

Exploration of diabetes knowledge among registered nurses working in an NHS Trust

Christina Lange and Ruth Pearce

This article reports the findings of an exploration of diabetes knowledge among registered nurses (RNs) in an NHS Trust. The literature review and questionnaires provided an opportunity for the diabetes specialist nursing service to reflect critically on current education practices. Significant knowledge gaps in diabetes management were found; not all RNs were aware of latest best practice. A discrepancy between actual and perceived diabetes knowledge was identified. There was no strong relationship between diabetes training attendance and enhanced diabetes knowledge and care. Education planning and delivery changed to consider effects on practice.

The National Diabetes Inpatient Audit carried out in 2015 (Health and Social Care Information Centre [HSCIC], 2016) highlighted some improvements in diabetes care in the past 5 years, but identified a clear need for more. Satisfaction has not improved since the audit started in 2010, with some inpatients reporting staff had insufficient knowledge (HSCIC, 2016). This article focuses on a service evaluation of diabetes knowledge and training preferences among registered nurses (RNs) carried out as part of a master's degree dissertation.

Literature review

Various studies have investigated diabetes knowledge and training among nurses (e.g. Cytryn et al, 2009; Graue et al, 2010; Livingston and Dunning, 2010; King et al, 2012). Overall, they have shown suboptimal knowledge, the need for improvement, the benefits of diabetes training among nurses and the impact this can have on patient care. Modic et al (2013) found nurses were not confident or satisfactorily prepared to make decisions about diabetes management in hospital. Ahmed et al (2012) found diabetes management knowledge was significantly lacking among nurses in inpatient

and outpatient settings. Strider and Phillips (2011) revealed deficient knowledge about hypoglycaemia and its management, which was affecting the quality and safety of care that at-risk patients received. Carney et al (2013) found gaps in nurses' and student nurses' knowledge of nutritional management of diabetes.

There is a need to acknowledge nurses may lack insight into their level of diabetes knowledge and skills (Strider and Phillips, 2011). Gerard et al (2010) demonstrated mediocre levels of actual knowledge despite positive levels of perceived knowledge, with significant variations across treatments, the management of acute complications, long-term complications, diet and foot care. Ahmed et al (2012) stress the importance of investigating nurses' actual knowledge to inform diabetes education development. They assert the need for awareness of knowledge plateaus and highlight the importance of reinforcing diabetes knowledge. Livingston and Dunning's study (2010) reinforced the need for ongoing training and the use of up-to-date, reliable information sources.

Acquisition of knowledge does not automatically equate with better diabetes care (Holmes and Dyer, 2013). Education needs a strong link to practice to facilitate the transfer of evidence-based skills and knowledge into practice. Barriers such as "fear

Citation: Lange C, Pearce R (2017) Exploration of diabetes knowledge among registered nurses working in an NHS Trust. *Journal of Diabetes Nursing* 21: 203–7

Article points

1. Perception of knowledge and actual knowledge of diabetes differ.
2. Age, level of education, country of training and whether English is a first language impact on the care given as a result of diabetes knowledge.
3. Nurses have a responsibility to ensure their knowledge and skills are up to date in order to practise safely.

Key words

- Diabetes knowledge
- Education
- Impact
- Perception

Authors

Christina Lange is Diabetes Specialist Nurse at the Diabetes Centre, Hereford County Hospital, Wye Valley NHS Trust; and Ruth Pearce is Associate Professor at the School of Health Sciences, University of Nottingham.

Table 1. Participants' nursing roles (n=69)

Nursing role	Number (%)
Staff nurse	39 (56.5%)
Junior sister	8 (11.6%)
Ward sister	6 (8.7%)
Community staff nurse	4 (5.8%)
District nurse	2 (2.9%)
Specialist nurse	7 (10.1%)
Other role*	3 (4.3%)

*1 advanced nurse practitioner, 1 integrated flow manager and 1 student district nursing practitioner

Table 2. Nurses' level of education (n=67)

Education	Number (%)
Diploma	25 (37.3%)
Degree	29 (43.3%)
Masters	8 (11.9%)
Other	5 (7.5%)

Table 3. Time since training (n=69)

Years	Number (%)
1-3	12 (17.4%)
4-10	20 (29.0%)
11-20	13 (28.8%)
>20	24 (34.8%)

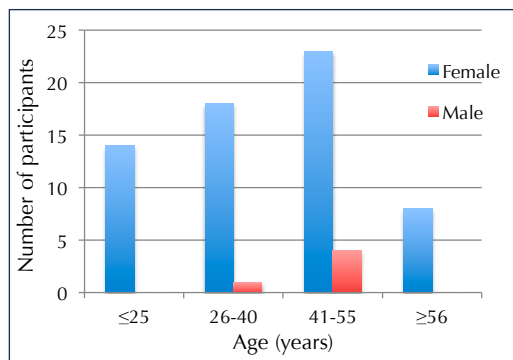


Figure 1. Distribution of participants' age and gender.

of change and fear of negative judgements [...] competing demands [...] lack of time [...] workplace environment and structural and organisational barriers”, have been identified (Graue et al, 2010).

Methodology

A questionnaire designed and piloted prior to this study was used to ascertain RNs' diabetes knowledge and identify factors that might affect levels of knowledge. It was developed to enable specific characteristics pertinent to the Trust (management of hypoglycaemia and insulin management) to be investigated as part of a service evaluation. These were areas that personal experience, local incident reporting and results from the National Diabetes Inpatient Audit (HSCIC, 2014) highlighted as needing improvement. Participants were asked to rate statements relating to diabetes knowledge, confidence and experiences regarding diabetes care from “strongly disagree” to “strongly agree”.

Using SurveyMonkey's sample size calculator, of the 742 RNs working with adults in the Trust, 86 RNs needed to participate in the study, allowing a 10% margin of error and 95% confidence interval. Questionnaires were distributed to 304 nurses to allow for a significant non-response rate.

Data were analysed using descriptive statistics and SPSS software was used to perform non-parametric statistical tests. Nominal and ordinal level data were collected; therefore non-parametric statistical tests were applied (Bowling, 2014). Fisher's exact test was used to determine whether there was a non-random relationship between two categorical variables and Kendall's tau-b (τ_b) correlation test (Fields, 2009) was used to determine the significance of participants' answers ($P < 0.05$ was considered statistically significant).

Authorisation was sought through the NHS Trust's Research and Development Department. The project was deemed to be a service evaluation, so Research NHS Ethics approval was not required. Participants were provided with a consent form, which was returned separately to the completed questionnaire to ensure the anonymity of responses.

Results

Sixty-nine of the 304 questionnaires distributed were returned, a response rate of 22.7%. Sixty-eight participants gave valid answers for age and gender (see Figure 1). Participants' roles (Table 1), level of education (Table 2) and time since completion of training (Table 3) varied. The answers to statements relating to diabetes knowledge, confidence and experiences of diabetes care are given in Figure 2. There were significant correlations between:

- Confidence in level of diabetes knowledge and confidence in delivering safe diabetes care ($\tau_b = 0.640$; $P < 0.01$).
- Experience delivering diabetes care and confidence delivering safe diabetes care ($\tau_b = 0.570$; $P < 0.01$).
- Confidence in delivering safe diabetes care and knowledge of insulin therapy ($\tau_b = 0.534$; $P < 0.01$).
- Confidence in delivering safe diabetes care and confidence in liaising with the diabetes specialist nursing team ($\tau_b = 0.426$; $P < 0.01$).
- Familiarity with the Trust's management of hypoglycaemia guidelines (TMHG) and knowledge of insulin therapy ($\tau_b = 0.256$; $P < 0.05$).
- Familiarity with the TMHG and delivery of safe diabetes care ($\tau_b = 0.367$; $P < 0.01$).

Forty-six participants (66.6%) agreed or strongly agreed that they were familiar with the TMHG and 51 (75%) correctly considered hypoglycaemia to be a blood glucose level < 4 mmol/L (see Table 4). There was no significant difference between familiarity with TMHG and correct identification of hypoglycaemia ($P = 0.229$).

Participants were invited to select all appropriate treatments for hypoglycaemia from a list of five options: 67 (97.1%) selected glucose drink, 22 (31.9%) a chocolate bar, 21 (30.4%) tea and biscuits, and 41 (59.4%) orange juice. None selected “don't know”. For further analysis participants were divided into two groups: those that had correctly identified hypoglycaemia treatments and those that

had not. No statistically significant difference was found when the groups were compared to the two groups created based on level of familiarity with the TMHG's ($P=0.798$), see *Table 5*.

When invited to select all of the oral diabetes treatments that could cause hypoglycaemia from a list of metformin, gliclazide, pioglitazone, sitagliptin, metformin M/R and "don't know", 10 participants (14.5%) selected "don't know". Forty-eight (69.6%) correctly selected gliclazide.

Asked what they would do if they had a patient successfully treated for hypoglycaemia who was due insulin with breakfast, 40 (60.6%) participants correctly indicated they would administer the insulin. Of the remainder, two (2.9%) would omit the insulin injection, one (1.5%) administer half the prescribed dose, 21 (31.8%) would request medical advice and one (1.5%) did not know what to do. When divided into two groups (correct and incorrect answers) and compared to perceived familiarity with TMHG's (those who agreed/strongly agreed vs neutral/disagreed/strongly disagreed), no significant difference was found ($P=0.109$). There was no significant difference when comparing correct/incorrect answers to confidence in knowledge around insulin therapy, see *Table 6* ($P=0.443$).

Demographic data on age, gender, first language, country of training, role, time since completion of training, highest level of education and diabetes training in the past 3 years were collected. The statistically significant differences for demographic variables and diabetes knowledge are given in *Table 7*. Age, level of education, country of training and whether English is a first language impacted on the care given as a result of diabetes knowledge.

Discussion

Diabetes knowledge among nurses

Significant gaps were identified among some participants in areas such as management of hypoglycaemia, oral diabetes treatments that can cause hypoglycaemia and management of insulin therapy. Not all participants were aware of the latest best practice. These findings correlate with other studies (Livingston and Dunning, 2010; Strider and Phillips, 2011; Ahmed et al, 2012; Modic et al, 2013). While all of the demographic data yielded statistically significant differences for at least one variable, time since completion of

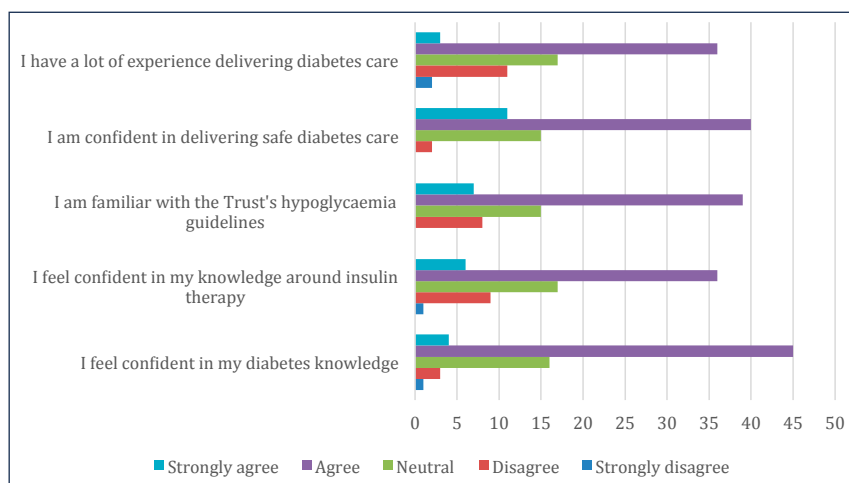


Figure 2. Participants' rating of statements relating to views and experiences in diabetes care.

Table 4. Familiarity with Trust guidelines and hypoglycaemic range.

Statement		Which of these blood glucose levels is considered hypoglycaemia (in mmol/L)?				Total
		3.5–11.0	<3.5	<4.0	I don't know	
I am familiar with the Trust's hypoglycaemia guidelines	Disagree	0	1	7	0	8
	Neutral	0	2	12	1	15
	Agree	2	8	28	0	38
	Strongly agree	0	3	4	0	7
Total		2	14	51	1	68

training (experience), level of education, diabetes training and role do not show a marked significant difference across diabetes knowledge (see *Table 7*). For example, when the variable for the scenario where a patient who has successfully been treated for hypoglycaemia and is due insulin was compared with the demographic variables, the only statistically significant difference observed was for country of training ($P=0.008$); all other variables were $P>0.05$. Modic et al (2014) found that level of education and experience did not impact on diabetes knowledge and Gerard et al (2010) found no relationship between level of education and knowledge.

Perceived versus actual knowledge

A theme that arose from the literature review was "perceived versus actual knowledge", and this was explored in the questionnaire. Of the 45 participants who agreed or strongly agreed that they were familiar with the TMHG's (see *Table 4*), 11 (25%) incorrectly

Table 5. Familiarity with Trust guidelines and hypoglycaemia treatments.

Statement: I am familiar with the Trust's hypoglycaemia guidelines	Hypoglycaemia treatments		
	Correct response (glucose drink and/or orange juice selected)	Incorrect response (tea and biscuits and/or chocolate bar selected)	Total
Agree or strongly agree	28 (40.6%)	18 (26.1%)	46 (66.7%)
Neutral, disagree or strongly disagree	13 (18.8%)	10 (14.5%)	23 (33.3%)
Total	41 (59.4%)	28 (40.6%)	69 (100.0%)

Table 6. Perceived confidence in insulin therapy and hypoglycaemia and insulin management scenario.

Statement: I feel confident in my knowledge around insulin therapy	How would you treat a patient who has successfully been treated for hypoglycaemia and is due insulin with breakfast?		
	Correct response (administer the insulin injection)	Incorrect response (omit the insulin, request medical advice or don't know)	Total
Agree or strongly agree	26 (39.4%)	14 (21.2%)	40 (60.6%)
Neutral, disagree or strongly disagree	14 (21.2%)	12 (18.2%)	26 (39.4%)
Total	40 (60.6%)	26 (39.4%)	66 (100.0%)

identified the hypoglycaemic range. Familiarity with the guidelines did not have a significant impact on the correct identification of hypoglycaemic level. Discrepancies were also found regarding hypoglycaemia treatment and familiarity with the TMHGs (Table 5), the management of insulin therapy after hypoglycaemia and confidence in knowledge of insulin therapy (Table 6), and in the management of insulin therapy after an episode of hypoglycaemia and familiarity with the TMHGs. Continuation of basal insulin while on variable rate intravenous insulin infusion (VRIII) and confidence in knowledge of insulin therapy was another area of discrepancy. When asked whether or not to continue basal insulin while a patient is on VRIII, 33 (47.8%) answered "yes", 17 (24.6%) "no", and 19 (27.9%) "don't know". No significant difference was found when comparing the variable to confidence around insulin therapy knowledge ($P=0.342$). A statistically significant difference was found for the training sessions attended ($P=0.018$). This was one of the only areas of diabetes

knowledge captured where attendance of training showed a difference. This and the high numbers of people who answered "don't know" may reflect that continuation of basal insulin while on VRIII is a more recent area of guidance (Joint Diabetes Societies for Inpatient Care, 2014; 2016). These findings highlight that while some nurses feel confident in their knowledge around certain areas of diabetes care, their answers to diabetes knowledge and care questions do not reflect this. There appears to be a marked discrepancy between perceived and actual knowledge. As there was a significant relationship between those who were confident in their level of diabetes knowledge and those who were confident in delivering safe diabetes care, these gaps in actual knowledge are potentially impacting on patient care.

It is worth considering which other factors impact on nurses' diabetes knowledge and the transfer of knowledge into practice. Holmes and Dyer (2013) identify lack of confidence, peer influence, busy working environments and reluctance to challenge peers' practice as factors that can contribute to this. Graue et al (2010) identify barriers to the transfer of knowledge into practice, such as fear of change and of negative judgements, competing demands, structural and organisational problems, and workplace environment.

Continued education in diabetes

Nurses have a responsibility to ensure their knowledge and skills are up to date in order to practise safely (Nursing and Midwifery Council, 2015). Although the majority of participants (68.7%) had attended at least one diabetes training session in the past 3 years, a significant proportion had not. Considering the increasing prevalence of diabetes, complexity of diabetes management and the rapid changes in management practices, up-to-date diabetes knowledge is essential (Gerard et al, 2010; Ahmed et al, 2012; Modic et al, 2014). If RNs are unable to identify their own lack of diabetes knowledge and are unaware of the fast pace of changes in management, the relevance to them of continued education in diabetes may be diminished.

Study limitations

Despite careful consideration and planning, potential response bias and social desirability cannot be dismissed (Bowling, 2014). A poor response rate

is characteristic of questionnaires (Oppenheim, 1992) and although several efforts were taken to maximise responses, the sample of respondents falls short of the intended 86 participants. There is the potential for non-response bias (Bowling, 2014) where the characteristics of non-respondents differ significantly from those of respondents. While the sample cannot claim to be representative or enable generalisation, this project enabled the views and perspectives of 69 RNs to be captured and contributes towards the service evaluation.

Changes made following the study

This project led to a reflection on current diabetes education practices, in particular considering how the training offered can address the knowledge gap. The awareness of a discrepancy between perceived and actual knowledge as well as the importance of culture and leadership led the Trust's Director of Nursing and Head of Education to create a team dedicated to reviewing education practices. This involved the development of a diabetes competency workbook, practical workshops to facilitate transference of knowledge into practice, and the greater involvement of nursing leadership and the education and development team in diabetes training.

Conclusion

There were significant gaps in diabetes knowledge among some RNs in the Trust. Not all participants were aware of the latest best practice. A discrepancy was found between perceived and actual knowledge. With the increasing prevalence of diabetes, its complexity and changes in management, it is essential RNs have current diabetes knowledge. ■

Acknowledgement

This article is based on research undertaken at the Institute of Health and Society at the University of Worcester in 2015 for Christina Lange's master's degree dissertation. The dissertation was submitted and completed in July 2016.

Ahmed A, Jabbar A, Zuberi L et al (2012) Diabetes related knowledge amongst residents and nurses: a multicenter study in Karachi, Pakistan. *BMC Endoc Disord* **12**: 1–8

Bowling A (2014) *Research Methods in Health: Investigating Health and Health Services* (4th edition). Open University Press, Berkshire

Carney T, Stein SE, Quintan JJ (2013) The need for additional training for nutritional management of diabetes. *Br J Nurs* **22**: 512–7

Cytryn KN, Garvey WT, Hayes SM et al (2009) A qualitative assessment of educational opportunities for primary care providers in type 2 diabetes care. *Diabetes Spectrum* **22**: 248–53

Table 7. Demographic variables* with a statistically significant difference for diabetes knowledge around hypoglycaemia management and insulin therapy.

Aspect of diabetes knowledge	Demographic variable
Familiarity with the Trust's management of hypoglycaemia guidelines	<ul style="list-style-type: none"> ● Country of training ● First language
Identification of hypoglycaemic range	Age (41–55 years)
<i>Oral treatment that can cause hypoglycaemia:</i>	
Metformin M/R	<ul style="list-style-type: none"> ● Age (≥56 years) ● Level of education
Gliclazide	Age (≥56 years)
I don't know	Age (≥56 years)
<i>Cause of hypoglycaemia:</i>	
Strict glycaemic control	<ul style="list-style-type: none"> ● Role ● Time since training
Change of insulin site	Role
Exercise	Age (26–40 years)
<i>Treatment for hypoglycaemia:</i>	
Tea and biscuits	Country of training
Orange juice	Level of education (degree)
Scenario: insulin management after a hypoglycaemic episode	<ul style="list-style-type: none"> ● Role ● Time since training
Basal insulin continued when on variable rate intravenous insulin infusion	<ul style="list-style-type: none"> ● Diabetes training ● Country of training ● First language

*Variables measured: age, role, time since completion of training, country of training, first language, level of education, and diabetes training

Fields A (2009) *Discovering Statistics using SPSS* (3rd edition). SAGE Publications, London

Gerard SO, Griffin MQ, Fitzpatrick J (2010) Advancing quality diabetes education through evidence and innovation. *J Nurs Care Qual* **25**: 160–7

Graue M, Bjarkøy R, Iversen MM et al (2010) Integrating evidence-based practice into the diabetes nurse curriculum in Bergen: perceived barriers to finding, reading and using research in practice. *European Diabetes Nursing* **7**: 10–5

Health and Social Care Information Centre (2014) *National Diabetes Inpatient Audit 2013*. HSCIC. Available at: <http://bit.ly/1IVGNf2f> (accessed 09.08.17)

Health and Social Care Information Centre (2016) *National Diabetes Inpatient Audit 2015: National Report*. HSCIC. Available at: <https://is.gd/D08BUd> (accessed 31.07.17)

Holmes C, Dyer P (2013) Diabetes training for nurses: the effectiveness of an inpatient diabetes half-day workshop. *Journal of Diabetes Nursing* **17**: 86–94

Joint Diabetes Societies for Inpatient Care (2014) *The use of Variable Rate Intravenous Insulin Infusion (VR/III) in Medical Inpatients*. Available at: <http://bit.ly/2uoDlVt> (accessed 09.08.17)

Joint Diabetes Societies for Inpatient Care (2016) *Management of Adults with Diabetes Undergoing Surgery and Elective Procedures: Improving Standards*. Available at: <http://bit.ly/2uoLUQP> (accessed 09.08.17)

King M, King L, Willis E et al (2012) The experiences of remote and rural Aboriginal health workers and registered nurses who

undertook a postgraduate diabetes course to improve the health of indigenous Australians. *Contemp Nurse* **42**: 107–17

Livingston R, Dunning T (2010) Practice nurses' role and knowledge about diabetes management within rural and remote Australian general practices. *European Diabetes Nursing* **7**: 55–62

Modic BM, Vanderbilt A, Siedlecki SL et al (2014) Diabetes management unawareness: what do bedside nurses know? *Appl Nurs Res* **27**: 157–61

Nursing and Midwifery Council (2015) *The Code: Professional Standards of Practice and Behaviours for Nurses and Midwives*. NMC, London

Oppenheim AN (1992) *Questionnaire Design, Interviewing and Attitude Measurement* (2nd edition). Pinter Publishers, London

Strider P, Phillips A (2011) Older people with diabetes in hospital: results of a staff knowledge audit. *Journal of Diabetes Nursing* **15**: 191–7 (<http://bit.ly/2xtKyVt>)