioural distress in people with dementia. In: Leicester British Psychological Society; 2013.
30. Clodomiro A, Gareri P, Puccio G, Frangipane F, Castagna A, Manfredi VG *et al*. Somatic comorbidities and Alzheimer's disease treatment. Neurol Sci 2013; 34: 1581–9.

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Priorities for the professional development of registered nurses in nursing homes: a Delphi study

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Abstract

Objective: to establish a consensus on the care and professional development needs of registered nurses (RNs) employed by UK care homes.
Design: two-stage, online modified Delphi study.
Setting and participants: a panel (n = 352) of individuals with experience, expertise or interest in care home nursing: (i) care home nurses and managers; (ii) community healthcare professionals (including general practitioners, geriatricians, specialist and district nurses); and (iii) nurse educators in higher education.
Results: RNs employed by nursing homes require particular skills, knowledge, competence and experience to provide high-quality care for older residents. The most important responsibilities for the nursing home nurse were: promoting dignity, personhood and wellbeing, ensuring resident safety and enhancing quality of life. Continuing professional development priorities included personal care, dementia care and managing long-term conditions. The main barrier to professional development was staff shortages. Nursing degree programmes were perceived as inadequately preparing nurses for a nursing home role. Nursing homes could improve by providing supportive learning opportunities for students and fostering challenging and rewarding careers for newly RNs.
Conclusion: if nurses employed by nursing homes are not fit for purpose, the consequences for the wider health and social-care system are significant. Nursing homes, the NHS, educational and local authorities need to work together to provide challenging and rewarding career paths for RNs and evaluate them. Without well-trained, motivated staff, a high-quality care sector will remain merely an aspiration.

Keywords: *older people, Delphi survey, nursing homes, skilled nursing facilities, frail elderly, long-term care*