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ORIGINAL ARTICLE

The use of neuroimaging in dementia by Irish general practitioners

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Abstract
Background More than 48,000 people in Ireland are living with dementia, and the number is likely to rise to 130,000 by 2041. Dementia frequently remains undiagnosed, depriving many of early interventions and the opportunity to plan for the future. Neuroimaging is helpful in the diagnosis of dementia, yet it is often insufficiently utilised. General practitioners (GPs) often decide which patients should be referred on for specialist assessment and as such play a crucial role in dementia diagnosis.
Aims To establish the accessibility of neuroimaging in dementia by GPs, current referral patterns, confidence in referral and opinions on radiology reports.
Methods The research design was a postal survey among GPs in single and group practices in urban, rural and semi-rural areas in the east and southeast of Ireland. GPs were identified from the Irish Medical Directory and posted individual anonymous questionnaires.
Results A third of participants reported that they had no direct access to neuroimaging. Access differed between public and private patients. GPs primarily referred to computed tomography and magnetic resonance imaging, but only 14.6 % based these referrals on published guidelines. A total of 47.8 % of participants were not very confident in their ability to choose the most appropriate modality.
Conclusion Access to neuroimaging investigations for suspected cases of dementia varies between locations and public and private systems. To improve diagnostic rates and ensure appropriate utilisation of imaging resources, GPs require access to clinical and referral guidelines to ensure appropriate use of neuroimaging and the best possible patient outcomes.

Keywords Dementia · General practice · Diagnosis · Neuroimaging · Access

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Introduction

In Ireland, it has been estimated at almost 48,000 people are currently living with dementia. This number is likely to rise to more than 130,000 by 2041 [1]. Ireland is predicted to have the largest growth in the older population of all European countries in the coming decades [2]. The overall cost of dementia in Ireland is estimated at €1.69 billion per annum [3]. While decreasing prevalence rates are reported, mainly due to higher education levels, healthier diets and increased physical exercise, the number of people with the disease will increase due to increased life expectancy [4–6].

Despite its impact, dementia remains vastly underdiagnosed. According to the UK Alzheimer's Society, only 44.2 % of UK people with dementia are formally diagnosed, with a similar situation in Ireland [3, 7]. Though there is currently no cure for dementia, this 'treatment gap' is a significant barrier to improving lives of people with dementia and their carers [8]. People with undiagnosed dementia have no access to the treatment, care and organised support that formal diagnosis provides, and they cannot avail of currently available interventions which can be efficient in improving symptoms [8].

Neuroimaging plays a crucial role in the diagnosis and understanding of dementia, allowing identification of brain changes as part of the clinical diagnosis, and can assist in establishing dementia subtypes which is important for treatment, prognosis and care planning [9]. Structural imaging using computed tomography (CT) or magnetic resonance imaging (MRI) helps to exclude other cerebral pathologies in the assessment of people with suspected dementia [10, 11]. Nuclear medicine scans can help differentiate Alzheimer's disease (AD), vascular dementia and frontotemporal dementia if a diagnosis is unclear [10]. Structural and functional imaging also proves useful in preclinical detection, allowing earlier treatment [11]. MRI or CT imaging is recommended for routine evaluation where AD is suspected [12, 13]. MRI scans in particular are a marker of AD progression [12, 14].

In the absence of national guidelines, many Irish general practitioners (GPs) follow the National Institute for Health and Clinical Excellence/Social Care Institute for Excellence (NICE/SCIE) guidelines, which recommend structural imaging in the assessment of people with suspected dementia [10]. NICE/SCIE also recommends nuclear medicine single-photon emission computed tomography (SPECT) and positron emission tomography (PET) scans to differentiate AD, vascular dementia and frontotemporal dementia if the diagnosis is in doubt. Such a subtype diagnosis should be made by health-care professionals with expertise in differential diagnosis [1, 15]. This is in keeping with the Irish College of General Practitioners (ICGP) views on the diagnosis and management of dementia [16]. Despite these guidelines, neuroimaging is not sufficiently utilised in the diagnosis of dementia, although neuroimaging investigations of the brain and spine in suspected neoplasm, vascular disease and inflammatory disease, requested by GPs and hospital specialists, have demonstrated similar diagnostic yield and impact positively on patient management [17–19].

GPs have a crucial role in the early diagnosis of dementia [20]. They are important gatekeepers since they decide which patients should be referred for specialist assessment and treatment [8, 21]. A UK study found that only 4 % of patients with probable or confirmed dementia on a primary care register were first diagnosed in secondary care, and that two-thirds of those identified in primary care were referred immediately [22]. In a 2012 opinion piece, O'Connell suggests that to enable the diagnosis of most cases of dementia, it is imperative that GPs are adequately trained in clinical assessment skills and have access to key diagnostics [20]. The current survey aimed at establishing the accessibility of neuroimaging for suspected cases of dementia, reasons for referral and current confidence and knowledge in this area.

Methods

Study design

The research design was a postal survey, and a questionnaire pertinent to the research enquiry was developed.

Questionnaire

The questionnaire included open and closed questions and consisted of sections designed to ascertain the demographic characteristics of the sample, satisfaction with diagnostic capabilities within the health service as well as access to neuroimaging, current referral patterns and use of protocols, and the usefulness of reports on neuroimaging investigations. The questionnaire was completely anonymous.

Participants

The survey targeted GPs in Ireland with practices located within the INTERREG Ireland–Wales project area, which included approximately two-thirds of all GPs in the Republic of Ireland (counties in the region are: Carlow, Dublin, Kildare, Kilkenny, Meath, South Tipperary, Waterford, Wexford, Wicklow and the adjacent counties of Cork and Kerry). Some respondents gave their home address, which could be located outside the project area, e.g. County Monaghan, rather than their practice address from within the area. Individual and group practice addresses were identified through the Irish Medical Directory 2011–2012. A total of 1684 questionnaires were posted to individual GPs in rural, semi-rural and urban areas in March 2013. Respondents were given 4 weeks to return the questionnaire. There was no follow-up.

Statistical analysis

Data analysis was carried out using IBM SPSS Statistics Version 20. Descriptive statistics are reported for most analyses. Chi-square analysis including standardised

residuals was used to establish associations between categorical variables. Open questions were examined using thematic analysis.

Results

Demographics

A total of 302 questionnaires were returned corresponding to a response rate of 18 %. Just over half of respondents (56.6 %, 167/295) were male. The respondents' year of qualification ranged from 1965 to 2012 (32.7 %, 1975–1984; 26.9 %, 1985–1994; 18.5 %, 1995–2004). The mean number of years participants had spent in their current job was 18.2 years (SD 11.47, range 0.5–44).

Just over half of practices (55.8 %, 164/294) were located in urban areas, and almost a third (29.3 %, 86/294) were located in semi-rural locations (i.e. towns with a population of 1500–5000). The majority of participants (88.3 %, 265/300) worked in mixed practices, i.e. in private practice and under the Irish General Medical Scheme (GMS) which entitles patients with an income below a particular figure to receive certain health services free of charge. Only 6.3 % (19/300) of respondents worked exclusively under the GMS, while just 4.7 % (14/300) worked solely in private practice.

A total of 44.8 % (133/297) of respondents reported that between 25 and 49 % of their patients were aged over 65 years of age, with GPs in rural areas more likely to report this (66.7 %, 28/42, SR = 2.1). Nearly all participants (94.7 %, 284/300) were involved in the diagnosis of mild cognitive impairment (MCI) or dementia.

Diagnostic capabilities within the health service area

The majority of respondents rated the proficiency in the diagnosis of MCI or dementia within their Health Service Executive (HSE) region as excellent (11.5 %, 34/296) or good (49.7 %, 147/296); however, over a third (34.1 %, 101/296) rated them as fair and 4.7 % (14/296) as poor. GPs located in major urban areas rated the HSE's capabilities favourably, while GPs outside of these counties rated them more negatively. Approximately, two-thirds of respondents in counties Dublin and Cork (65.3 and 65.2 %, respectively), the two largest urban centres, rated the HSE's capabilities as excellent or good, whereas 80 % of respondents in county Kildare and 100 % in county Monaghan rated them as fair or poor. GPs working in private practice (38.5 %, 5/13, SR = 5.6) were more likely to rate the HSE's capabilities as poor than their GMS or mixed practice counterparts.

Qualitative analysis revealed that participants stated most frequently that faster access to specialists and services, in particular to geriatric services, would improve the number of people who receive a diagnosis of MCI or dementia. Other aspects that were mentioned to improve the rate of diagnosis were better access to imaging (particularly for patients under the GMS) ($n = 30$), better access to assessment or diagnostics ($n = 28$), further memory clinics ($n = 22$) as well as a dedicated team, clinic or service ($n = 19$).

Access to neuroimaging

GPs' access to neuroimaging for direct referral is displayed in Fig. 1. Numerous GPs commented that CT and MRI scans were only directly available for private patients, and that public patients could only avail of these scans through a referral to secondary or tertiary care.

Referral for neuroimaging

GP opinions on the importance of neuroimaging for the diagnosis of dementia, as opposed to other investigations, are displayed in Fig. 2.

Almost half of respondents (48.6 %, 143/294) referred patients with suspected dementia for neuroimaging, and 41.2 % (122/296) referred patients with suspected MCI. GPs who qualified as a practitioner between 1965 and 1974 were less likely to refer patients with suspected dementia (30 %, 11/43, SR = −2.2). The reasons for referral in suspected MCI or dementia are displayed in Fig. 3. It is important to note in this question that responses were not mutually exclusive.

GPs who considered neuroimaging for the diagnosis of dementia as opposed to other diagnostic tests as very important were more likely to refer patients to establish a

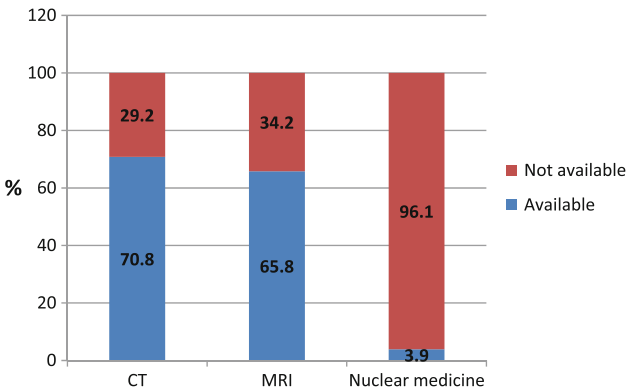

Fig. 1 Reported availability of neuroimaging modalities for direct referral

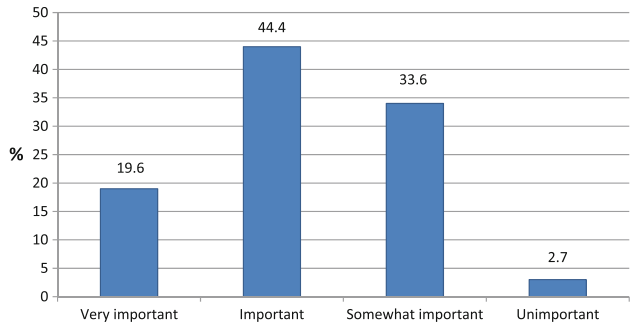

Fig. 2 Importance of neuroimaging for the diagnosis of dementia compared to other investigations

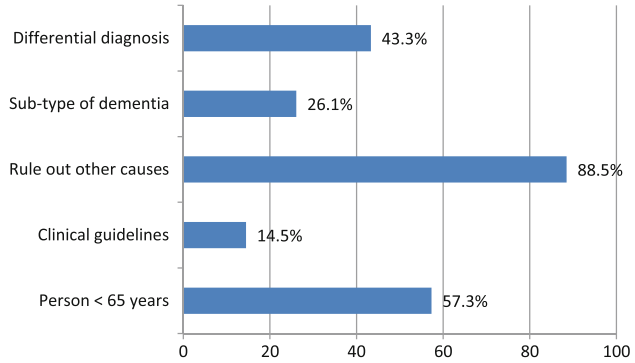

Fig. 3 Reasons for referral for neuroimaging in suspected MCI or dementia

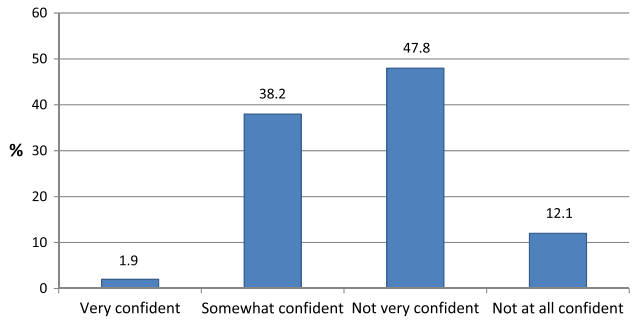

Fig. 4 Confidence in the ability to choose the most appropriate neuroimaging modality

differential diagnosis (65.9 %, 27/41, SR = 2.2), whereas GPs who considered it somewhat important were less likely to refer on the basis of clinical guidelines (2.5 %, 1/40, SR = −2.0). The vast majority (93.1 %, 149/160) of those who referred patients with suspected MCI or dementia were not aware of any dementia-specific protocols for referrals.

Asked which modalities they referred to, 75.6 % (118/156) of respondents stated that they referred to MRI, followed by 71.8 % (112/156) who referred to CT (several modalities could be selected). Only one participant referred to nuclear medicine.

Confidence in their ability to choose the most appropriate modality is displayed in Fig. 4. Just over half of respondents who referred patients (50.8 %, 60/122) stated that there were modalities that they would like to have access to, but currently did not. Those who stated which particular modalities were unavailable to them mainly cited CT and MRI through the public health system. Others indicated PET and SPECT. In Ireland, public patients generally require a referral to secondary or tertiary care to access neuroimaging, whereas private patients can avail of direct access.

Most of the participating GPs (66.8 %, 197/295) had access to radiology reports on neuroimaging investigations. The majority of those who had access found the information helpful (69.3 %, 138/199) or very helpful (25.6 %, 51/199) and rated their understanding of the report as good (59.3 %, 118/199) or excellent (18.1 %, 36/199). Over a fifth of participants (21.6 %, 43/199) rated their understanding of the radiology report as poor.

Of those who were involved in explaining the report to patients and their family members, approximately half found it easy (49.2 %, 91/185) or very easy (7 %, 13/185) to explain the report. However, more than a third (38.4 %, 71/185) found it difficult and a further 5.4 % (10/185) very difficult. GPs who were very confident or somewhat confident in understanding neuroimaging in dementia were more likely to find it very easy (37.5 %, 3/8, SR = 4.4) or easy (49.4 %, 43/87, SR = 4.4) to explain the report.

Discussion

Almost all survey participants were involved in the diagnosis of dementia or MCI. Yet, approximately a third of participants did not have access to CT or MRI scans in spite of the NICE/SCIE guidelines recommending these for the investigation of dementia [10]. Very few GPs had access to nuclear medicine scans. Since these are required to establish a sub-type diagnosis which should be made by a specialist, GP access to these might not be warranted [1]. Most participants considered neuroimaging for the diagnosis of dementia as important or very important in comparison to other investigations. It should be noted, however, that this question did not qualify the importance of neuroimaging in relation to the disease stage. The importance of neuroimaging for dementia may be considerably reduced in cases of unmistakable, advanced dementia, for example. GPs with access to neuroimaging cited CT as the most available modality followed by MRI. There was a discrepancy in the availability of neuroimaging between public and private patients. Private patients could avail of direct access to neuroimaging, whereas public patients required a referral to secondary or tertiary care.

Although nearly half of the respondents referred patients with suspected MCI or dementia, very few did so in line with clinical guidelines, and the vast majority of respondents were not aware of dementia-specific protocols.

While the current results reveal that numerous GPs refer patients with suspected dementia for neuroimaging, an overwhelming issue is that access appears to be varied and frequently insufficient and differs between the public and the private systems. This is in line with a report by the Irish College of General Practitioners (ICGP) which found that access to diagnostics for public patients was unacceptably long when compared to private patients [23].

Best practice guidelines currently recommend the early detection and diagnosis of dementia [3, 10, 24]. NICE/SCIE guidelines state that a diagnosis of dementia can often be appropriately made in primary care. Referral to a specialist, such as an old-age psychiatrist or neurologist, is required if the diagnosis is in doubt. GPs thus require the necessary skills to diagnose dementia or have sufficient knowledge to be able to refer people to services that can provide more comprehensive diagnostic information [3]. However, there are currently no national guidelines in Ireland to assist GPs with the diagnosis of dementia, although the development of clear guidelines on the recognition and management of dementia has been recommended, and clinical governance requires that practitioners in all domains of clinical work follow evidence-based guidelines [3, 25–27].

The accurate diagnosis of dementia presents a challenge for GPs and specialists [16]. Difficulties identified include differentiating normal ageing from symptoms of dementia, a lack of confidence, the belief that nothing can be done for a person with dementia, concerns about the impact of the diagnosis on the patient and the fear of making a wrong diagnosis [28]. According to a reference guide by the ICGP, the recognition of an emerging dementia syndrome is dependent upon history taking (the patient's report and a collateral history), a physical examination, appropriate investigations (e.g. blood, ECG and neuroimaging examinations), a medication review, a cognitive assessment as well as specialist input for complex cases where uncertainty about the diagnosis exists [16]. Irish GPs experience difficulties in disclosing a diagnosis of dementia to their patients with disclosure rates ranking poorly in comparison to those reported in other countries. GPs' perceptions of the patient's level of comprehension were found to be the key factor influencing their disclosure pattern [28].

Similar to our finding that the vast majority of respondents were not aware of dementia-specific protocols for referrals of suspected MCI or dementia cases to neuroimaging, an ICGP report found that awareness of protocols for access to radiology was uniformly low among GPs [23]. According to the report, only 8.1 % of GPs were aware of direct access protocols for CT in public hospitals and 7.4 % for MRI. In contrast, 18.2 % of GPs were aware of direct access protocols for CT in private hospitals and 26.8 % for MRI, underlining yet again the discrepancy between the public and private health-care sectors. This highlights the lack of awareness among GPs of the presence of direct access protocols for suspected dementia previously identified by the ICGP and further emphasise the need for national referral guidelines for access to radiology and other diagnostics, by GPs [23].

In the current health-care system, the radiology report is generally the only method of communication from the radiologist to the GP and as such plays an important role [29]. A recent US study on GPs' perspective on radiology reporting found that the majority of respondents (79 %) were satisfied with radiology reporting and recommendations in general [30]. The high reported level of understanding and helpfulness of the radiology report among GPs in the current study would suggest that the report might be sufficient for them to establish a diagnosis of dementia. Rather worryingly, 33.2 % of respondents indicated that they did not receive a radiology report on completing neuroimaging investigations. While respondents were not asked to further qualify their negative response to this question, this may relate to cases referred to a specialist centre and neuroimaging requested at the secondary or tertiary centre and not reported back to the GP as would be the norm for direct referral.

The main characteristics of the sample corresponded to previous reports and suggest a good representation of the group in particular with respect to gender, practice type (mixed, group, in urban, rural or semi-rural areas) and also in relation to year of qualification [28, 31, 32]. Possible reasons for the reduced response rate include GPs' time constraints, the fact that those working under the GMS do not generally refer patients directly for neuroimaging which could explain a lack of interest in the study [23], or research fatigue due to the number of requests they receive to participate in research. Responses outside the major urban centres were particularly low.

As the current study has shown, many GPs refer patients with suspected dementia for neuroimaging. Thus, clear protocols for referral of suspected cases of dementia are required and training related to these protocols should be available to maximise the use of limited resources. While two-thirds of GPs were satisfied with diagnostic capabilities in their area, access to neuroimaging could be improved. Neuroimaging should be available to every patient, independent of location and whether the patient follows the public or the private system.

Conclusions

The current study would suggest that international referral guidelines are not commonly used by GPs, awareness of referral protocols is low, and their self-stated confidence in referral to neuroimaging is varied. To optimise service utilisation and ensure the highest standard of care for all patients, GPs require national guidelines for the diagnosis of dementia, greater awareness of referral protocols as well as equal access to services at the point of need.

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References

1. Department of Health (2014) The Irish National dementia strategy. http://health.gov.ie/wp-content/uploads/2014/12/30115-National-Dementia-Strategy-Eng.pdf. Accessed 4 May 2015
2. National Audit Office (2007) Improving services and support for people with dementia. The Stationery Office. http://www.nao.org.uk/wp-content/uploads/2007/07/0607604.pdf. Accessed 4 May 2015
3. Cahill S, O'Shea E, Pierce M (2012) Creating excellence in dementia care: a research review for Ireland's national dementia strategy. Trinity College Dublin, Dublin
4. Matthews FE, Arthur A, Barnes LE, Bond J, Jagger C, Robinson L et al (2013) A two-decade comparison of prevalence of dementia in individuals aged 65 years and older from three geographical areas of England. Lancet 382:1405–1412
5. Prince M, Guerchet M, Prina M (2013) The global impact of dementia 2013–2050. Alzheimer's Disease International, London
6. Larson EB, Yaffe K, Langa KM (2013) New insights into the dementia epidemic. N Engl J Med 369:2275–2277
7. Alzheimer's Society (2012) Mapping the dementia gap. http://www.alzheimers.org.uk/site/scripts/download_info.php?downloadID=554. Accessed 4 Nov 2013
8. Prince M, Bryce R, Ferri C (2011) World Alzheimer Report 2011: the benefits of early diagnosis and intervention. Alzheimer's Disease International, London
9. Health Quality Ontario (2014) The appropriate use of neuroimaging in the diagnostic work-up of dementia. Ont Health Technol Assess Ser 14(1):1–64
10. National Institute for Health and Clinical Excellence (2007) Dementia: a NICE–SCIE Guideline on supporting people with dementia and their carers in health and social care. National Institute for Health and Clinical Excellence Social Care Institute for Excellence, London
11. Tartaglia MC, Rosen HJ, Miller BL (2011) Neuroimaging in dementia. Neurotherapeutics 8:82–92
12. Frisoni G, Fox N, Clifford R, Scheltens P, Thompson P (2010) The clinical use of structural MRI in Alzheimer disease. Nat Rev Neurol 6(2):67–77
13. Alzheimer's Association (2013) 2013 Alzheimer's disease facts and figures. Alzheimers Dement 9(2):208–245
14. Drago V, Babiloni C, Bartres-Faz D, Caroli A, Bosch B, Hensch T et al (2011) Disease tracking markers for alzheimer's disease at the prodromal (MCI) stage. J Alzheimers Dis 26:159–199
15. NICE/SCIE (2006) Dementia: supporting people with dementia and their carers in health and social care. National Institute for Health and Clinical Excellence, Manchester
16. Foley T, Swanwick G (2014) Dementia: diagnosis and management in general practice. Irish College of General Practitioners. http://www.icgp.ie/go/library/icgp_publications/quick_reference_guides/E58DDB1B-B7B8-9694-7C170D04919D8699.html. Accessed 24 Apr 2015
17. White PM, Halliday-Pegg JC, Collie DA (2002) Open access neuroimaging for general practitioners—diagnostic yield and influence on patient management. Br J Gen Pract 52:33–35
18. Collie DA, Sellar RJ, Steyn JP, Cull RE (1999) The diagnostic yield of magnetic resonance imaging (MRI) of the brain and spine requested by general practitioners: comparison with hospital clinicians. Br J Gen Pract 49:559–561
19. Simpson GC, Forbes K, Teasdale E, Tyagi A, Santosh C (2010) Impact of GP direct-access computerised tomography for the investigation of chronic daily headache. Br J Gen Pract 60:897–901
20. O'Connell H (2012) A national dementia strategy for Ireland: signposting the possibilities. A Clinician's Perspective Dublin, Ireland
21. Health Information and Quality Authority (2011) Report and recommendations on patient referrals from general practice to outpatient and radiology services, including the national standard for patient referral information. Health Information and Quality Authority, Dublin
22. Wilcock J, Iliffe S, Turner S, Bryans M, O'Carroll R, Keady J et al (2009) Concordance with clinical practice guidelines for dementia in general practice. Aging Ment Health 13(2):155–161
23. O'Riordan M, Collins C, Doran G (2013) Access to diagnostics: a key enabler for a primary care led health service. ICGP, Dublin
24. Commission Audit (2002) Forget me not 2002: developing mental health services for older people in England. Audiot Commission, London
25. Department of Health (2009) Living well with dementia: a national strategy. Department of Health, London
26. Scally G, Donaldson LJ (1998) Clinical governance and the drive for quality improvement in the new NHS in England. BMJ 317:61
27. Waldemar G, Phung K, Burns A, Georges J, Hansen F, Iliffe S et al (2007) Access to diagnostic evaluation and treatment for dementia in Europe. Int J Geriatr Psychiatry 22:47–54
28. Cahill S, Clark M, Walsh C, O'Connell H, Lawlor B (2006) Dementia in primary care: the first survey of Irish general practitioners. Int J Geriatr Psychiatry 21:319–324
29. Grieve FM, Plumb AA, Khan SH (2010) Radiology reporting: a general practitioner's perspective. Br J Radiol 83:17–22
30. Gunn AJ, Sahani DV, Bennett SE, Choy G (2013) Recent measures to improve radiology reporting: perspectives from primary care physicians. J Am Coll Radiol 10(2):122–127
31. The Competition Authority (2009) General medical practitioners: part I: overview of the GP profession. The Competition Authority, Dublin
32. O'Dowd T, O'Kelly M, O'Kelly F (2006) Structure of general practice in Ireland: 1982–2005. Irish College of General Practitioners, Dublin