

# Inpatient nursing staff knowledge on hypoglycaemia management

Jackline Ndebu, Colin Jones

**Citation:** Ndebu J, Jones C (2018) Inpatient nursing staff knowledge on hypoglycaemia management. *Journal of Diabetes Nursing* 22: JDN008

## Article points

1. Hypoglycaemia experienced as an inpatient is associated with increased length of stay, higher morbidity and mortality, and increased cost.
2. The National Diabetes Inpatient Audit in 2016 found that one in five inpatients with diabetes experience hypoglycaemia during their hospital stay.
3. A questionnaire survey study was carried out in order to identify any gaps in hypoglycaemia management between nursing staff on the diabetes, vascular and critical care wards.

## Key words

- Education
- Hypoglycaemia
- Inpatient nurses

## Authors

Jackline Ndebu is Diabetes Specialist Nurse, Royal Liverpool University Hospital and studying towards a Masters in Advanced Healthcare Practice at Liverpool John Moores University; Colin Jones is Senior Lecturer, Liverpool John Moores University

**Hypoglycaemia is a major barrier to intensive glycaemic control and although the 2016 National Diabetes Inpatient Audit showed that the prevalence of hypoglycaemia has decreased from 26% to 20% since 2011, 1 in 5 inpatients with diabetes still experience hypoglycaemia during their hospital stay. Consequently, it is vital to evaluate whether nursing staff have the right knowledge to manage hypoglycaemia and if not, the reasons why. Using a questionnaire, a study was carried out at a large inner-city hospital in order to identify any gaps in hypoglycaemia management between nursing staff on the diabetes, vascular and critical care wards. As expected, the snapshot audit showed more hypoglycaemia episodes occurred in the diabetes wards and patients across the three wards mostly experienced hypoglycaemia during the night. Therefore, the difference between the day and night shift nurses' hypoglycaemia management was also evaluated.**

In the UK, it is estimated that there are 4.5 million people living with diabetes and approximately 1.1 million people with undiagnosed diabetes (Diabetes UK, 2016). Diabetes is currently costing the NHS an estimated £10 billion, which is 10% of the NHS budget (Diabetes UK, 2016).

Hypoglycaemia is one of the most vital acute complications associated with glucose-lowering therapies, such as insulin or sulfonylureas. Hypoglycaemia can simply be defined as an abnormally low blood glucose reading <4.0 mmol/L (McCrimmon and Sherwin 2010; American Diabetes Association [ADA], 2016; Hardy, 2017). Therefore, in 2010 the Joint British Diabetes Societies-Inpatient (JBDS-IP) Care Group published a guideline to help prevent and improve management of hypoglycaemia in people with diabetes while in hospital (JBDS-IP, 2010; Hill, 2011; Hulkower, Pollack and Zonszein, 2014).

The NHS is facing a crisis, with general nursing shortages that have resulted in agency and temporary workers filling in vacancies on the wards, and nursing

staff lacking the specialist support needed as there is a shortage of DSNs (Francis Report, 2013; Diabetes UK, 2014; NHS Improvement, 2016). Furthermore, it has been suggested that regardless of whether a patient is in critical care, vascular or a general ward, hypoglycaemia is associated with increased length of stay, increased cost, and higher morbidity and mortality rates, with at least 25% of all inpatient days incurred by patients with diabetes (Turchin et al, 2009; Hermanides et al, 2010; NICE-SUGAR study, 2012; Seaquist et al, 2012). Therefore, it is paramount that the NHS has plans in place to deal with this epidemic of diabetes as it is going to demand even more resources in the near future.

## Methodology

A questionnaire survey (*Box 1*, overleaf) was developed based on the hospital's hypoglycaemia management guidelines, and a snapshot audit (*Table 1*, overleaf) was carried out to determine when the majority of the hypoglycaemia episodes occurred. The cross-sectional survey only involved inpatient

**Box 1. Questionnaire for nursing staff on inpatient hypoglycaemic (low blood glucose) management.**

**Please circle the appropriate answer**

1. Grade:	Ward Manager	Staff nurse	Staff nurse	HCA (Band 4)	HCA (Band 3)	
2. Base ward:						
3. On average, how many hours per week do you work on your ward?	≥32 hours	16–31 hours	<16 hours			
4. What shift pattern do you primarily work?	Early	Late	Night	Mix of shifts		
5. Do you come across patients with diabetes in your ward?	Yes	No	I work on a diabetes ward			
6. Are you aware of existence of Inpatient Hypoglycaemia Guideline in the Trust?	Yes	No	Where can you find these?			
7. Have you had training in hypoglycaemia management?	Yes	No				
8. What is the cut-off capillary blood glucose level (mmol/L) for hypoglycaemia as per local protocol?	<2.5	<3	<4	<5		
9. Please select the symptom(s) of hypoglycaemia from the following:	Hunger	Shaking	Sweating	Confusion	Headache	Fits
10. Which antidiabetes medication(s) commonly causes hypoglycaemia?	Metformin	Glitazone	Gliclazide	Insulin		
11. What would you use to treat the hypoglycaemia? Please give examples and quantities.						
12. Please list the contents of the “Hypoglycaemia Box”.						
13. Insulin needs to be omitted after a hypoglycaemic episode treatment?	True	False	Not sure			
14. Is it essential to re-check the blood glucose?	Yes	No	Not sure			
If yes, when do you need to check?						
If no, why?						
15. Do you document the hypoglycaemic episode in medical notes for doctors to review?	Yes	No				
16. Do you routinely check capillary blood glucose readings for all patients with diabetes?	Yes	No				
17. How do you think most hypoglycaemic episodes are detected in the hospital?	Routine check	Suspected by patients	Suspected by staff			
18. Do you think hypoglycaemia increases a patient’s length of hospital stay?	Yes	No	Not sure			
19. How do you think hypoglycaemia increases mortality (death)?	Yes	No	Not sure			
20. Do you know how to contact the Diabetes Team if their advice is required?	Yes	No	Not sure			

registered nurses and healthcare assistants (HCAs) working on the diabetes, critical care and vascular wards. All had completed blood glucose training.

Once ethical approval was granted, consent was gained from the relevant ward manager. As this was a voluntary and completely anonymous study, no personal details were collected and any returned questionnaires implied informed consent. Verbal consent was also gained from the relevant ward managers as they helped identify participants. The participants were chosen at random and issued with a questionnaire that took approximately 10 minutes to complete; however, each participant was given 2 weeks to return their questionnaires. Additionally, as ward areas can be very busy, nursing staff were requested

to complete the questionnaire during their break time or keep it overnight in order not to be distracted from potentially life-threatening situations. Above all, the study preserved confidentiality in accordance with the Nursing and Midwifery Council (NMC, 2015) guidelines by ensuring all data collected was only stored in NHS and Liverpool John Moores University password-protected computers.

The snapshot audit was carried out over four weeks in April, 2017. The questionnaires were issued and collected during May and June, 2017.

**Results**

The statistical analysis was performed using the SPSS version 23.0 (IBM Corp, 2015). Looking at

**Page points**

1. Response rates were not a initially expected; 100 questionnaires were issued and 40 responses were received.
2. All three wards came across people with diabetes on their wards and all of the nursing staff questioned were aware of the hospital's hypoglycaemia guidelines.
3. Although everyone used some form of rapid-acting carbohydrates for hypoglycaemia treatment and were aware to recheck blood glucose after treatment, only 77.5% (31/40) of the nursing staff rechecked the blood glucose after 15 minutes as per the hospital's guidelines.

**Table 1. Number of hypoglycaemic episodes over a 4-week period.**

	Total number of patients who experienced hypoglycaemia	Total number of hypoglycaemic episodes	Total number of hypoglycaemic episodes by shift
<b>Critical care wards (2 wards)</b>	20	39	Early: 9 Late: 4 Night: 26
<b>Diabetes wards (2 wards)</b>	33	127	Early: 34 Late: 26 Night: 67
<b>Vascular wards (2 wards)</b>	18	55	Early: 17 Late: 9 Night: 29

the snapshot audit (*Table 1*), most hypoglycaemia episodes occurred in the diabetes wards and inpatients across the three wards mostly experienced nocturnal hypoglycaemia.

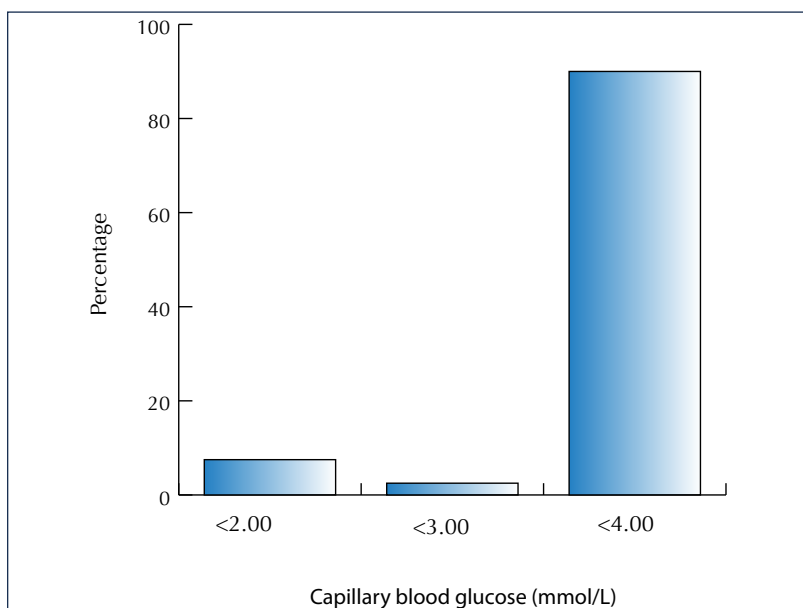
Although 150 questionnaires were meant to be issued to six wards; two wards did not participate. Consequently, only 100 questionnaires were issued, with 40 responses received. The breakdown of staff was: 5% Ward Manager; 7.5% Senior Nurse; 75% Staff Nurse; 2.5% HCA (Band 4) and 10% HCA

(Band 3). Even though 82.5% (33/40) of the above nursing staff worked full-time, 75% (30/40) worked a mixture of early, late and night shifts. Only 5% (2/40) worked nights permanently.

All three wards came across people with diabetes on their wards and all of the nursing staff questioned were aware of the hospital's hypoglycaemia guidelines; 95% (38/40) of participants had completed hypoglycaemia training. While 90% of nursing staff considered capillary blood glucose (CBG) of <4.0 mmol/L to be hypoglycaemia, 7.5% considered a CBG of <2.5 mmol/L and 2.5% considered a CBG of <3.0 mmol/L to be hypoglycaemia (*Figure 1*).

Looking at hypoglycaemia treatment, 93.75% (15/16) of diabetes ward nurses recognised all hypoglycaemia symptoms; however, only 58.3% (7/12) from vascular and 25% (3/12) from critical care wards recognised the symptoms. Furthermore, only 58.3% (7/12) of critical care nursing staff recognised just 3 or fewer hypoglycaemia symptoms. Although everyone used some form of rapid-acting carbohydrates for hypoglycaemia treatment and were aware to recheck CBG after treatment, only 77.5% (31/40) of the nursing staff rechecked the CBG after 15 minutes as per this hospital's guidelines, while 17.5% (7/40) rechecked after 20–30 minutes. Moreover, 10% (4/40) stated they would have omitted insulin after this treatment.

Overall, everyone was aware of how to contact the diabetes team and 95% (38/40) checked CBG for all



*Figure 1. Responses to the question about what blood glucose level constitutes hypoglycaemia.*

diabetes patients. However, it is vital to note that 60% of those asked detected hypoglycaemia through all three means: routine checks, suspected by patients and suspected by staff. Essentially, 90% (36/40) of nursing staff that participated in this study were aware that hypoglycaemia increased both patients' length of stay and mortality rates.

## Discussion

This study had a good demographic mix representing a variety of staff bandings, although, only 5% of the nurses worked nights permanently. As the snapshot audit showed more hypoglycaemia episodes occurred at night, the small percentage of nurses working night shifts in this study made it difficult for hypoglycaemia knowledge to be compared with that of daytime nurses. One explanation of this could be because permanent night-shift working is not encouraged in this Trust as per the European Working Time Directive and Royal College of Nursing (RCN), in order to minimise health risks in all their workers (Health and Safety Executive, 2006; RCN, 2012). Additionally, there are fewer staff members working at night and the nature of their work means that fatigue may threaten their decision making. This could have explained why so few completed and returned the questionnaires (Nilsson et al, 2008; Morrison et al, 2013).

The 2016 NaDIA results (NHS Digital, 2017) showed that 1 in 6 hospital beds was occupied by a person with diabetes and this is reflected in our study as all three wards had inpatients with diabetes. Additionally, Holmes and Dyer (2013) and the RCN (2017) have shown that diabetes training is vital for all healthcare providers, irrespective of the discipline they work in. Reassuringly our study showed that 95% of nursing staff had received hypoglycaemia training. This is positive compared to a previous study that showed only a 51% attendance at formal hypoglycaemia training (Chinnasamy et al, 2011). What is concerning, however, only 90% nursing staff recognised the correct hypoglycaemia cut off CBG of <math><4.0\text{ mmol/L}</math> and perhaps this is why hypoglycaemia treatment can often be delayed in hospitals (Livingstone and Boyle, 2015). The diabetes inpatient specialist nurses (DISNs) have a role in encouraging all nursing staff in the hospital to complete up-to-date hypoglycaemia training but ultimately it is also the responsibility of the individual staff members to

ensure they are familiar with all hospital guidelines (NMC, 2015).

As expected, 93.75% of nurses on the diabetes ward recognised all hypoglycaemia symptoms. Surprisingly, however, only 25% of critical care nurses recognised all hypoglycaemia symptoms. Their patients are normally unstable and at a risk of hypoglycaemia due to intravenous insulin administration, continuous veno-venous haemofiltration, inotropic support or sepsis (Turchin et al, 2009; Bilotta and Rosa, 2012). Perhaps, the fact that more care is demanded by critical care patients makes it difficult for these nurses to manage hypoglycaemia effectively or, more training is essential. This could be an area where both the Critical Care Nurse Educators and DISNs work together to improve the overall patients' care. Although all nurses would have treated hypoglycaemia with a rapid-acting carbohydrate, only 77.5% would have rechecked CBG after 15 minutes and 10% would have omitted the patient's insulin after treatment. This shows that nursing staff are neither familiar with their local hospital guidelines, nor the JBDS-IP (2010) guidelines on hypoglycaemia management. Hence, all nurses need to not only be aware of their hospital guidelines but be up to date with current research and adhere to the NMC standards for medicines management (NMC, 2007; 2015).

It is reassuring that all nurses were aware of how to contact the diabetes team, with 95% of them having checked CBG for all diabetes patients. Furthermore, it was encouraging that 90% were aware that hypoglycaemia increases both the patients' length of stay and mortality rates. Although this is promising, only 60% of nurses would have detected a hypoglycaemic episode through routine checks, suspected by patients and staff. This is alarming as not all people with diabetes have hypoglycaemia awareness. De Galan et al (2006) defined hypoglycaemia unawareness as "neuroglycopenia before the appearance of autonomic warning symptoms". Additionally, as reported by Martin-Timon and Del Canizo-Gomez (2015), up to 40% of people with type 1 diabetes can have a loss of hypoglycaemia awareness. Therefore, if more people with diabetes are unable to recognise hypoglycaemia symptoms and fewer nurses are routinely checking CBGs of inpatients with diabetes, eventually more adverse events will occur in the hospitals. Furthermore, although the 2016 NaDIA

## Page points

1. The study showed that 95% of nursing staff had received hypoglycaemia training.
2. Similarly, it is reassuring that all nurses were aware of how to contact the diabetes team in the hospital, and 90% were aware that hypoglycaemia increases length of stay in hospital as well as risk of mortality.
3. It is clear, however, that many of the nurses need to have a better understanding of the hospital guidelines for hypoglycaemia, as well as national guidelines.

**“Essentially, hypoglycaemia should not be occurring in hospitals; however, whenever it does occur, it is paramount that it is effectively managed.”**

results showed a reduction of hypoglycaemia by 6%, a substantial amount of people are still experiencing severe hypoglycaemia (NHS Digital, 2016). Inpatient nurse on all wards need to recognise the importance of routine checks in people with diabetes in order to pick up hypoglycaemic episodes quicker, thus preventing further diabetes complications.

### Study limitations

This study had a small response rate and, as ethical approval took longer than anticipated, there were time constraints. It is suggested that a larger cohort of nurses could be studied in the future, with a greater emphasis on night shift workers, so that all nurses are well represented.

### Conclusion

This study showed there is still a lack of knowledge of inpatient hypoglycaemia management in this hospital; however, as predicted the diabetes ward nurses had better hypoglycaemia management knowledge than vascular or critical care ward nurses.

Essentially, hypoglycaemia should not be occurring in hospitals; however, whenever it does occur, it is paramount that it is effectively managed in order to reduce NHS costs, the patient's length of stay, and morbidity and mortality rates. Therefore, investment in more DISNs to support nursing staff on the ward will help improve hypoglycaemia management in all hospitals.

In this trust, projects have been developed to tackle inpatient hypoglycaemia and more DISNs have been employed to support all inpatient/ward nurses. Furthermore, it is suggested that all hospitals should have hypoglycaemia management as part of their mandatory annual training in order to ensure all nurses are trained and are up to date with current research. ■

American Diabetes Association (2016) Hypoglycemia (Low Blood Glucose). ADA, Available at: <https://is.gd/CQu1UG> (accessed 01.02.18)

Bilotta F, Rosa G (2012) Glycemia management in critical care patients. *World J Diabetes* **3**: 130–4

Chinnasamy E, Mandal A, Khan S et al (2011) Nurses' knowledge of inpatient hypoglycaemia management. *Journal of Diabetes Nursing* **15**: 313–7

De Galan BE, Schouwenberg BJW, Tack CJ, Smits P (2006) Pathophysiology and management of recurrent hypoglycaemia and hypoglycaemia unawareness in diabetes. *Neth J Med* **64**: 269–79

Diabetes UK (2014) *Diabetes specialist nurses “at breaking point.”* Diabetes UK, London. Available at: <https://is.gd/xlFemz> (accessed 01.02.18)

Diabetes UK (2016) *Facts and Stats*. Diabetes UK, London. Available at: <https://is.gd/z07p6d> (accessed 01.02.18)

Francis Report (2013) *Report of the Mid Staffordshire NHS Foundation Trust Public Inquiry*. Available at: <https://is.gd/xxbHVv> (accessed 01.02.18)

Hardy K (2017) *Adult Diabetes Management Guidelines 2017–22*. Available at: <https://is.gd/51dEjI> (accessed 01.02.18)

Health and Safety Executive (2006) *Managing shift work: Health and safety guidance*. HSE, Bootle, Merseyside

Hermanides J, Bosman RJ, Vriesendorp TM et al (2010) Hypoglycemia is associated with intensive care unit mortality. *Crit Care Med* **38**: 1430–34

Hill J (2011) How to manage hypoglycaemia. *Nursing Times* **107**: 40

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

Hulkower RD, Pollack RM, Zonszein J (2014) Understanding hypoglycaemia in hospitalized patients. *Diabetes Manag (Lond)* **4**: 165–76

IBM Corp (2015) *BIM SPSS Statistics for Windows*. Version 23.0. Armonk, USA

Joint British Diabetes Societies, Inpatient Care Group (2010) *The hospital management of hypoglycaemia in adults with diabetes mellitus*. Available at: <https://is.gd/0kW5ps> (accessed 01.02.18)

Livingstone R, Boyle J (2015) Improving the quality of assessment and management of hypoglycaemia in hospitalised patients with diabetes mellitus by introducing ‘hypo boxes’ to general medical wards with a specialist interest in diabetes. *BMJ Qual Improv Rep* **4**: 1–4

Martin-Timon I, Del Canizo-Gomez FJ (2015) Mechanisms of hypoglycaemia unawareness and implications in diabetic patients. *World J Diabetes* **6**: 912–26

McCrimmon RJ, Sherwin RS (2010) Hypoglycemia in type 1 diabetes. *Diabetes* **59**: 2333–9

Morrison I, Flower D, Hurley J, MacFadyen RJ (2013) Working the night shift: A necessary time for training or a risk to? *J R Coll Physicians Edinb* **43**: 230–5

NHS Digital (2016) *National Diabetes Inpatient Audit England and Wales*. NHS Digital, Leeds. Available at: <https://is.gd/tiLORK> (accessed 01.02.18)

NHS Improvement (2016) Evidence from NHS Improvement on clinical staff shortages. A workforce analysis. Available at: <https://is.gd/CgVlUn> (accessed 01.02.18)

NICE-SUGAR study (2012) Hypoglycemia and risk of death in critically ill patients. *N Eng J Med* **367**: 1108–18

Nilsson K, Campbell AM, Andersson EP (2008) Night nursing: Staff's working experiences. *BMC Nursing* **7**: 13

Nursing and Midwifery Council (2007) *Standard for medicines management*. NMC, London. Available at: <https://is.gd/czhL49> (accessed 01.02.18)

Nursing and Midwifery Council (2015) *The Code: Professional standards of practice and behaviour for nurses and midwives*. NMC, London. Available at: <https://is.gd/eFrOrp> (accessed 01.02.18)

Royal College of Nursing (2012) A shift in the right direction. RCN guidance on the occupational health and safety of shift work in the nursing workforce. RCN, London. Available at: <https://is.gd/jrLUn0> (accessed 01.02.18)

Royal College of Nursing (2017) Education, prevention and role of the nurse. RCN, London. Available at: <https://is.gd/6sLGmA> (accessed 01.02.18)

Sequist ER, Miller ME, Bonds DE et al (2012) The impact of frequent and unrecognised hypoglycemia on mortality in the ACCORD study. *Diabetes Care* **35**: 409–14

Turchin A, Matheny ME, Shubina M et al (2009) Hypoglycemia and clinical outcomes in patients with diabetes hospitalized in the general ward. *Diabetes Care* **32**: 1153