RESEARCH NOTE

Cycle of Care for people with diabetes: an equitable initiative?
[version 1; peer review: 1 approved, 1 approved with reservations]

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Abstract

Background: Structured management of uncomplicated diabetes in primary care constitutes good quality diabetes care. The cycle of care is a national initiative that financially remunerates general practitioners to provide structured diabetes care for people with type 2 diabetes. However, eligibility for the cycle of care is limited to those with means-tested public health insurance. We investigate the national coverage of the cycle of care and describe the socio-demographic and clinical profile of those eligible and non-eligible for the initiative.

Methods: A cross-sectional analysis of The Irish LongituDinal study on Ageing (TILDA) Wave 1 was conducted. Type 2 diabetes was defined using self-reported doctor-diagnosis of diabetes, age at diagnosis and use of insulin/oral hypoglycaemic agents. Findings were applied to the 2016 Irish census figures to estimate the absolute population eligible and non-eligible for the initiative. Pearson’s chi-square test was used to compare the profiles of those eligible and non-eligible for the initiative.

Results: Of the 8,107 TILDA participants, 609 had type 2 diabetes (7.9% [95%CI: 7.3%, 8.5%]) and 31.6% (95%CI: 27.8, 35.6) of these were not eligible for the cycle of care. Applying these estimates to census data, an estimated 36,567 (95%CI: 32,170, 41,196) individuals aged ≥50 years with type 2 diabetes in Ireland are not eligible for the initiative. Those not eligible were less likely to be on insulin and more likely to be managing their diabetes without medication.

Conclusions: Nearly one-third of people with type 2 diabetes aged ≥50 years are not eligible for the cycle of care and appear to fit the outlined criteria for uncomplicated diabetes which can be appropriately managed in primary care. Financial barriers to managing uncomplicated diabetes in primary care exist. It is essential that the cycle of care is extended to all those likely to benefit from regular structured diabetes management.
Keywords
Diabetes, Primary Care, Integrated Care, Cycle of Care

This article is included in the TILDA gateway.

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Author roles: O'Neill KN: Conceptualization, Formal Analysis, Methodology, Writing – Original Draft Preparation, Writing – Review & Editing; McHugh SM: Conceptualization, Methodology, Writing – Review & Editing; Kearney PM: Conceptualization, Methodology, Writing – Review & Editing

Competing interests: No competing interests were disclosed.

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Introduction
With rising prevalence and burgeoning healthcare costs, diabetes embodies many of the challenges facing health systems worldwide\(^1\). The prevalence of doctor-diagnosed diabetes in Ireland has increased from 2.2% of the adult population in 1998 to 5.2% in 2015\(^2\). Among adults aged 50 years and older, the prevalence of type 2 diabetes is 8.5%\(^3\). Healthcare costs attributable to diabetes in those aged over 50 years are estimated at €89 million per annum with hospital admissions accounting for almost 70% of costs\(^4\). Out-patient department visits attributable to diabetes cost an estimated €18.5 million per annum.

International consensus exists that structured management of uncomplicated diabetes in primary care with suitable organisational support, constitutes good quality diabetes care. There is growing evidence that primary care led structured diabetes management is associated with improved outcomes for patients\(^5\). Structured approaches to diabetes care demonstrate improvements in glycaemic control and cardiovascular risk factors\(^6\). Integrated diabetes care has been shown to reduce preventable hospitalisations for diabetes-related complications\(^7\). Recent guidance on integrated care for diabetes in Ireland recommends that patients with uncomplicated type 2 diabetes are managed in primary care and with complicated type 2 diabetes are managed between primary and secondary care\(^8\). The management of type 1 diabetes remains in secondary care. Patients with uncomplicated type 2 diabetes are defined as patients not on insulin, treated by diet or glucose lowering agents only, controlled HbA1c and no diabetes-related complications\(^9\).

In 2015, the diabetes “cycle of care” was introduced. This is the first national initiative to financially remunerate General Practitioners (GPs) for providing structured care for people with type 2 diabetes. GPs are remunerated for providing two structured diabetes review visits per year. The initiative establishes formal requirements for registering, recording and reporting processes of care. However, GPs are only remunerated for patients covered by means-tested public health insurance schemes. We aim to investigate the coverage of the cycle of care and to describe the socio-demographic and clinical profile of the those eligible and non-eligible for the initiative.

Methods
Data source
A cross-sectional analysis of Wave 1 (2009–2011) of The Irish LongituDinA study on Ageing (TILDA)\(^10\) was conducted. TILDA is a population-based prospective cohort study of community-dwelling adults aged 50 years and over\(^11\). The sampling frame is the Irish Geodirectory, a comprehensive and up-to-date list of all residential addresses in Ireland\(^12\). A multistage probability sampling design was used. A total of 8,175 participants from 6,282 households completed a computer-assisted personal interview (CAPI) (response rate: 62%).

Variable definition
Individuals were classified as having diabetes if they self-reported a previous doctor diagnosis. Type 1 diabetes was defined as those who were aged less than 50 years at diabetes diagnosis and reported injecting insulin, but not taking oral hypoglycaemic agents. All others were classified as having type 2 diabetes. Participants who reported a doctor diagnosis of diabetes during the CAPI were asked the question ‘Has a doctor ever told you that you have any of the following conditions related to your diabetes?’ The conditions listed were: leg ulcer (peripheral vascular disease), protein in urine (proxy for elevated urine albumin creatinine ratio), lack of feeling and tingling pain in legs and feet due to nerve damage (diabetic neuropathy), damage to the back of your eye (diabetic retinopathy). These were defined as microvascular complications. Participants were considered as having a macrovascular complication if they self-reported a doctor-diagnosis of any of the following: heart attack (myocardial infarction), heart failure (congestive cardiac failure), stroke (cerebrovascular accident) or mini stroke (transient ischaemic attack). Participants who self-reported a doctor diagnosis of diabetes were also asked whether they inject insulin or take any tablets, pills or medications for their diabetes. We categorised diabetes management as injecting insulin, taking tablets only and no medication. During the CAPI, participants were also asked about their health cover where they could indicate if they have a medical card or GP visit card, private insurance or neither. As Ireland has a government-funded public health system, all individuals are entitled to hospital services free of charge, though with a co-payment at point of access. Primary care services are paid for out-of-pocket. A medical card entitles the holder to health cover under the General Medical Scheme. This is a means-tested scheme which entitles an individual to primary care services and hospital services free at the point of access. Prescription items are also provided free of charge under this scheme, albeit with a co-payment. A GP-visit card entitles the holder to free access to primary care services and is also means-tested. The means test criteria differ for those under and over 70 years of age. Participants who reported either having a medical card or a GP-visit card were classed as eligible for the cycle of care. Other variables of interest included age in years (50–64, 65–74, 75+), gender, self-reported health (excellent/very good, good, fair/poor), and education (none/primary, secondary, third level).

Statistical analysis
Pearson’s chi-square test was used for the comparison of categorical variables across eligibility status. The proportion of people eligible for the cycle of care was applied to the most recent census population figures (2016) to estimate the absolute numbers of people eligible and not eligible for the initiative\(^13\). Survey weights were applied to the analysis to reflect the complex sampling design and to adjust for participation bias\(^14\). A complete case analysis was conducted. Analysis was carried out in Stata v. 13 for windows (StataCorp, College Station, TX, USA) using the survey function (svy).

Results
Of the 8,107 participants with complete data, 609 people had type 2 diabetes (7.9% [95% CI: 7.3%, 8.5%]). Table 1 documents that 31.6% (95% CI: 27.8, 35.6) of people with type 2 diabetes, aged 50 years and over, are not eligible for the cycle of care. In 2016, this equates to an estimated 36,567 (95% CI: 32,170, 41,196)
people in Ireland, aged 50 years and over, who were not eligible for the initiative.

Table 2 shows the characteristics of the population eligible for the cycle of care and those not eligible. There was a significantly lower proportion of females in the non-eligible population (30.8% compared to 47.2% in the eligible population). The age breakdown between the groups also differed; those not eligible for the cycle of care were younger, with only 4.1% aged over 75 years compared to 34.2% of the eligible population. The prevalence of macrovascular complications in the non-eligible population was 13.4% compared to 17.4% in people who were eligible; however, this was not statistically significant (p=0.2). Similarly, 22.7% of the eligible population had a microvascular complication compared to 28.1% of the non-eligible population (p=0.2). There were statistically significant differences in diabetes management (p<0.001). Among those not eligible for the cycle of care, 9.8% were on insulin compared to 17.4% of those eligible. A higher proportion of non-eligible people reported no medical treatment for their diabetes (27.4% compared to 14.7%).

**Discussion**

This study describes the proportion, socio-demographic and clinical profile of people with type 2 diabetes according to their eligibility status for the cycle of care initiative. Almost one-third of people over the age of 50 years with type 2 diabetes are not eligible for the initiative. They are more likely to be male, to be younger and to have higher levels of educational attainment than those covered by the scheme.

The aim of the cycle of care is to provide financial remuneration to GPs for providing structured review visits for people with type 2 diabetes in primary care. National guidelines for integrated care identify people with uncomplicated type 2 diabetes as most suitable for management in primary care. Our findings indicate that most of those currently not eligible for the cycle of care initiative fit the criteria of uncomplicated diabetes and are therefore suitable for primary care management. Almost double the proportion of the non-eligible population managed their diabetes without medication. Furthermore, a significantly lower proportion of the non-eligible population were on insulin.

| Cycle of care | % (95% CI) | Population Estimate 2016 N (95% CI) |
|---------------|------------|--------------------------------------|
| Eligible      | 68.5 (64.4, 72.2) | 79,267 (74,523, 83,548) |
| Non-eligible  | 31.6 (27.8, 35.6) | 36,567 (32,170, 41,196) |

CI, confidence interval.

| Variable                          | Eligible % (95% CI) (n=403) | Non-eligible % (95% CI) (n=206) | P value |
|-----------------------------------|-----------------------------|----------------------------------|---------|
| Female                            | 47.2 (42.4-51.9)            | 30.8 (24.8-37.5)                 | <0.001  |
| Age, years                        |                             |                                  |         |
| 50–64                             | 31.4 (27.0-36.2)            | 69.7 (63.2-75.6)                 |         |
| 65–74                             | 34.2 (29.8-39.0)            | 26.2 (20.8-32.4)                 |         |
| 75+                               | 34.2 (29.5-39.2)            | 4.1 (2.0-8.1)                    |         |
| Self-reported health              |                             |                                  |         |
| Excellent/very good               | 31.9 (27.5-36.7)            | 34.7 (28.4-41.6)                 | <0.001  |
| Good                              | 29.5 (25.1-34.3)            | 36.6 (30.3-43.4)                 |         |
| Fair/poor                         | 38.6 (33.8-43.6)            | 28.7 (22.5-35.7)                 | 0.06    |
| Education                         |                             |                                  |         |
| None/primary                      | 60.4 (55.4-65.2)            | 28.3 (22.1-35.4)                 | <0.001  |
| Secondary                         | 32.2 (27.7-37.1)            | 46.4 (39.7-53.2)                 |         |
| Third level                       | 7.4 (5.6-9.7)               | 25.3 (20.1-31.4)                 |         |
| Private health insurance          | 28.5 (24.0-33.6)            | 76.5 (69.1-82.5)                 | <0.001  |
| Diabetes management               |                             |                                  |         |
| Insulin                           | 17.4 (14.0-21.5)            | 9.9 (6.3-15.0)                   |         |
| Tablets only                      | 67.9 (63.0-72.4)            | 62.8 (55.9-69.2)                 |         |
| No medication                     | 14.7 (11.6-18.5)            | 27.4 (21.6-34.0)                 | <0.001  |
| Diabetes-related condition        |                             |                                  |         |
| Macro vascular                    | 17.4 (14.0-21.4)            | 13.4 (9.1-19.3)                  | 0.21    |
| Micro vascular                    | 28.1 (23.7-33.1)            | 22.7 (17.2-29.2)                 | 0.16    |

CI, confidence interval.
Integrated diabetes care has been shown to reduce preventable hospitalisations for diabetes-related complications\(^6\). Structured approaches to diabetes care demonstrate improvements in glycaemic control and cardiovascular risk factors\(^6\). However, if integrated diabetes care is to be clinically effective and cost-effective, it must be provided in the most appropriate setting to all people with diabetes\(^6\).

In Ireland, attendance at out-patient clinics is free at the point of access, creating a perverse incentive for non-eligible individuals to seek routine diabetes care in secondary care. The roll out of the cycle of care to all people with type 2 diabetes would remove the financial barriers that currently exist to managing uncomplicated diabetes at the right time and in the right place. For integrated care to be implemented, the financing must be aligned with the care pathways.

Using a nationally representative sample, we provide robust estimates of the number of people aged 50 years and over who are currently not eligible for the cycle of care. There are some limitations to be noted. Our estimates only include people aged over 50 years and so the total number of non-eligible people is likely to be higher. Self-reported doctor diagnoses may introduce misclassification bias and result in inaccurate estimates. However, a number of studies have demonstrated that self-report is a suitable method to determine the prevalence of diabetes compared to medical records\(^7\). The self-reported doctor diagnosis of diabetes may underestimate the true prevalence of diabetes as it does not measure undiagnosed diabetes. However, the prevalence of undiagnosed diabetes has been shown to be low in this cohort\(^8\). As TILDA does not contain information on diabetes-specific health service use, we were unable to explore attendance rates at outpatient departments compared to GP visits for routine diabetes care.

Our findings highlight the inequity of the cycle of care, particularly for younger people with type 2 diabetes. While a welcome initiative and an important step in the implementation of integrated diabetes care in Ireland, eligibility needs to be based on clinical criteria rather than income. It is essential that the provision of the cycle of care be extended to all people with type 2 diabetes in Ireland.

Data availability
The data presented in this report are part of the TILDA study (Wave 1)\(^8\). This is available from the Irish Social Studies Archive (ISSDA) through a system of managed open access. You may find it useful to browse the TILDA Register of Use, which lists all projects that have been approved to use TILDA data.

Accessing the data
To access the data for the purposes of research, please complete a ISSDA Data Request Form for Research Purposes, sign it, and send it to ISSDA by email (issda@ucd.ie).

For teaching purposes, please complete the ISSDA Data Request Form for Teaching Purposes, and follow the procedures, as above. Teaching requests are approved on a once-off module/workshop basis. Subsequent occurrences of the module/workshop require a new teaching request form.

Data will be disseminated on receipt of a fully completed, signed form.

Author contributions
KON, SMH and PM conceived the study. KON conducted data analysis and drafted the manuscript. SMH and PM reviewed the manuscript. KON revised the manuscript and all authors approved the final manuscript.

Grant information
This study was funded by the Health Research Board under a Research Leader Award held by Professor Patricia Kearney, RL/2013/7.

The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Acknowledgements
The authors would like to acknowledge all TILDA participants, the staff and researchers at the TILDA centre in Trinity College Dublin and the Irish Social Science Data Archive for providing access to the data.

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Version 1

Reviewer Report 07 June 2019

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1. In the Introduction, the authors stated that integrated diabetes care has been shown to reduce preventable hospitalisations for diabetes-related complications. In as much as this is true, it will be better to also emphasise that integration of diabetes care within primary care is just as effective Seidu et al. (2016)1. The description of the cycle of care here seems like a financial incentive intervention, not necessarily an integrated care system. If it is, the authors need to explain how this fits as an integrated care system.

2. The authors defined uncomplicated diabetes as “Patients with uncomplicated type 2 diabetes are defined as patients not on insulin, treated by diet or glucose lowering agents only, controlled HbA1c and no diabetes-related complications”. This is a very glucocentric definition, as in recent times, diabetes is now seen to be more than glucose control. For example, a patient with CKD5 and diabetes who has excellent glucose control, even if they are not on insulin, needs to be managed in specialist centres. Therefore, the definition of complex diabetes should take into consideration comorbidities that may otherwise make the management of diabetes complex in the primary care setting, such as heart failure, severe renal failure, morbid obesity, very young type 2 diabetics, etc. Additionally, how do the authors classify patients on GLP1RA? Complex or not complex? These are injectables but not insulin.

3. Does the cycle of care initiative only focus on 2 reviews a year and measurements of processes of care? How about intermediate outcomes such as hba1c levels and hard outcomes such as hospitalisations for MI, strokes, amputations, blindness and renal failure?

4. Those not eligible for the cycle of care were younger, with only 4.1% aged over 75 years compared to 34.2% of the eligible population. This has serious complications for the population of Ireland. Type 2 diabetes in the young is a very aggressive disease, with patients more likely to suffer all the complications than the elderly. This therefore has the potential of hitting the national economy and the social fabric of Ireland in years to come as this demographic population are productive in the economy and the carers of the young and elderly. This point needs to be made in the discussion to highlight the importance of this finding.

5. The absence of non-statistically significant differences in micro and macro vascular...
complications between the 2 groups could be because the diagnosis is self-reported. This method can obviously be less reliable. This point needs to be expanded upon in the discussion. If on the other hand, the authors don't think this is a major issue, then they need to explain why the government should continue funding the cycle of care.

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Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Partly

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

*Competing Interests*: No competing interests were disclosed.

*Reviewer Expertise*: Diabetes, models of care.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.
The research note describes the eligibility of patients with diabetes for inclusion to the national initiative "cycle of care", that financially remunerates general practitioners to provide structured diabetes care for people with type 2 diabetes. Since the eligibility for the cycle of care is limited to those with specific public health insurance, this might be an important limiting factor. The authors were using data from The Irish Longitudinal study on Ageing that is a population-based prospective cohort study of community-dwelling adults aged 50 or more, where a multistage probability sampling design was used to assure representativeness. Scientifically sound assumptions were made to define the type of diabetes. The findings indicate that most of the patients that are currently not eligible for the cycle of care initiative fit the criteria of uncomplicated diabetes and are therefore suitable for structured management at primary care. If integrated diabetes care is to be clinically and cost-effective, it must be provided in the most appropriate setting to all people with diabetes. Therefore, eligibility of the patients' needs to be based on clinical criteria rather than income, the provision of cycle of care needs to be extended to all people with type 2 diabetes.

There is only one minor remark – the main results are appropriately reported in a Table, and they do not need to be described again in the results section. The first paragraph of the discussion section should be broadened, where the main results with contextualisation should be described.

Analyses and report as is this one are most welcomed in scientific societies and are even more valuable as inputs to evidence-informed policy making.

**Is the work clearly and accurately presented and does it cite the current literature?**
Yes

**Is the study design appropriate and is the work technically sound?**
Yes

**Are sufficient details of methods and analysis provided to allow replication by others?**
Yes

**If applicable, is the statistical analysis and its interpretation appropriate?**
Yes

**Are all the source data underlying the results available to ensure full reproducibility?**
Yes

**Are the conclusions drawn adequately supported by the results?**
Yes

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Diabetes, empowerment and health literacy, models of care, evidence-informed policy making, strategical planning and implementation
I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.