The DEVICE Study

Diabetes Emergencies: Virtual Interactive Clinical Education

NHS England

Dr Ben Atkinson – Consultant in Emergency Medicine[1], Dr Mayank Patel – Consultant in Diabetes & Endocrinology[2], Ana Flores – Trainee Emergency Medicine Advanced Clinical Practitioner[1], Sarah Goyder-Shanks - Trainee Emergency Medicine Advanced Clinical Practitioner[1], Maj. Tom Barnes – Staff Grade in Emergency Medicine[1], Prof. Partha Kar – Consultant in Diabetes & Endocrinology[1]

[1]Queen Alexandra Hospital, Portsmouth Hospitals NHS Trust
[2]University Hospital Southampton Foundation Trust

Background:

Simulation Based Medical Education (SBME) supports the development of competencies in technical skills and human factors (or non-technical skills) for all. SBME is an excellent tool to allow staff prepare for clinical crises that are seen every day in healthcare.

The clinical care of people with diabetes (PWD) of any type is becoming increasingly complex as PWD are living longer with multiple comorbidities and polypharmacy. The TOPDOC Study[1] reported low confidence in the acute management of hyperglycaemic crises by non-diabetes specialist doctors. In addition, the prevalence of Type 1 diabetes is increasing and there is a national awareness of increased risk of Diabetic Ketoacidosis (DKA) in hospital with Type 1 diabetes and specialist diabetes advice may not be readily available for non-specialist staff to call upon to support clinical inpatient diabetes care, particularly out of hours. Since 2017, the National Diabetes Inpatient Audit has estimated that the risk of a patient with type 1 diabetes developing DKA whilst a hospital inpatient is 1 in 25.

"The risk of a patient developing DKA as an inpatient is 1 in 25"

Individuals living with type 1 diabetes have also voiced concern about being admitted to hospital as they worry about staff knowledge of type 1 diabetes. Nationally, the high turnover and number of non-specialist clinical staff make it challenging for specialist diabetes teams to deliver regular diabetes training, to help inform and reduce clinical risk.

Virtual reality (VR) simulation has been used in training successfully in multiple industries. Recently VR technology has been shown to be a viable platform for medical simulation and may provide a means of offering junior doctors a safe training environment in the management of diabetes emergencies without any risk of harm to patients.

Aims:

To explore the feasibility of using VR as a means of delivering effective training in diabetes emergencies for clinicians in training. This will be assessed by measuring confidence in ability to manage clinical scenarios and potential future changes to clinical practice, whilst also being an enjoyable educational experience that trainees want to use regularly. Achieving this would take the trainees to Kirkpatrick Level 3.

Kirkpatrick Levels
1. Impact on **Reaction**
2. Impact on **Learning**
3. Impact on **Behaviour**
4. Impact on **Systems**

Methods:

Clinical project planning was conducted collaboratively, involving 2 senior Diabetes Consultants, a Specialist Registrar in Diabetes, an Emergency Medicine Consultant and a person with type 1 diabetes.

The use of VR as a training tool was enabled through working with Oxford Medical Simulation. They provided the Oculus Rift VR headsets, software and developed the diabetes emergency training scenarios with the clinical project team.

Four diabetes scenarios were created, providing an immersive realistic clinical experience for the user. Novo Nordisk, a pharmaceutical company, provided an educational grant to enable the pilot project to be developed.

Two sites were selected for this pilot - University Hospital Southampton and Queen Alexandra Hospital, Portsmouth. Both sites enrolled junior clinicians (Foundation Year 2 to Core Training 2 and trainee ACPs) currently working in the specialities of Emergency Medicine or Acute Medicine.

The trainees had a pre-brief and orientation with the setup and then went through the diabetes emergency scenarios. The supervising clinician observed the trainees and only offered support if requested.

After the test scenario (DKA) was complete the supervising clinician debriefed the trainee and an electronic feedback evaluation form was emailed to the participant to assess their confidence managing the diabetes emergency before and after use of the VR training tool. The trainees were sent a curriculum mapped certificate for their ePortfolio.

Results:

39 Trainees completed the test scenario all of which had little or no previous experience with VR education or gaming.

100% of trainees deemed these scenarios were suitable for their level and will improve their daily practice. 56% felt that they would use all of what they learned in daily practice. 42% felt they would use more than half of what they learned in their daily practice. One trainee said "….honestly, this was the single most useful learning experience I've had so far in my medical training."

Regarding the knowledge acquired from the VR experience, 72% expected they would use the knowledge within a week, 18% expected they would use the knowledge within the next month and 10% expected they would use the knowledge within the next 3 months.

Before VR the mean trainee confidence in managing DKA (on an 8-point Likert scale) was 3.92 (3.38-4.47). After VR this increased to 5.41 (4.79-6.03) using 95% confidence intervals. The mean confidence increased by 28% after the VR training.

72% of trainees expect to use the knowledge gained within a week at work

28% increase in confidence in managing DKA after using VR

"Honestly, this was the single most useful learning experience I've had so far in my medical training"

Conclusion & Discussion:

An evaluation of the results obtained from this pilot project to date would suggest that VR is a useful and well-liked educational tool for junior trainees which increases their confidence in managing Diabetic Ketoacidosis, taking them to Kirkpatrick level 2. The trainees felt they would use what they had learned in their daily practice in the near future.

Many positive comments were shared by the trainees expressing their preference to this mode of learning over PowerPoint presentations and over eLearning modules. They all recommended the training to others. Although the increase in confidence and trainee experience was excellent, delivering the VR experience is a fairly time-consuming exercise as the trainees use the VR training in series, compared to 8-10 trainees using a small group traditional simulation-based session (being taught concurrently). This VR training does not examine teamwork and systems like other modes of simulation training can, as it focuses mainly on personal clinical knowledge and prioritisation.

All trainees will receive another follow up evaluation survey regarding whether the knowledge gained in the VR pilot has changed their clinical practice and behaviour at work over the 3 months since they participated in the study (taking them to Kirkpatrick Level 3).

Further work is being planned to take this study to a larger group and compare it to standard simulation training or other teaching methods using a crossover trial.

References:
[1] Lack of confidence among trainee doctors in the management of diabetes: the Trainees Own Perception of Delivery of Care (TOPDOC) Diabetes Study George JT et al. Q J Med 2011; 104:761–766

Sim Wessex | ASPiH BELFAST 2019 10th Anniversary | Portsmouth Hospitals NHS — NHS Trust | NHS University Hospital Southampton NHS Foundation Trust | OMS OXFORD MEDICAL SIMULATION | novo nordisk