

Point-of-care simulation training to address serious untoward incidence of hypoglycaemia

Kim Sleeman, Amanda Davis, Amanda Veall

Citation: Sleeman K, Davis A, Veall A (2018) Point-of-care simulation training to address serious untoward incidence of hypoglycaemia. *Journal of Diabetes Nursing* 22: JDN004

Article points

1. Simulation training allows the recreation of real life in an environment that is safe for the clinician and the patient, as well as being effective in developing both technical and non-technical skills.
2. A team of diabetes nurses at the Cornwall Partnership Foundation Trust have developed point-of-care simulation training, which takes place on the wards to enable a real-life situation. The main aim was eliminate serious untoward incidences of hypoglycaemia throughout the trust.
3. As a result of the training, immediate changes have been made in the wards and the feedback from training participants has been very positive.

Key words

- Education
- Hypoglycaemia
- Point-of-care training
- Simulation

Authors

For authors' details, see the end of the article.

This article discusses the design, implementation and initial outcomes of a project to establish an effective training programme on the identification and treatment of hypoglycaemia using point-of-care simulation training. The project utilised the RAID (review, agree, implement, demonstrate) quality improvement cycle. The aims of the study were to improve the quality of inpatient hypoglycaemia treatment and reduce serious untoward incidences in an acute district general hospital. As a direct result of point-of-care simulations, immediate changes have been made in the ward setting. There has been positive feedback from the staff involved and the number of incidences of mismanagement of hypoglycaemia has been reduced.

Diabetes healthcare is increasing in complexity at an astounding rate. Rapid developments in practice often result in an increased depth of knowledge and skills required by healthcare professionals in caring for those with diabetes.

With ever-changing team dynamics and restructuring of healthcare organisations comes the need to provide high-quality and safe clinical practice in diabetes management. Training and education programmes are one way to address these demands, however evolving educational strategies are now required over traditional standard education.

Since the 1960s, the aviation industry has turned to simulation (SIM) training to provide such education programmes in their profession. SIM training proved to equip staff with the necessary skills and knowledge required.

The use of SIM in the aviation industry has not gone unnoticed by healthcare providers. The Chief Medical Officer, Sir Liam Donaldson (Donaldson, 2009), stated:

"Simulation training in all its forms will be a vital part in building a safer healthcare system."

SIM training has also received significant endorsement by the Department of Health (2011) and the General Medical Council (2011). SIM training allows the recreation of real life, in an environment that is safe for the clinician and the patient, as well as being effective in developing both technical and non-technical skills (Cook et al, 2011).

Following the publication of the damning report of the failings at The Mid Staffordshire NHS Foundation Trust (Francis, 2013), the NHS in the UK is under enormous scrutiny. Our Trust has recognised the importance of cultural changes at the coalface by introducing an integrated SIM team using point-of-care (POC) SIM. POC SIM is one way to improve morale, enhance education, and tackle human factors and team working dynamics to ultimately improve upon patient care and safety.

Background

The Royal Cornwall Hospital is a district general hospital based in Truro in Cornwall, with approximately 743 beds and outpatient departments. The number of people with diabetes in Cornwall is approximately 28 000 with a high inpatient prevalence of diabetes. Diabetes Inpatient

Specialist Nurses (DISNs) from the Cornwall Partnership NHS Foundation Trust provide diabetes inpatient services to the acute trust.

A SIM pilot project was initially funded by the Strategic Health Authority innovation fund and the Trust's department of post-graduate education. This enabled set up of a dedicated SIM facility with an appointment of a SIM practitioner and purchase of the SIM equipment. In collaboration with existing available resources, an anaesthetic fellow and members of the hospitals learning and development department, a SIM team was formulated. To obtain the necessary skills to deliver SIM, the team attended the Bristol Medical Simulation Centre training, which then facilitated POC training to be implemented within the hospital (Bristol Medical Simulation Centre, 2017).

Following commencement of the successful pilot, which had been received enthusiastically by all members of staff, the SIM team secured ongoing funding and requested expressions of interest from specialities and departments within the hospital. It was hoped this expansion would facilitate collaborative multi-professional SIM training throughout the Trust.

It was at this time our Trust had experienced serious untoward incidences (SUIs) regarding hypoglycaemia management, of which one proved to be consequently fatal. This was despite an up-to-date trust-wide hypoglycaemia guideline, the introduction of hypoglycaemia boxes on all wards, regular face-to-face training and access to national e-learning modules. Therefore, these traditional educational methods alone appeared to be ineffective.

Following discussion with the SIM department, the DISNs wrote and developed a POC module for hypoglycaemia education. This enabled teaching of the Trust's guidelines for management of hypoglycaemia on the wards at the POC. A project was then established to deliver this SIM module to the ward where the SUI had occurred over a 3-month period and evaluate its effectiveness.

The reasons for addressing hypoglycaemia management for ward staff were twofold. The primary objective relates to patient safety; in a study of more than 100 000 inpatients with

diabetes, those who experienced hypoglycaemic episodes were found to have had longer hospital stays, a 7% higher risk of inpatient mortality, a 39% increase in hospital costs and a 58% increased likelihood of discharge to a skilled nursing facility (Curkendell et al, 2009). The second relates to staff morale and how much this is affected by a SUI.

POC SIM training

SIM training is delivered using a human patient simulator that simulates a person experiencing hypoglycaemia. Delivered at the POC within the ward environment, the ward team have to respond in real time, using usual ward resources. It is delivered to the entire multidisciplinary team (MDT) concurrently including nurses, healthcare assistants, and junior and senior ward doctors. All members partake in their usual roles during the SIM with little instruction from the SIM team to recreate a real-life situational event (*Figure 1*).

Moving training into the workplace with POC SIM training provides a unique opportunity to reach staff who have limited training support and funding. Challenging human factors in the work environment allows the MDT to learn together and improve performance, with consequent delivery of safer patient care, better outcomes and improved productivity.

SIM is specifically designed to be patient-centred and service driven. Careful

Page points

1. To obtain the necessary skills to deliver simulation (SIM) training, the team attended the Bristol Medical Simulation Centre training, which then facilitated point-of-care (POC) training to be implemented within the hospital.
2. SIM training is delivered using a human patient simulator that simulates a person experiencing hypoglycaemia. Delivered at POC within the ward environment, the ward team have to respond in real time, using usual ward resources.
3. Challenging human factors in the work environment allows the multidisciplinary team to learn together and improve performance, with consequent delivery of safer patient care, better outcomes and improved productivity.



Figure 1. The multidisciplinary team take part in the training in their usual roles.

Page points

1. Rehearsing situations increases confidence and skill such that when they are encountered in clinical practice they can be managed calmly and with the experience of detailed rehearsal.
2. The main aim of the project was to reduce occurrence of hypoglycaemia incidences in the wards and improve hypoglycaemia knowledge.
3. A further aim was to develop a knowledgeable multidisciplinary team who could manage hypoglycaemia effectively.
4. The method utilised the RAID (review, agree, implement and demonstrate) quality improvement model.

Box 1. Advantages of point-of-care simulation training.

- Key aspects of patient safety can be identified
- Allows for actual teams to learn together in their usual working environment
- Allows for testing of logistics and systems
- Multidisciplinary team integration and training relevant to the workplace
- Enables the discovery of latent safety issues
- Identifies “system and process” errors in situ
- Time effective (takes one hour for scenario and debrief)
- Increases staff engagement and motivation

planning and management enables scenarios to be crafted to recreate situations in which swift, accurate management is required to achieve positive patient outcomes. Rehearsing situations increases confidence and skill such that when they are encountered in clinical practice they can be managed calmly and with the experience of detailed rehearsal. SIM improves patient care by developing not only the skill and knowledge of the individual within their particular role, but improves situational awareness required for good team working. Broussard (2008) proposes “simulators provide a safe and effective means of preparing nurses for practice”. The advantages of this style of training are outlined in *Box 1*.

Hypoglycaemia SIM project aims

- To transparently address failings in clinical areas following recent SUIs involving hypoglycaemia.
- Reduce the occurrence of hypoglycaemia-related SUIs.
- Improve management of hypoglycaemia within the Trust.
- Develop a knowledgeable MDT, who could identify, treat and manage hypoglycaemia effectively.

This would be achieved by:

- Prompt recognition of severe hypoglycaemia.
- Correct treatment and management of severe hypoglycaemia as per hospital guidelines.
- Identifying the possible causes for the hypoglycaemic event.
- Appropriate management of diabetes medications during hospital stay.
- Effective MDT working and communication.

Method

Quality improvement cycle

The method utilised the RAID (review, agree, implement and demonstrate) quality improvement model. This was favoured over other quality improvement models as it had successfully been used by the DISN team on a previous educational project (Bull and Veall, 2009). It was therefore a tried and tested method that instilled confidence for assisting the MDT to make quality improvements.

The review stage

This stage generates engagement of staff and stakeholders for commencement of change. The identified stakeholders were the ward managers, governance leads, DISN team and SIM team.

A review of local incident reporting and SUIs identified key failings within the process of the management of hypoglycaemia within the ward setting.

The agree stage

The DISN team met with the SIM team to gain agreement for hypoglycaemia POC training. Following agreement, the hypoglycaemia SIM module was collaboratively written based on the key learning points from one of the recent SUIs. The ward manager and governance lead on the ward where the fatal SUI had occurred agreed that the hypoglycaemia SIM could be delivered to the staff on their ward. This established engagement from all major stakeholders.

The ward manager, SIM team and DISN team agreed on dates for the training. The ward manager took responsibility for advertising the SIM training sessions, ensuring availability of staff, and allocation of bed space.

The implementation stage

The SIM and DISN team provided the POC hypoglycaemia SIM module at the agreed date and time within the ward. The ward team had to respond within real time to the event using the resources available on the ward. It was of paramount importance that the attendees worked cohesively in their usual roles, demonstrating their individual skills and knowledge, team working and communication abilities. Minimal instruction was given to staff during the scenario; the SIM teams role was that of passive observers. This enabled staff to independently make decisions and autonomous care judgments exposing any in situ system and process errors or latent safety issues.

Following the session there was an analysis of learning points with a structured team debrief and discussion, and the provision of feedback. During the debrief a non-judgmental approach was maintained and affirmative language used to raise constructive criticism and ensuing discussion. This promoted reflection and learner transference of

knowledge for application to real clinical situations. Feelings surrounding the SIM experience, performance, and skills and knowledge were explored. This limited exposure to any detrimental consequences arising from participation in the SIM. Analysis of learning points included: the team's response to the event; team communication and working integration; appropriate and timely use of ward and hypoglycaemia resources. This promoted open and interactive discussion in a safe environment to provide feedback for development.

Any obligatory remedial measures were identified with any immediate actions to maintain patient safety implemented (*Table 1*). Any ongoing changes to ward culture or clinical practice required were established. Additionally, all the team members were signposted to further learning resources for consolidation of newly acquired knowledge.

The healthcare professionals involved concluded the SIM by completing anonymised evaluation forms, which incorporated both qualitative and quantitative questions (*Box 2*).

The implementation was challenging at times. Effective communication was key to facilitating the process and ensuring effective learning.

The demonstration stage

This stage included measuring and discussing the improvements in staff knowledge and subsequently patient care. In general, staff who attended POC SIM training identified an improvement in their knowledge and the availability of the correct resources on their wards.

- The completed anonymised evaluation forms were reviewed and analysed demonstrating very favourable outcomes (*Figure 2*, overleaf).
- A post-SIM report was formulated and sent to the ward manager and medical governance lead, copying in the DISN team. This was also disseminated within the organisation's governance structure. The governance lead and SIM team liaised with the ward manager to ensure the report had been actioned and this was then formally reported back to the Trust governance board via an action grid.
- The numbers of mis-managed hypoglycaemia incidents on the ward where the SUI had occurred post-POC SIM was revisited and

Table 1. Significant issues highlighted by the POC SIM training and the action taken.

Risk	Action
No glucagon stored in a fridge on the ward.	<ol style="list-style-type: none"> 1. Immediate discussion with nurse in charge of ward. 2. Glucagon obtained from pharmacy. 3. Daily "top-up" arranged. 4. "Glucagon in Fridge" stickers sent to all wards throughout the Trust to include in their Hypoglycaemia boxes.
Poor knowledge of Hypoglycaemia boxes and relevant guidelines.	<ol style="list-style-type: none"> 1 Direct discussion of the Hypoglycaemia box guidelines with staff. 2. Repeat dissemination of the hypoglycaemia guideline. 3. Ward staff to sign that they have read and understood guideline.
Poor knowledge among staff in relation to drawing up intravenous glucose.	<ol style="list-style-type: none"> 1. Individuals (both medical and nursing) advised of the competency framework for the administration of injectable medicines. 2. Learning and development meeting with the Ward Manager

POC SIM=point-of-care simulation training.

Box 2. Post simulation feedback/evaluation.

- Q1: How are you currently feeling on the scale of 1–10? (1=Found this a negative experience and didn't enjoy it all; 10=Positive learning environment and enjoyed it).
- Q2: (Point-of-care [POC] feedback only). Doing a simulation session in my clinical environment enhanced the 'realism' and was more valuable than doing it in a simulation suite. 1=Disagree to 10=Agree.
- Q3: Do you think that this simulation session has improved your clinical ability in any way? (1=I do not feel that this session has added anything useful to 10= I feel certain that it improved my clinical ability).
- Q4: How would you rate this session overall? (1=Very poor to 10=Excellent).
- Q5: After this session I am likely to modify my practise (1=Very unlikely to change practise to 10=Very likely to change practise).
- Q6: (POC feedback only) Working in a simulated environment with different members of the multidisciplinary team is valuable. Circle to what extent you agree with this (1=Disagree to 10=Agree)
- Q7: Did you feel comfortable within the simulated environment or did you feel under pressure? (1=I felt under pressure, it was like a test of my ability to 10=I felt comfortable and well supported; this was for my development).
- Free text comments

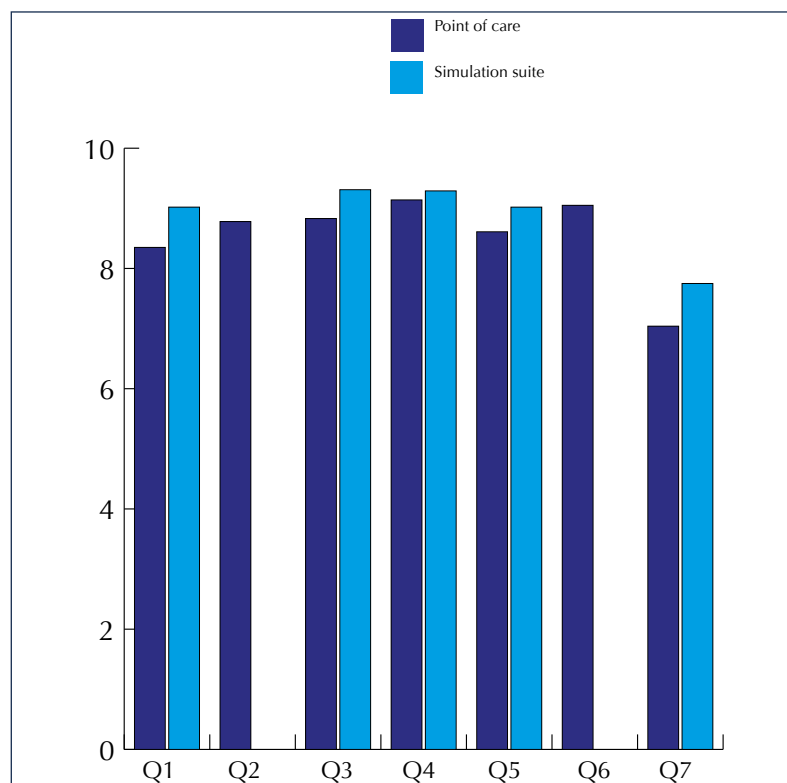


Figure 2. Average feedback question scores for simulation training according to location.

compared to the baseline numbers pre-POC SIM for a comparison. This had reduced by 100%.

- Anecdotal evidence of correct hypoglycaemia management obtained from DISN patient clinical reviews on the project ward, along with verbal feedback from staff verified that hypoglycaemia knowledge and confidence after attending the SIM had increased and improved.

Following the success of the initial POC project, the Trust decided to develop a rolling hypoglycaemia SIM training programme. The aim was to deliver improved quality of inpatient care for adults with diabetes in hospital trust wide.

Hypoglycaemia SIM training was then introduced into:

1. Junior doctor training
2. Degree module for nurses in care of the critically ill patient.
3. Registered nurse preceptees training programme.
4. Surgical directorate SIM rolling programme.
5. Available on request to individual wards and departments following a training needs analysis

6. DISN recommendation from identification via incident reports and through real-time incidences of severe hypoglycaemia.

Formal evaluation and success of the rolling programme was undertaken after one year.

Analysis

During the period of delivery, 60% of hypoglycaemia SIM training was delivered at POC rather than in the SIM suite. POC SIM was delivered to MDTs, the majority of which were nurses (66%); healthcare assistants, medical staff and allied healthcare professionals made up the remaining 34%.

A local audit of incidents and SUIs was undertaken to demonstrate outcomes. The recent National Diabetes Audit was also analysed. The results showed:

- 100% reduction in hypoglycaemia incidents seen on the pilot ward, and a 64% reduction in hypoglycaemia incidences and 100% reduction of SUIs throughout the Trust.
- Comparing our hospital data on hypoglycaemia to the national average in 2016, we can demonstrate below average incidents of mild hypoglycaemia at 12.3% (national average 18.5%; National Diabetes Inpatient Audit [NaDIA], 2017).
- Patients reporting they were “satisfied” or “very satisfied” with the overall care of their diabetes while in hospital was above the national average by 6% (NaDIA, 2017). Increased knowledge of staff and correct management of diabetes requirements would have been integral to this response.
- Continued analysis of feedback received post-SIM training illustrates ongoing positive learning outcomes and experiences across seven evaluation questions. Average score of 9/10 (Figure 3).

Sustainability and replication

Hypoglycaemia SIM training at our Trust has been ongoing for three consecutive years and has been embedded into a rolling programme. Working in partnership with the SIM team enabled us to up-skill and empower a readily available and funded resource. This enabled the SIM team to feel confident in their ability to deliver the hypoglycaemia module in times of a DISN absence.

Working from a detailed scripted scenario, they can deliver the training and impart the key messages. Questions raised outside of their knowledge are forwarded on to the DISN team to address.

DISN attendance is not essential but advantageous. This flexibility is helpful given DISNs increasing workloads and the inpatient diabetes prevalence. The hypoglycaemia SIM is adaptable to suit each ward speciality. This customises the module, making it tangible and transferable. Additionally, POC SIM is not exclusive to hypoglycaemia training and can be applied to other diabetes-related emergencies, such as diabetic ketoacidosis. Ongoing formative and summative assessment via the aforementioned evaluation tools will evidence the sustainability of the hypoglycaemia SIM programme in the long term.

Other specialist teams in our Trust who have found current training methods to be ineffective have expressed an interest in working with the DISN team to facilitate development of their own specialist area SIM.

Ipswich Hospital NHS Trust have already replicated our hypoglycaemia SIM training following consultation with us. They have chosen to undertake a slightly different approach, with the recording of their hypoglycaemia SIM training to produce a DVD/internet teaching aid. This has since been rolled out successfully with their Trust.

Conclusion

SIM training is a certified educational method used worldwide by a variety of professions. POC SIM further develops the SIM suite training by allowing on-ward training. MDT training at the POC offers insight into how the MDT operates, as well as into the functionality of the clinical area. Crucially it allows changes to practice be made before a “real life” situation occurs.

Using state-of-the-art SIM mannequins and equipment is not crucial for this training to be successful. Role play or resuscitation mannequins with a narrator could be used in its place.

The success of POC SIM lies with its ability to tease out inherent latent safety and human factor issues via interrogation of the environment and available resources, team working and communication skills. A hypoglycaemia emergency can occur at any time and place. With bed space

being at a premium, SIM training can be conducted in bathrooms, corridors and patient/staff day rooms. It is feasible that staff could encounter such a situation and adds to the realism of the scenario while allowing POC training to still be delivered in today's pressured climate. Other healthcare, voluntary and patient organisations could adopt this more cost effective approach.

Hypoglycaemia SIM POC training is a positive addition in the education of healthcare professionals. It is an innovative training tool and was received exceptionally well demonstrating favourable outcomes. The reduction of hypoglycaemia events following its introduction in our Trust will have a positive impact on risk of diabetes inpatient mortality and a decrease length of stay in hospital. All have obvious advantages for diabetes inpatient care and improved organisational productivity. ■

Acknowledgements

We would like to thank Steve Harris, Simulation Specialist Practitioner and The Simulation Team at the Royal Cornwall Hospital NHS Trust, and Karen Palmer, Scientific Advisor Diabetes at Sanofi UK for their valued assistance throughout this project.

Bristol Medical Simulation Centre (2017) *Training the trainers*. BMSC, Bristol. Available at: www.bmsc.co.uk (accessed 25.01.18)

Broussard L (2008) Simulation-based learning. How simulators help nurses improve clinical skills and preserve patient safety. *Nurs Womens Health* **12**: 521–4

Bull K, Veall, A (2009) Developing a diabetes link-nurse programme using the RAID quality improvement model. *Journal of Diabetes Nursing* **13**: 298–304

Cook D, Hatala R, Brydges R et al (2011) Technology-enhanced simulation for health professions education - A systematic review and meta-analysis. *JAMA* **306**: 978–88

Curkendall SM, Natoli JL, Alexander CM et al (2009) Economic and clinical impact of inpatient diabetic hypoglycemia. *Endocr Pract* **15**: 302–12

Department of Health (2011) *A framework for technology enhanced learning*. DoH, London. Available at: <https://is.gd/LOpvsT> (accessed 25.01.18)

Donaldson L (2009) *Safer medical practice: machines, manikins and polo mints*. In: Donaldson L (ed) *150 Years of the Annual Report of the Chief Medical Officer: On the state of the public health 2008*. DoH, London, UK: 49–55

Francis R (2013) *Report of the Mid Staffordshire NHS Foundation Trust*. The Stationary Office, London.

General Medical Council (2011) *The trainee doctor*. GMC, London. Available at: <https://is.gd/xBRrc> (accessed 25.01.18)

NHS Digital (2016) *National Diabetes Inpatient Audit* (2016) NHS Digital, Leeds. Available at: <https://is.gd/RRrCQA> (accessed 25.01.18)

“Using state-of-the-art simulation mannequins and equipment is not crucial for this training to be successful. Role play or resuscitation mannequins with a narrator could be used in its place.”

Authors

Kim Sleeman is Clinical Nurse Specialist Diabetes' Amanda Davis is Clinical Nurse Specialist Diabetes; Amanda Veall is Lead Clinical Nurse Specialist Diabetes. All at Cornwall Partnership Foundation Trust Diabetes Inpatient team. Royal Cornwall Hospital, Truro, Cornwall.