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Original research

## Referral rates of patients with diabetes to secondary care are inversely related to the prevalence of diabetes in each primary care practice and confidence in treatment, not to HbA1c level

Q.Z. Siah<sup>a</sup>, N.H. Ubeysekara<sup>b</sup>, P.N. Taylor<sup>c</sup>, S.J. Davies<sup>d</sup>, F.S. Wong<sup>b</sup>, C.M. Dayan<sup>b</sup>, M. Alhadj Ali<sup>b,\*</sup>

<sup>a</sup> School of Medicine, Cardiff University, UHW Main Building, Heath Park, Cardiff CF14 4XN, UK

<sup>b</sup> Diabetes Research Group, Division of Infection and Immunity, Cardiff University School of Medicine, Cardiff CF14 4XN, UK

<sup>c</sup> Thyroid Research Group, Division of Infection and Immunity, Cardiff University School of Medicine, Cardiff CF14 4XN, UK

<sup>d</sup> Woodlands Medical Centre, 1 Green Farm Rd, Cardiff CF5 4RG, UK

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### ABSTRACT

**Aims:** To determine the factors affecting the referral rates of patients with diabetes from primary care to secondary care.

**Methods:** A study based on 66 GP surgeries in the Cardiff and Vale University Health Board (population: 515,581) was conducted. We included patients who had an established clinical diagnosis of diabetes (type 1 and type 2) from September 2017 to September 2018.

HbA1c outcome data of GP surgeries were obtained from the Quality and Outcomes Framework (QOF) database published for 2018. Referral rates were obtained from the electronic referral database of Cardiff and Vale University Health Board over the same period, and this was adjusted according to the number of patients with diabetes in each GP surgery. Confidence level on the treatment of diabetes among GPs was assessed as a sub-study conducted in nine GP surgeries in the same area, using a self-administered questionnaire. Linear regression was undertaken to assess the relationship between adjusted referral rate and key factors which might influence prescribing rate.

**Results:** The average adjusted referral rate to secondary care in one year was 4.23% of patients with diabetes in each GP surgery, with a wide variation of 1.24% to 16.28%. The average percentage of patients with diabetes with HbA1c < 59 mmol/mol was 63.17% (range: 43.19–76.23%). The average confidence score of GPs in treating diabetes was 67% and ranged from 50–85% in the sub-study. Referral rates correlated inversely with the numbers of patients with diabetes in each practice  $\beta = -0.32$ ; (95% CI  $-0.57, -0.08$ )  $p = 0.01$ , but there was no significant correlation with the HbA1c outcome  $\beta = -0.13$ ; (95% CI  $-0.39, 0.12$ );  $p = 0.30$ . Borderline significant negative correlation was observed between referral rates and overall practice size  $\beta = -0.23$ ; (95% CI  $-0.48, 0.02$ )  $p = 0.07$ .

**Conclusions:** Referral rates of patients with diabetes to secondary care are determined by the number of patients with diabetes in each practice and confidence level in treatment, not by the overall practice size or HbA1c level. Ensuring quality training in diabetes care for primary care teams as well as the development of integrated diabetes care may be the best way to optimise the volume and appropriateness of referrals to secondary care.

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\* Corresponding author at: Diabetes Research Group, Division of Infection and Immunity, Cardiff University School of Medicine, Cardiff CF14 4XN, United Kingdom.

E-mail addresses: [SiahQZ@cardiff.ac.uk](mailto:SiahQZ@cardiff.ac.uk) (Q.Z. Siah), [nishaniubaysekara@yahoo.com](mailto:nishaniubaysekara@yahoo.com) (N.H. Ubeysekara), [taylorpn@cardiff.ac.uk](mailto:taylorpn@cardiff.ac.uk) (P.N. Taylor), [sarahjanedavies@doctors.org.uk](mailto:sarahjanedavies@doctors.org.uk) (S.J. Davies), [wongfs@cardiff.ac.uk](mailto:wongfs@cardiff.ac.uk) (F.S. Wong), [dayancm@cardiff.ac.uk](mailto:dayancm@cardiff.ac.uk) (C.M. Dayan), [alhadjalim@cardiff.ac.uk](mailto:alhadjalim@cardiff.ac.uk) (M.A. Ali).

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### 1. Introduction/Background

In the UK, the number of patients diagnosed with diabetes has doubled over the last two decades (1.4 million diagnosed cases in 1996 versus 3.8 million in 2019) [1], and currently, one in every 15 people in the UK population has diabetes. Management of diabetes in the UK is predicted to cost more than £39.8 billion by 2035–36 (estimated at £23.7 billion in 2014) [1], posing serious

public health challenges to the UK. In Wales, around 10% (£500 million) of the annual NHS Wales budget is used for patients with diabetes managed in primary and secondary care [2].

Current guidelines for diabetes care propose that patients with Type 2 diabetes should be predominantly managed at primary care level. Only when there is an indication of worsening glycaemic control or other diabetes complications, is referral to secondary care or community-based services recommended [3]. Secondary care provides complex diabetic foot care, intensive glycaemic control and management of diabetes-related microvascular complications (retinopathy, nephropathy and neuropathy) [4]. Appropriate and timely referral between primary and secondary care is required for delivery of all the recommended care processes, reduction of the number of hospital admissions for vulnerable patients, as well as optimisation of long-term glycaemic control for patients with diabetes [5].

Cardiff and Vale University Health Board (C&V UHB) provides both primary and secondary health care services to a population of 515,581 people in South Wales, UK. This study investigated the factors associated with variation in referral rates of patients with diabetes in C&V UHB from 66 primary care practices to secondary care. Factors studied included practice size, number of patients with diabetes in the practice, average HbA1c of patients with diabetes in the practice and the confidence level of GPs in the treatment of diabetes. Sharp et al. criticised the appropriateness and timeliness of onward referral to secondary care services as it is often delayed until patient care becomes highly complex [6]. We were therefore particularly interested to explore the relationship between glycaemic control and referral rates, hypothesising that practices with higher mean glycaemic control, would have higher rates of referral to secondary care.

## 2. Objectives

The primary objective of this study was to determine factors affecting secondary care referral rates and to identify correlation between factors and referral behaviour using a statistical analysis model.

The secondary objectives included establishing variation of referral rate between primary care practices of patients with diabetes within Cardiff & Vale University Health Board.

## 3. Methods

In this study, we have used the UK Quality and Outcomes Framework (QOF) Database to collect data on total number of patients, number of patients with diabetes (*DM001*) and number of patients with HbA1c level below 59 mmol/mol (*DM007*) in each GP surgery for the years of 2017 and 2018 [7]. Confidence level of GPs in treating diabetes cases was assessed through a parallel sub-study. This sub-study focused and analysed the confidence level of GPs in nine GP surgeries of the same locality, as compared to 66 GP surgeries in the main study.

Data on referral rates of each GP surgery to secondary care for the year of 2018 were obtained from the electronic referral database of Cardiff & Vale University Health Board. To ensure fair comparison, referral rates were adjusted to the number of patients with Diabetes Mellitus in respective GP surgeries.

Adjusted Referral Rates

$$= \frac{\text{Number of Referral Cases Per GP Surgery}}{\text{Number of Patients with Diabetes in Each GP Surgery}}$$

Ordinary Least Squares (OLS) linear regression was undertaken to assess the relationship between adjusted referral rate and diabetes control, practice size, number of patients with diabetes and

confidence in treatment of diabetes. Data analysis was undertaken using STATA version 12.1 (STACORP, College Station, TX). Data graphs were made and prepared by using Prism software, (Graph-Pad Software) version 4.02.

Diabetes in the UK consists of 10% Type 1 Diabetes Mellitus and 90% Type 2 Diabetes Mellitus [8]. Therefore, the discussion in this study is formulated in the context of Type 2 Diabetes Mellitus.

### 3.1. Specification on QOF data

DM001 – The contractor establishes and maintains a register of all patients aged 17 or over with diabetes mellitus, which specifies the type of diabetes where a diagnosis has been confirmed.

DM007 – The percentage of patients with diabetes, on the register, in whom the last IFCC-HbA1c is 59 mmol/mol or less in the preceding 12 months.

## 4. Missing data

There were three GP surgeries which we excluded, as there was no data available for the respective GP surgeries on QOF website for the year 2018. Also, we excluded an additional GP surgery as a high number of referrals for 2018 was due a change in contractual arrangements.

## 5. Results

The study population for this study was 515,581 patients. 25,492 patients were registered on the primary care dataset as having diabetes (4.94%) across 66 GP surgeries. There was more than a 7-fold variation in the percentage of patients with diabetes across 66 GP surgeries (Range: 1.21–9.15%).

Prior to applying adjustment to referral rates, we found that there was a total of 967 new referral cases (equivalent to 3.8% of the whole diabetes population in Cardiff & Vale UHB) across a one-year period from September 2017 – September 2018. The average of adjusted secondary care referral rates was 4.23%, ranging from 1.24% to 16.28%. Fig. 1 illustrates a 10-fold variation in the adjusted referral rates among the 66 GP surgeries in Cardiff & Vale University Health Board. HbA1c levels of less than 59 mmol/mol (7.5%) is used as the parameter to indicate good glycaemic control on the QOF framework. In Fig. 2 below, there was no significant correlation observed between this measure of metabolic control and the adjusted referral rate  $\beta = -0.13$ ; (95% CI  $-0.39, 0.12$ );  $p = 0.30$ .

According to Fig. 3, there was a borderline significant negative correlation between adjusted referral rate and practice size  $\beta = -0.23$ ; (95% CI  $-0.48, 0.02$ )  $p = 0.07$ . However, when we analysed the adjusted referral rates in relation to the number of patients with diabetes in each GP surgery, there was a significant negative correlation  $\beta = -0.32$ ; (95% CI  $-0.57, -0.08$ )  $p = 0.01$ , depicted in Fig. 4.

In a parallel sub-study, questionnaires were sent out to nine GP surgeries within Cardiff & Vale University Health Board which required the GPs to rate their confidence level in different domains. The average confidence score of GPs in treating diabetes was 67% and ranged from 50%–85% in the sub-study Fig. 5. In our study, we specifically focused on the domain of management and treatment of people with an above target HbA1c, an above target blood pressure, an above target cholesterol and an above target BMI or waist circumference. Due to the small size of the parallel sub-study, formal statistical analysis was not possible, but the line of best fit suggested reducing referral rate with increased confidence in diabetes treatment.

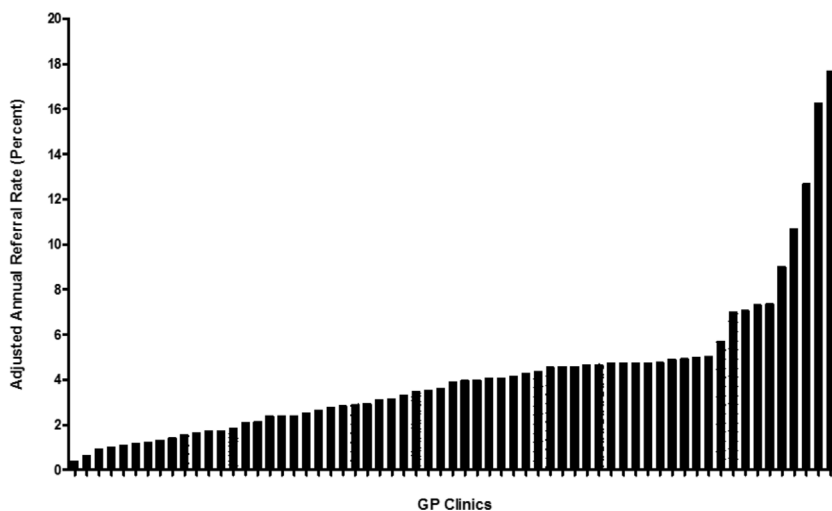


Fig. 1. Adjusted referral rate (September 2017 – September 2018).

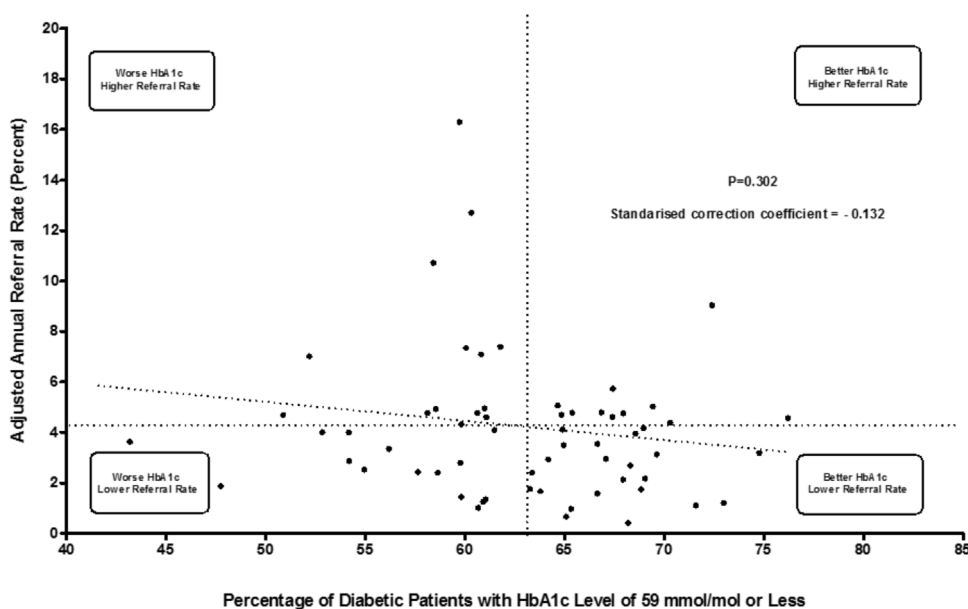


Fig. 2. Adjusted percentage of referral and percentage of patients with diabetes & with HbA1c level of 59 mmol/mol or less.

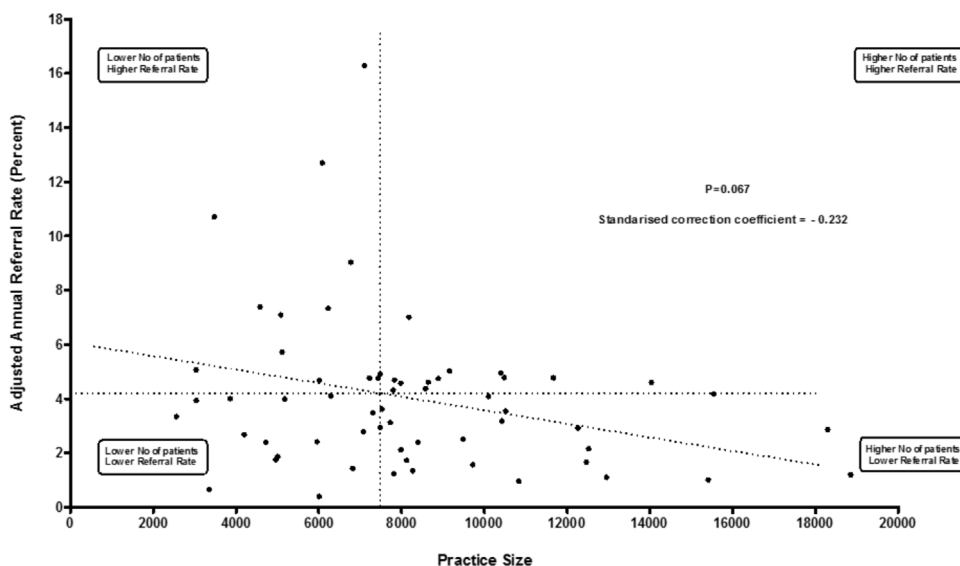


Fig. 3. Adjusted percentage of referral and practice size.

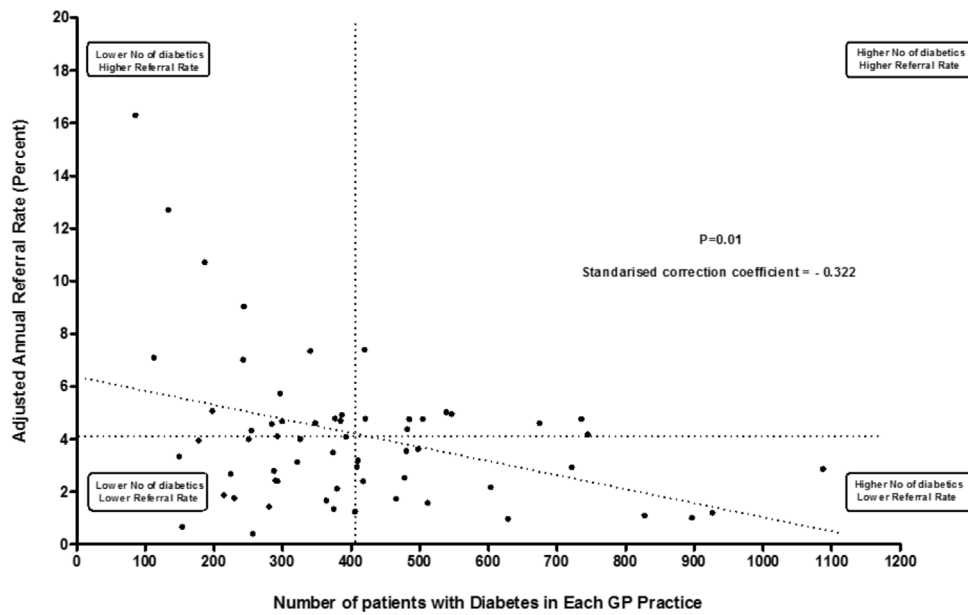


Fig. 4. Adjusted percentage of referral and number of patients with diabetes in each GP surgery.

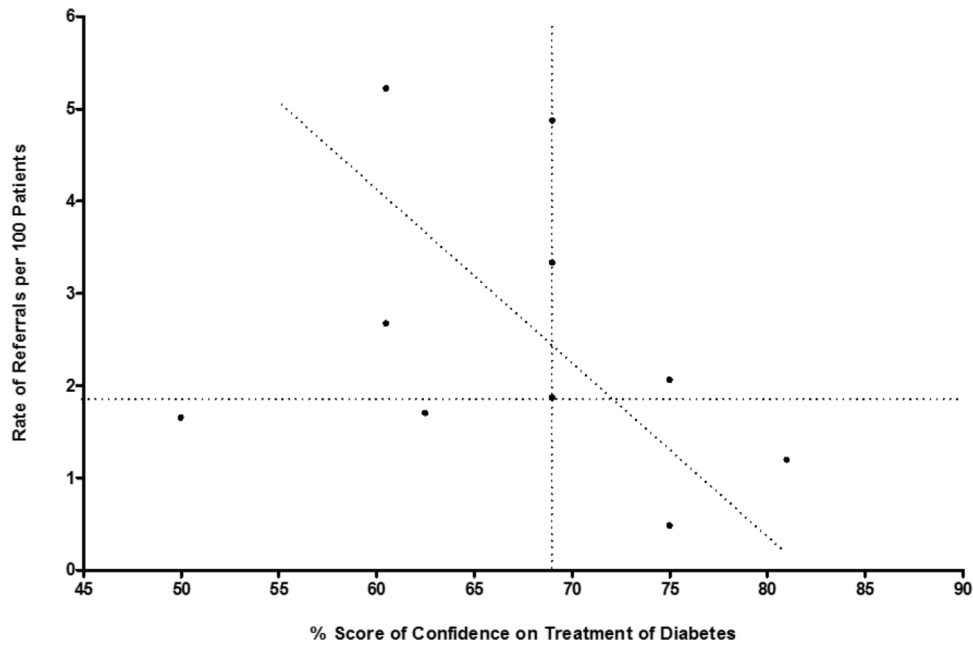


Fig. 5. Rate of referral to secondary care and percentage score of confidence on treatment of diabetes among GPs.

## 6. Discussion

Our observations in a population of more than 500,000 and 66 primary care practices suggest that referral rates from primary care to secondary care diabetes services correlate poorly with metabolic control levels or overall practice size. However, it correlated with the number of patients with diabetes in the practice and appeared to relate to confidence in treatment. The 10-fold difference in adjusted referral rates between GP surgeries in C&V HB are striking and illustrates that there is no standardisation in referral behaviour across GP surgeries.

Structured shared care models have been proven to be effective in managing chronic disease such as diabetes and acceptable to patients. Managing diabetes cases in primary care settings involves not only GPs, but also diabetes specialist nurses or practice nurses

who have special interest in diabetes [9]. Such enhanced models of shared care which involve skilled teams are unlikely to lead to an increase in complications and hospitalisations, and they can be as effective as the existing integrated care models [10]. Although researchers from different continents have been strong advocates of the shared care model for several decades, many countries still fail in instituting this clinical model. It is believed that such a model requires major changes in funding policies and these have been proven to be the reason behind the postponement of the implementation [11]. A Cochrane review suggested that multidisciplinary professional interventions could enhance the diabetes management and emphasised the importance of the role of the nurses in educating patients about diabetes [9]. For example, regular reviews of treatment adherence by practice nurses improved the delivery of care. Van Dijk et al. confirmed that interventions by primary care

nurses also reduced referrals of newly diagnosed Type 2 Diabetes Mellitus patients to internists [12]. Referral rates in this latter study in the Netherlands (4.9–5.7% of established cases) were comparable, although slightly higher than the average in C&V HB (3.8%).

There have been few published studies of factors determining referral rates from different general practices. Russell-Jones et al. reported that in one area of Southern England, routine referral rates to secondary care were half that expected from national statistics [13]. The authors noted that this was associated with a lower rate of achievement of glycaemic targets and a markedly higher rate of referrals to secondary care services for emergency care. This marked difference in referral rate compared to surrounding areas was suggested to be due to a “triage” process introduced by secondary care to reduce referrals that was not associated with a structured enhanced training programme for the GP practices in the area. In a nearby region where enhanced training was provided, glycaemic control was better and emergency referral rates were not increased. However, correction was not made for higher socioeconomic status in the second region.

It is important to note that primary and secondary care form part of the same organisation in Wales (unlike in England) and hence in our study area there were no financial incentives to either primary or secondary care associated with differences in referral rates. Diabetes prevalence varied 7-fold between practices in C&V HB, most likely reflecting difference in the ethnicity of the local population for each practice. However, it is striking that referral rates were significantly lower rather than higher in practices with a higher diabetes prevalence (shown in Fig. 4), consistent with referral rates being driven by inexperience in diabetes care, rather than the burden of the number of patients affected by diabetes per GP. The lack of association with HbA1c level is also consistent with this interpretation, and this conclusion is further supported by the confidence survey sub-study results illustrated in Fig. 5. This would suggest that GPs' confidence level in treating patients with diabetes increases with the amount of experience they have. This leads us to suggest that increasing training and confidence in treatment of diabetes for general practitioners may reduce unnecessary referrals to secondary care without affecting overall outcomes.

## 7. Strengths and limitations

Strengths of the main study of this project are the large sample size (66 practices, more than 25,000 patients with diabetes) and electronic data collection of diabetes rates, HbA1c and referral rates. Weaknesses are the small size of the parallel sub-study on confidence rates and the risk of selective under-reporting of high HbA1c levels on the QOF website as the return rate for recorded HbA1c level was only 88.7%. Although results were adjusted for varying prevalence of diabetes in each practice, no account was taken of differences in ethnicity, socioeconomic status and mean age of patients between practices which may contribute to variation in referral rates. For example, there may be a higher referral rate of elderly patients due to their frail outlook which is exacerbated by comorbidities. Furthermore, it should be noted that we only analysed aggregated data from each practice, and not individual level data (e.g. HbA1c, age) for each referral.

## 8. Conclusion

Referral rate correlated inversely with the number of patients with diabetes in each practice, and lower rates appeared to be associated with increased confidence in GPs due to accumulated experience. HbA1c outcome and overall practice size were not found to play significant roles in affecting the referral rates. We conclude that increased training for primary care teams may be the most effective way of ensuring that all referrals from primary to secondary care are appropriate and necessary.

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Merck Sharp and Dohme (MSD) provided funding for the confidence sub-study but had no involvement in the data analysis. This research did not receive any other specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Conflict of interest

The authors state that they have no conflict of interest.

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