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Research: care Delivery

A survey of staffing levels in paediatric diabetes services throughout the UK

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What's new?

- The rising prevalence of diabetes and the increased complexity of intensive insulin regimens pose new challenges to paediatric diabetes services and their workforce.
- The latest survey of UK paediatric diabetes services in 2008 highlighted important deficiencies in staffing levels across services, but the current state is unknown.
- We found wide variations in staffing levels of paediatric diabetes services across the UK, with heavy caseloads for psychologists and dietitians in Northern Ireland and Wales.
- Half of the services in the UK met the recommended staffing levels for nurses.
- We observed important gaps in 24-h access to advice from the diabetes team.

Abstract

Aims To assess staffing levels of healthcare professionals involved in the care of children and young people with diabetes in the UK.

Methods A web-based questionnaire was distributed to lead consultant paediatricians from all paediatric diabetes services in the UK between October and December 2014. Data on staffing levels and other aspects of diabetes services were collected and differences between the four nations of the UK and across the 10 English diabetes networks were explored.

Results Some 175 services (93%) caring for 29 711 children and young people aged ≤ 24 years with diabetes participated in the survey. Northern Ireland and Wales had the lowest ratio of total staff to patient population. Nursing caseloads per one whole-time equivalent (WTE) nurse ranged from 71 patients in England to 110 patients in Northern Ireland with only 52% of the UK services meeting the Royal College of Nursing recommended nurse-to-patient ratio of $< 1 : 70$. Scotland and Northern Ireland had the highest ratio of consultants and fully trained doctors per 1000 patients (3.5 WTE). Overall, 17% of consultants had a Certificate of Completion of Training in Endocrinology and Diabetes. Some 44% of dietitians were able to adjust insulin dose. Only 43% of services provided 24-h access to advice from the diabetes team and 82% of services had access to a psychologist. Staffing levels adjusted for volume were not directly related to glycaemic performance of services in England and Wales.

Conclusions Wide variations in staffing levels existed across the four nations of the UK and important gaps were present in key areas.

<H1>Introduction

The UK has the fourth largest paediatric diabetes population in Europe and the fifth largest population in the world [1,2]. The incidence of the condition has increased over recent years particularly among the pre-school age group [3]. There is a consensus that a well-resourced multidisciplinary team lies at the centre of an effective model of paediatric diabetes care. Results from the landmark Diabetes Control and Complications Trial showed that intensive management aiming for lower glycaemic targets conferred a significant reduction in risk of complications [4]. However, intensification of diabetes treatment included not only an

intensive insulin regimen, but also frequent clinic visits, patient education and high levels of support from a multidisciplinary team.

Current UK clinical guidelines recommend that all children and young people with diabetes be managed by a multidisciplinary team [5]. Five surveys of paediatric diabetes services have been carried out in the UK since 1988, with the latest in 2008 again highlighting important deficiencies in staffing levels across paediatric diabetes services [6]. However, the current state of the UK paediatric diabetes workforce is unknown. The rising prevalence of diabetes and the increased complexity of intensive insulin regimens pose new challenges to paediatric and adolescent diabetes services and their workforce, thus demonstrating the need for appropriate healthcare planning and delivery. This survey was timely, given the introduction of Best Practice Tariff in England in 2012, enabling enhanced payments for paediatric diabetes clinics that meet certain criteria [7].

The current survey aimed to assess how many healthcare professionals are involved in the care of children and young people with diabetes in the UK. An additional aim was to find out how staffing levels vary between services across the four nations of the UK (England, Scotland, Northern Ireland and Wales), and across the 10 regional diabetes networks within England. Finally, we explored whether staffing levels were associated with the mean HbA_{1c} attained by each diabetes service in England and Wales by linkage with the National Paediatric Diabetes Audit published data.

<H1>Methods

An online survey was conducted by the UCL Children's Policy Research Unit in collaboration with the National Paediatric Diabetes Networks, and with the support of the British Society for Paediatric Endocrinology and Diabetes, the Association of Children's Diabetes Clinicians and Diabetes UK. A working group developed and piloted a

questionnaire. It was recognized that some paediatric diabetes services would operate more than one clinic at different geographical sites and therefore questions referred to the whole service. The survey collected staffing information for all healthcare professionals involved in paediatric diabetes care. Additional information about the service was also collected, including service volume, provision of out-of-hour services and achievement of Best Practice Tariff (in England only). Unique survey links were sent to email addresses of lead consultants from all identifiable paediatric diabetes services in the four UK nations. Contact details of clinical leads were taken from respective national diabetes network managers. Two reminder emails were sent after 3 and 4 weeks respectively. Data were collected between October and December 2014.

<H2>Data analysis

Survey data were aggregated at the UK, country and regional network level (within England), and presented as average values, unless otherwise stated. Staffing levels were defined as number of whole-time equivalents (WTE) staff contracted to work in paediatric diabetes care for each profession per service. In all analyses, we adjusted staffing levels for service volume by calculating the number of WTE per 1000 children and young people with diabetes aged ≤ 24 years under the care of a paediatrician (staff-to-patient ratio). To allow comparisons with previous surveys for nursing staffing levels, we also calculated the number of children and young people per one WTE nurse. In service-level analyses, comparisons between countries and diabetes networks were tested with Kruskal–Wallis test for continuous outcomes and by a chi-square test for categorical outcomes.

We also linked workforce data for England and Wales with adjusted mean HbA_{1c} levels for each service (adjusted for composition of services with regard to patient's age, gender, diabetes duration, ethnicity and small-area deprivation), as published in the 2014–2015 National Paediatric Diabetes Audit report [8]. We conducted a series of service-level analyses

using univariate linear regression models to examine the association of a service's glycaemic performance with staffing levels (i.e. total and profession-specific) and other service-level characteristics. A *P*-value of < 0.05 was considered statistically significant. All analyses were performed using STATA version 12.

<H1>Results

In total, 175 of 188 diabetes services (93% response rate) took part in the survey, caring for a total of 29 711 children and young people with diabetes up to the age of 24 years. Table 1 compares key survey findings across the four nations. Service volume differed significantly between nations (*P* < 0.001), with median service size ranging from 89 patients in Wales to 228 patients in Scotland. The majority of services (80%) provided out-of-hours support for diabetes management (defined as 17.00 to 08.00 on weekdays and 09.00 to 09.00 at weekends); however, only 43% of services provided 24-h access to advice from members of the diabetes team.

Figure 1 shows the staffing levels for all members of the diabetes multidisciplinary team in relation to the population of children and young people with diabetes in each regional diabetes network in England and for each of the four nations. As shown, total staffing levels were highest in England (24.4 WTE per 1000 patients), followed by Scotland (21 WTE) and Northern Ireland (17.2 WTE). Wales had the lowest staff-to-patient ratio with 15.5 WTE healthcare professionals per 1000 patients. Results from each staff category are presented below.

<H2>Paediatric diabetes specialist nurses

All services were attended by at least one paediatric diabetes specialist nurse (PDSN) with 98% (483 of 493, 10 PDSN with missing information) working in both hospital and community settings. Overall, there was an average caseload of 73 patients for one WTE

PDSN (13.8 WTE per 1000 patients) in the UK, with only about half of the services (52%) meeting the Royal College of Nursing recommended nurse-to-patient ratio of < 1 : 70.

Nursing staffing levels differed significantly between the four nations ($P < 0.001$). Caseload per one WTE nurse ranged from 71 patients in England to 110 in Northern Ireland. There were significant differences in PDSN staffing levels between networks within England from one nurse per 53 patients in the North East to one nurse per 86 patients in the East Midlands ($P = 0.01$).

<H2>Dietitians

Almost all services (174 of 175) offered children and young people regular dietetic support. Sixty-six per cent of dietitians (174 of 263, 12 dietitians with missing information) worked in both hospital and community settings, and 44% (113 of 256, 19 dietitians with missing information) were able to adjust insulin dose. Staffing levels for dietitians varied by 2.7-fold across the four nations ($P < 0.001$). The number of WTE dietitians per 1000 patients was lowest in Northern Ireland (1.8 WTE) and highest in England (4.9 WTE). Dietitian caseload was quite homogeneous within England and showed no significant differences between networks ($P = 0.51$).

<H2>Consultants, other fully trained doctors and trainee doctors

Most services (42%) were led by two consultants and in 61% of services (106) consultants dedicated up to four programmed activities to diabetes. Consultants' average working experience (years spent as a consultant) ranged from 8 years in Northern Ireland to 13.9 years in Scotland. Ninety-three per cent of consultants (305 of 329, 17 consultants from 11 services with missing training status) had received some type of training in paediatric diabetes including a Certificate of Completion of Training (CCT) in endocrinology and diabetes (17%), pre-CCT specialty training such as the Royal College of Paediatrics and Child Health SPIN module (30%), postgraduate course (7%) or other informal training (39%). Overall,

28% of services were also attended by at least one fully trained doctor other than a consultant. The ratio of consultants and other fully trained doctors per 1000 children and young people with diabetes differed significantly between the four nations ($P < 0.001$) and ranged from 1.9 WTE in Wales to 3.5 WTE in Scotland and Northern Ireland. England had an average ratio of 2.7 WTE with no significant differences between networks ($P = 0.05$). Twenty-nine per cent of the services (41 of 144, two services with missing information) were also attended by trainee doctors.

<H2>Psychologists and other mental health professionals

Overall, 82% of diabetes services (143 of 175) had a mental health professional working as an integrated member of the multidisciplinary team. The majority were clinical psychologists (87%), followed by health psychologists (3%), psychiatrists (2%) and other professionals.

Staffing levels for mental health professionals differed considerably between the four nations ($P < 0.001$); they were highest in England (2.2 WTE per 1000 patients) and were distributed quite homogeneously across the regional networks. In Wales, only 29% of services (4 of 14) were attended by a mental health professional with an average ratio of 0.1 WTE per 1000 patients.

<H2>Diabetes educators

Only 20 of 175 services in the UK (11%) had a diabetes educator, defined as any member of the diabetes team outside the PDSN workforce responsible specifically for the structured education programme, with significant cross-nation differences (0% in Wales vs. 72% in Northern Ireland, $P < 0.001$).

<H2>Best Practice Tariff payments

In England, Best Practice Tariff payments were achieved by 88% of services (118 of 134, 12 services with missing information). Best Practice Tariff achievement differed significantly

across the networks ($P = 0.03$) and ranged from 58% in London to 100% in the North East, North West and South Central regions. Of the 118 services receiving enhanced payments, 104 (88%) reported that they were able to appoint new staff as a result of the tariff. Services that achieved Best Practice Tariff payments had a minimally lower mean glycaemic control compared with services which did not meet the tariff criteria [70 mmol/mol (8.6%) vs. 72 mmol/mol (8.8%), $P = 0.05$].

To give an indication of the changes in staffing levels over the last 12 years, we present current workforce data along with comparable data from two previous paediatric diabetes surveys (Table 2). As shown, there were marked improvements in nursing caseload, provision of integrated psychological support, and specialization of consultant paediatricians.

<H2>Relation with HbA_{1c} service levels

Linkage of survey data related to England and Wales with adjusted HbA_{1c} levels obtained from the 2014–2015 NPDA report showed that total and profession-specific staffing levels were not related to a service's glycaemic performance (Table S1). We found no statistically significant differences in mean HbA_{1c} in services with a dedicated psychologist [70 mmol/mol (8.6%) vs. 72 mmol/mol (8.7%), $P = 0.06$], in services where dietitians could adjust insulin doses [70 mmol/mol (8.5%) vs. 71 mmol/mol (8.7%), $P = 0.07$], and in services providing any out-of-hours support for diabetes management [70 mmol/mol (8.6%) vs. 71 mmol/mol (8.7%), $P = 0.20$].

<H1>Discussion

Results from the current survey showed wide variations in staffing levels across the UK nations and suggest some important gaps in key areas. Among the four UK nations, England appeared to have the best staffed paediatric diabetes services with quite homogeneously distributed staffing levels across the 10 regional diabetes networks. Northern Ireland and

Wales had the lowest ratio of total staff to child and young people population, with heavy caseloads, particularly for psychologists and dietitians.

Nursing staffing levels varied significantly both between the UK nations and within England.

Overall, there were 73 patients per nurse in the UK, which signifies an appreciable improvement in the nursing caseload from 147 patients per nurse in 2002 [9] and 92 patients per nurse in 2008 [6]. However, findings from the current survey showed that about half of the services did not meet the Royal College of Nursing recommended ratio of < 1 : 70 [10].

This recommended nursing caseload is now 11 years old and might need to be reconsidered given the emphasis of current National Institute for Health and Care Excellence (NICE) guidelines on tighter glycaemic control. Nursing caseload was heavier in Northern Ireland where one fulltime nurse was responsible on average for > 100 patients, although this was compensated by the relatively higher ratio of diabetes educators who are responsible for the structured education program, an activity delivered elsewhere by PDSNs.

We found that four of five services in the UK had a dedicated psychologist as an integral member of the multidisciplinary team. This constitutes a substantial improvement compared to previous years; for example, previous surveys in 2002 and 2008 had shown that only 22% of clinics provided specialized psychological services [6,9]. However, serious deficiencies in psychological support still exist in Wales, where only 29% of clinics had a specialist psychologist working in the service. It is likely that services in England have been able to use funding from the Best Practice Tariff to appoint psychologists, but this is not available in Wales. Both the National Service Framework [11] and NICE guidelines [5] emphasize the importance of providing specialized support from mental health professionals who can screen and evaluate psychosocial functioning in children with diabetes.

We also found that fewer than half of the services (43%) offer 24-h access to support from the diabetes team. This proportion remains unchanged since 2008 [6] and is quite concerning given the complex nature of diabetes management. Providing 24/7 support to all patients and their families should be central to future provision of paediatric diabetes services. Another interesting finding was that fewer than one in five consultants working in the paediatric diabetes services were specialized in endocrinology and diabetes. Although the proportion of specialized consultants is still small, it has almost doubled since 2008 [6], indicating an increasing trend towards specialization of consultant paediatricians in the UK. Other factors should also be kept in mind when interpreting these numbers, including changes in number of tertiary posts and changes in specialist training over time.

Staffing levels appeared to have no association with the glycaemic performance of the service in our service-level analysis. Two UK studies also found no association of glycaemic control with nursing [12,13] and consultant caseload [13]. Another study by the Hvidovre study group found no difference in glycaemic control between centres with and without a psychologist [14]. An effective multidisciplinary team needs much more than just a collection of different members and it is possible that team factors other than staffing levels are important for diabetes outcomes, including skill-mix, team cohesiveness, and consistency of target setting [14].

Our survey achieved a high response rate (93%) which means the results are quite generalizable to the whole UK. However, there are a number of limitations to the survey. First, data were based on self-report from lead consultants and it is possible that some services might have over- or underestimated their responses. Second, the relationship between staffing levels and national audit glycaemic outcomes was based on service-level analyses and no conclusions can be drawn about the role of staffing levels on individual glycaemic control. Third, in line with the National Paediatric Diabetes Audit reports, we

collected information about the number of children and young people with diabetes under the age of 24 years cared for by paediatric diabetes services. Using the same age definition allowed us to link survey data with national audit data and formally examine associations with glycaemic performance. However, our survey did not address workforce and level of training available for transitional care. In particular, we did not survey adult diabetes teams on staffing levels available for young people with diabetes aged 19 to 24 years, nor the level of specialist training of adult teams. Since most young people with diabetes above the age of 19 years will be under adult care, our survey results are less likely to be applicable to this age group and a separate focused workforce survey for this age group is required. Finally, our analysis was a snapshot comparison of staffing levels and no formal comparison with previous surveys was possible due to differences in units of analyses and questions asked.

Therefore, the current analysis cannot undertake quantitative comparison of staffing levels over time or address the impact of quality improvement initiatives on staffing levels.

In conclusion, we found wide variations in staffing levels of paediatric diabetes services across the four UK nations, with heavy caseloads for psychologists and dietitians in Northern Ireland and Wales. Half of the services in the UK met the recommended staffing levels for nurses and important gaps were observed in 24-h access to advice from the diabetes team.

Given the timing of the survey and the recent introduction of the Best Practice Tariff in England, a more dynamic comparison and a repeat survey will help inform whether an uplift in staffing levels will impact on diabetes outcomes in the longer term.

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Competing interests

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Author contributions

All co-authors fulfilled authorship criteria per ICMJE guidelines, read and approved the final manuscript. All co-authors contributed to the study conceptualization, study design, development and piloting of the survey questionnaire, helped with interpretation of findings

and critically reviewed the paper. TS had the general supervision of the study. DC created the survey questionnaire, collected data, conceptualized the analytic plan, cleaned and analysed the data, and drafted the first version of the manuscript. TS and DC are guarantors of the study, had full access to all the data in the study and affirm that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned have been explained.

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FIGURE 1 Mean whole time equivalent (WTE) of healthcare professionals per 1000 children and young people aged ≤ 24 years with diabetes in the UK by country/region. PDSN, paediatric diabetes specialist nurses, MHP, mental health professionals. Diabetes educators defined as any professionals outside the PDSN workforce responsible specifically for the structured education programme.

<H1>Supporting Information

Additional Supporting Information may be found in the online version of this article:

Table S1 Association between staffing levels and a service's glycaemic performance in England and Wales

Table 1 Survey results for paediatric diabetes services in the UK by country

	UK	England	Scotland	N. Ireland	Wales	<i>P</i> -value [□]
Number of services (response rate)	175 (93%)	146 (94%)	8 (73%)	7 (100%)	14 (100%)	–
Number of children and young people aged ≤ 24 years with diabetes	29,711	24,796	2,321	1,172	1,422	–
Service volume; median (range)	141 (35–625)	146 (35–460)	228 (135–625)	170 (80–257)	89 (40–210)	< 0.001
24-h access to advice from the diabetes team (%) [*]	43	49	13	29	0	0.002
Caseload per 1 WTE PDSN	73	71	76	110	88	< 0.001
PDSN-to-patient ratio < 1 : 70 (%)	52	58	25	14	21	0.003
Dietitians allowed to adjust insulin dose (%) [†]	50	52	75	29	29	0.11
Consultant with a CCT in endocrinology and diabetes (%) [‡]	21	24	25	0	0	0.07
Psychologist /MHP working in the service (%)	82	87	88	71	29	< 0.001

^{*}One service with missing information. [†]Ten services with missing information. [‡]Eleven services with missing information. [□] Service-level analyses comparing differences in outcomes between the four UK countries; Kruskal-Wallis test was used for continuous outcomes and chi-square test for categorical outcomes.

WTE, whole-time equivalent; PDSN, paediatric diabetes specialist nurse; CCT, certificate of completion of training; MHP, mental health professional.

Table 2 Current workforce findings presented together with that of previous national surveys

	2002*	2008*	2014
Number of clinics/services† (response rate)	169 (78%)	129 (63%)	175 (93%)
Caseload per nurse‡	147	92	73
Nurses working in both hospital and community (%)‡	91	72	98
Paediatric dietitian in clinic/service†	87	93	99
Consultants specialized in paediatric diabetology/endocrinology (%)	11	9	21
Psychologist/psychiatrist in clinic/service (%)†	22	22	82

*2002 survey by Edge *et al.* [9]; 2008 survey by Gosden *et al.* [6].

†In 2002 questions referred to clinics, whereas in 2008 and 2014 questions referred to whole services that might operate more than one clinic in different geographical sites. ‡In 2002 the question asked if diabetes specialist nurses attended the clinic rather than paediatric diabetes specialist nurses (2008 and 2014).

