Diabetes training for nurses: The effectiveness of an inpatient diabetes half-day workshop

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Article points

1. People with diabetes are more likely to be admitted to hospital than people without the condition. Evidence suggests that these people with diabetes are more likely to experience complication, which may be due to lack of knowledge among healthcare professionals.
2. The Heart of England NHS Foundation Trust carried out three half-day inpatient diabetes workshops for nurses and assessed their effectiveness through questionnaires.
3. The results indicate that the workshops were an effective method of training nurses in diabetes care and the authors suggest hospitals should encourage training in this area.

Key words

- Inpatient care
- Training

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People with diabetes are more likely to be admitted to hospital and have longer stays than people without the condition. Data from the National Diabetes Inpatient Audit (2011) suggests that people with diabetes may experience avoidable complications while in hospital such as prescription errors, management errors and errors in timing of medication administration and it is assumed that many of these errors occur due to deficiencies in healthcare professional knowledge. This article reports on a study carried out by the Heart of England NHS Foundation Trust that assessed the effectiveness of training nurses in inpatient diabetes care through half-day workshops.

The prevalence of diabetes amongst hospital inpatients ranges from 5.8% to 25.8% (Health and Social Care Information Centre, 2011). People with diabetes are more likely to be admitted to hospital and have longer stays than people of the same age without the condition. The NHS in England spends more than £2 billion a year on inpatient care for people with diabetes, which accounts for approximately 11% of NHS inpatient care expenditure (Kerr, 2011). The excess sum spent on a population of the same age and gender without diabetes is an estimated £600 million (Kerr, 2011).

There is evidence to suggest that inpatient care is poor in many areas and people with diabetes experience avoidable complications whilst in hospital such as prescription errors, management errors and errors in the timing of medication administration (Health and Social Care Information Centre, 2011). It is assumed that many of these errors are due to deficiencies in staff knowledge. It is therefore essential that all healthcare professionals caring for people with diabetes in hospitals have adequate training to ensure high-quality care for this population.

Nurses working in diabetes should be well educated and actively involved in developing and delivering educational programmes (Crowley, 2000). When assessing ward nurses' knowledge of diabetes, it is important to consider three vital aspects in order to pitch training at the correct level:

- Length and type of experience.
- Level of diabetes education.
- Level of exposure in caring for people with diabetes.

A training-needs analysis of our hospital trust nurses' diabetes knowledge was performed by the inpatient diabetes team (IDT) and this identified three levels of training required:

- ***Level 1***: Basic awareness, which was mandatory for all staff.
- ***Level 2***: Enhanced awareness, which was essential for all front-line assessment areas and admission wards.
- ***Level 3***: Advanced awareness, which was desirable for senior nurses and medical staff who routinely manage people with diabetes.

Page points

1. The Heart of England NHS Foundation Trust's Inpatient Diabetes Team carried out a training needs analysis of nurses' knowledge in diabetes inpatient care and three levels of training needs were identified: basic awareness, enhanced awareness and advanced training.
2. The Trust carried out a study into the effectiveness of eight half-day workshops (enhanced awareness) by issuing questionnaires to participants prior to and after the workshop.
3. The aim of the workshop was to: improve quality of care for people with diabetes when they are in hospital; increase knowledge and skills of healthcare professionals; improve patient safety and support inpatient diabetes ward metrics.

The training-needs analysis was developed to reflect the NHS "Think Glucose" campaign and the *Rapid Response Report* issued by the National Patient Safety Agency (2010) to ensure the best practice and guidance was included in the training content.

Level 1 (basic awareness) was developed as an e-learning module based on multiple choice questions with compulsory fields to complete. This was mandatory for all nursing staff, including contracted and agency staff. *Level 2* (enhanced awareness) was considered essential for all nursing staff in front-line assessment and admission wards. This was delivered as a half-day diabetes workshop. It was decided to focus the workshop on bands 5–7 and this was delivered on each site. *Level 3* (advanced training) was desirable for all nursing staff who routinely manage people with diabetes. The aim was for level 3 staff to have more in-depth knowledge and key competencies, and to become diabetes champions and mentors for level 2 staff. They would be allocated time with the IDT over several weeks. The project has started on one site and is in its first phase, with level 2 nurses that have been selected to be diabetes champions using a specific programme with competencies.

Level 2 workshop training

The aim of the half-day workshop was to:

- Improve the quality of care for people with diabetes when they are in hospital.
- Ensure that care is consistent.
- Increase knowledge and skills associated with managing people with diabetes.
- Reduce errors.
- Improve patient safety.
- Disseminate information to other nurses.
- Support inpatient diabetes ward metrics (measures of the standard of record keeping for key indicators of diabetes care).

The specific learning objectives of the workshop were to:

- Be able to recognise and differentiate between type 1 and type 2 diabetes.
- Be able to describe the impact that diabetes can have during an acute illness or admission.
- Understand the rationale of capillary blood glucose (CBG) monitoring, how to record results and when to raise concerns.
- Demonstrate a broad understanding of the administration of insulin and other antidiabetes treatments, including the use of variable rate intravenous insulin infusions (VRIIIs; also known as "sliding scales").
- Understand the management of hyperglycaemia and hypoglycaemia.

Study aim

The aim of this study was to assess the nurses' knowledge of inpatient diabetes care pre- and post-workshop. It was hypothesised that the nurses' knowledge may be deficient in several areas, especially in regard to the appropriate use of insulin (for example, the use of VRIII and subcutaneous insulin) and the management of hyperglycaemia and hypoglycaemia. It was hoped that the workshop would improve knowledge, resulting in improved care.

Method

Nurses based in one of the three hospitals in our acute foundation trust were invited to attend the half-day workshop. On enrolling on to the courses through the diabetes directorate website, a diabetes knowledge questionnaire was administered for baseline knowledge and the same questionnaire was repeated at the end of the course. The questions were selected by the diabetes inpatient team and drawn from diabetes educational websites, clinical papers and trust diabetes guidelines. A selection of pilot questions were taken from the basic awareness e-learning module and analysed previously. From the diabetes directorate website, the nurses received a link to supporting material such as the NHS Diabetes e-learning modules and our trust's inpatient diabetes guidelines. At the workshop, nurses received interactive teaching on key components of diabetes management in hospital, including CBG monitoring, sliding scales, and the management of hyperglycaemia and hypoglycaemia. The workshop was devised and delivered by the diabetes inpatient specialist nurses (DISNs) and a consultant physician diabetologist.

Statistical analyses were performed with Microsoft® Excel®. Descriptive statistics were performed and the relationship between pre- and post-workshop knowledge was analysed with

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the t-test. The Cronbach's alpha score was used to assess the reliability of the questionnaire. The Cronbach's alpha is a coefficient of internal consistency. It is commonly used as an estimate of the reliability of a psychometric test for a sample of examinees. The Cronbach's alpha ranges from 0 to 1, and a score greater than 0.7 is considered acceptable.

Results

In total, 336 band 5–7 nurses completed the pre-workshop questionnaire and 286 completed the post-workshop questionnaire. The pre-workshop questionnaire showed the majority of the nurses had not attended a diabetes workshop or course in the last 5 years. The questionnaire was found to have high overall internal consistency by a Cronbach alpha of 0.80.

Prior to the workshop there was good understanding of the definition of diabetes, symptoms and treatment of hypoglycaemia, CBG monitoring of inpatients with diabetes and the impact of illness on diabetes. More than 90% of nurses in all three centres knew the CBG level for hypoglycaemia. More than 80% of nurses were able to identify the symptoms of hypoglycaemia, the initial treatment of a patient with hypoglycaemia and how to manage a patient with hypoglycaemia who was about to have a meal and was due their insulin.

There were significant deficiencies in knowledge of the referral criteria to the IDT, the time–action profiles of the various insulins, how to use a VRIII in different clinical settings, conversion from VRIII to subcutaneous insulin and the understanding of prescribing errors of inpatients with diabetes. Only 6% of nurses knew the two referral criteria to the IDT and knowledge of individual referral criteria ranged from 17 to 40%. Knowledge of the contraindications of metformin in renal impairment was reported in 59–69% of nurses. The correct storage of insulin pens after use was only known in 41–47% of patients. The indication for VRIII in the perioperative situation is poorly understood. Only 41–47% of nurses knew that a VRIII would not be necessary in a diet-controlled person with type 2 diabetes and 19–22% of nurses understood that the indication for VRIII in a person with type 2 diabetes depended on the duration of the surgery. More than 75% of nurses knew that patients could be re-started back on their subcutaneous insulin when they were ready to eat, but they were unsure of any other time this could be done. Only 40–48% understood that subcutaneous insulin could be re-started at the time when their regular dose was due.

Approximately two-thirds of nurses understood that the diagnosis of diabetic ketoacidosis (DKA) included the presence of metabolic acidosis, and more than 75% knew that the presence of ketosis was required for diagnosis. The focus on the importance of ketones and capillary ketone measurements during the workshop resulted in nurses forgetting or downgrading the importance of metabolic acidosis in the diagnosis of DKA; 72% of nurses pre-workshop included metabolic acidosis in the diagnosis of DKA compared with only 31% post-workshop.

A significant number of nurses' subjective confidence improved following the workshop ($P<0.001$). Overall, knowledge did significantly improve following the workshop; mean scores rose from 59 to 67 in the three centres ($P<0.05$) (see *Table 1*). No nurse answered all 27 questions

Table 1. Mean scores for the pre- and post-workshop questionnaires.

Site	**Pre-workshop mean score** (mean ± SD)	**Post-workshop mean score** (mean ± SD)	***P*-value**
Birmingham Heartlands Hospital	57.8 ± 22.6	64.3 ± 27.3	0.01
Good Hope Hospital	58.4 ± 22.9	67.9 ± 24.7	0.003
Solihull Hospital	59.9 ± 24.1	68.9 ± 28.1	0.02

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correctly; however, the proportion of nurses who answered between 15–19 and 20–26 questions correctly increased after the workshop. Feedback from the workshop demonstrated that most nurses felt that their knowledge and understanding of diabetes improved; however, only 8% said that they would use this increased knowledge to update others (see *Table 2*).

Discussion

This study showed that the half-day workshop was effective in improving nurse knowledge. Most of the staff who attended the workshop felt that they would benefit from further education in diabetes. It is positive that staff would be willing to undergo training if the opportunity arose and that the majority are aware of their limitations. It is recognised that more can be done to improve the quality of care delivered and that appropriate specialist training for healthcare professionals is important when caring for people with diabetes.

Whilst the workshop was successful in improving knowledge of the nursing staff, this improvement does not necessarily equate to better care. We are aware that some healthcare professionals may have difficulty in translating knowledge into positive actions (Wagner, 2011). This can be for a variety of reasons including lack of confidence, reluctance to challenge peers or seniors, busy ward environment and dysfunctional working environment. Feedback from the workshop confirmed that only a minority of nurses would use their new knowledge to update other colleagues.

Ideally, to test whether the workshop resulted in improved care, the study would include pre- and post-workshop questionnaires, pre- and post-intervention focus groups, auditing of metrics and referral to IDT, plus family and patient interviews to provide additional information. Currently we have metric data which is being audited, but any improvement

Table 2. Feedback from the workshops (W1–8).

Impact of workshop on nurses attending	W1	W2	W3	W4	W5	W6	W7	W8	Total	%
Update others	5	1	3	0	2	0	4	2	17	8%
Better understanding, awareness and knowledge	16	6	10	16	10	6	3	6	73	34%
Aware of monitoring	3	4	3	5	5	3	3	7	33	15%
Aware of treatments	12	5	12	14	9	4	3	3	62	29%
Aware of diabetes website	1	0	0	0	2	0	0	0	3	1%
Safety	1	1	1	1	3	1	0	2	10	5%
Self-administering (empowering patients)	4	1	2	1	1	0	1	5	15	7%
								Grand total	213	

may be due to the Hawthorne effect (Landsberger, 1958), which stipulates that any changes in the behaviour of participants during the course of a study may be related only to the special social situation and social treatment they received, rather than a direct effect of the workshop.

The quality of referrals to the IDT and patient interviews would need to be reviewed in areas where the nurses attended the workshop to fully assess whether the workshops improved patient care. Wards where no nurses had attended the workshop could be used as a control.

The questionnaire used was not validated but provided us with an understanding of the nurses' knowledge and this enabled us to guide training to areas where their knowledge was lacking. Some of the questions were "closed" and thus did not really test core knowledge as the correct answer was too obvious. An example of this was:

"Should all patients with diabetes have a foot assessment when admitted to hospital?"

Interestingly, the correct answer, i.e. "Yes", was only given in 59% of nurses. The benefit of the questionnaire was that it was easily reproducible, did not take too long for the nurses to complete and the questions did reflect real life issues.

Adjustments to the workshop presentations occurred with each workshop as we further understood the level of knowledge of the nursing staff and the type of care we wanted to be delivered on the ward. The interactive nature of the workshop, with numerous case studies and worked examples, was a strength of the workshop, as reflected in the feedback. It enabled nurses to translate what was being taught back to their clinical areas but also allowed them to work out the best course of management in each situation. Adapting the workshop to each group was also beneficial and we hoped that this would empower the nurses; this is yet to be seen.

Whilst our training was successful, there were limitations, for example, we could only provide a half-day rather than full-day workshop. Furthermore, there needs to be a better understanding regarding the benefits of ongoing training for nursing staff. It is hoped that the recurring National Diabetes Inpatient Audit will provide the ongoing impetus to maintain training in our trust.

Conclusion

Diabetes is highly prevalent in hospital inpatients. All healthcare providers, irrespective of the discipline they work in, should have a basic knowledge of how to manage people with diabetes when they are admitted. Knowledge alone is not sufficient to result in changes to practice; methods of empowering nurses are also important.

"Provision of accessible educational programmes is essential and ongoing assessment of their effectiveness is an important consideration."

Hospitals also need to introduce clear and user-friendly inpatient diabetes management protocols to support the education programmes. An example of where this has been found to be very successful was the introduction of insulin order sets. An "order set" is a set of orders routinely issued by physicians in recurring situations in the care of patients with particular conditions, or other conditions requiring medical, surgical and nursing care (Noschese et al, 2008; Yu et al, 2012).

The provision of accessible educational programmes is essential and ongoing assessment of their effectiveness is an important consideration. It is not sufficient merely to highlight a shortfall in knowledge – the IDT and diabetes service also have a duty to develop training and support networks to increase the knowledge of their ward-based colleagues, and also to prevent staff becoming de-skilled. Optimal glycaemic control is important for patient safety and this control should not be secondary to the primary cause of hospital admission (Fowler and Rayman, 2010). Audit of inpatient diabetes care needs to be routinely carried out to see if the improved knowledge translates into improved clinical care. ■

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