Received: 26 February 2024 | Accepted: 22 March 2024

DOI: 10.1111/dme.15324

DIABETIC Medicine

COMMENTARY

People with diabetes undergoing surgery: Level of knowledge of fluid prescribing in trainees in diabetes

Ketan Dhatariya[1,2] | **Dileep N. Lobo**[3,4,5]

[1]Elsie Bertram Diabetes Centre, Norfolk & Norwich University Hospitals NHS Foundation Trust, Norwich, UK

[2]Norwich Medical School, University of East Anglia, Norwich, UK

[3]Nottingham Digestive Diseases Centre, Division of Translational Medical Sciences, School of Medicine, Queen's Medical Centre, University of Nottingham, Nottingham, UK

[4]MRC Versus Arthritis Centre for Musculoskeletal Ageing, School of Life Sciences, Queen's Medical Centre, University of Nottingham, Nottingham, UK

[5]Division of Surgery, Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania, USA

Correspondence
Ketan Dhatariya, Elsie Bertram Diabetes Centre, Norfolk & Norwich University Hospitals NHS Foundation Trust, Norwich NR4 7UY, UK.
Email: ketan.dhatariya@nnuh.nhs.uk

KEYWORDS
diabetes mellitus, electrolytes, intravenous fluids, peri-operative, prescribing

1 | INTRODUCTION

Intravenous fluids are the most commonly prescribed drugs in hospitalised patients, yet knowledge of fluid prescribing remains poor.[1–3] We wanted to assess what fluids middle-grade trainees in diabetes would prescribe in four hypothetical surgical inpatients with diabetes.

2 | METHODS

The Diabetes Clinical Update is an annual meeting run by the Association of British Clinical Diabetologists as a 3-day course covering half of the curriculum that trainees need to cover during their higher specialist training. The event has eight workshops and several didactic lectures. One of the workshops held in February 2024 was on peri-operative diabetes care. As part of this workshop, delegates were given four hypothetical scenarios and options on what initial fluid they would prescribe. These scenarios and options for fluid replacement for each scenario are shown in Box 1. In each case, the delegates were asked to select the *most appropriate fluid* to be prescribed for the following 24 h. The most appropriate answers, as deemed by the authors based on current evidence,[4,5] are shown in green.

The Norfolk and Norwich University Hospitals Quality Improvement Department agreed that because this was an exploratory analysis, using hypothetical data and no patient-identifiable materials, no ethical approval was required.

3 | RESULTS

Results were received from all of the 121 delegates, but two were invalid (choosing more than one response per question). Of the remaining 119 responders, 70 (59%) were female. The level of seniority of those returning the questionnaires was, Foundation year 3: $n=1$, Internal Medicine Trainee: $n=4$, Specialist trainee (ST) Year 1: $n=1$, ST3: $n=4$, ST4: $n=37$, ST5: $n=25$, ST6: $n=19$, ST7: $n=17$, Specialty Doctor: $n=1$, Fellow: $n=1$, Consultant: $n=4$, Not stated: $n=5$.

For each scenario, the fluids that trainees chose to prescribe are shown in Figure 1. The most appropriate answers are shown in green.

BOX 1 The four hypothetical scenarios

Scenario 1.

A 68-year-old woman is admitted to hospital with dysarthria and right-sided weakness. She was diagnosed with cerebral infarction and treated by the stroke team. The speech therapist notices that the patient has been choking on her food. The patient is nil by mouth for the next 24 h while awaiting nasogastric feeding.

Her glucose readings done 4 times/day were between 6 and 12 mmol/L for the last 2 weeks, and on admission, her glucose was 10 mmol/L.

Past Medical History (PMH): Type 1 Diabetes Mellitus.

Drug History (DH): Insulin Glargine 30 units od. Insulin Lispro 6–8 units with meals.

On examination.

Clinically euvolaemic.

Heart rate (HR): 78 bpm regular.

Blood pressure (BP): 143/88 mmHg.

Respiratory rate (RR): 18/min.

Body weight: 70 kg.

Investigations (reference range).

Sodium [Na^+]: 141 mmol/L (135–145 mmol/L).

Potassium [K^+]: 4.5 mmol/L (3.5–5.3 mmol/L).

Urea: 8.4 mmol/L (2–8 mmol/L).

Creatinine: 108 μmol/L (45–85 μmol/L).

Glycated haemoglobin (HbA_{1c}): 63 mmol/mol (<42 mmol/mol).

She was started on a variable rate intravenous insulin infusion (VRIII).

Scenario 2.

An 86-year-old man is admitted to the hospital with a fever, cough and shortness of breath. He is diagnosed with community-acquired pneumonia. He is restless, delirious and refusing to eat and drink.

PMH: Type 2 Diabetes Mellitus.

DH: Metformin 500 mg tds. Gliclazide 80 mg bd.

On examination.

HR: 112 bpm regular.

Initial BP: 94/62 mmHg, then 132/78 after 1.5 L Crystalloid. Now clinically euvolaemic.

RR: 30/min.

Sats: 94% on 2 L Nasal Prongs.

Body weight 50 kg.

Investigations.

[Na^+]: 129 mmol/L (135–145 mmol/L).

[K^+]: 4.6 mmol/L (3.5–5.3 mmol/L).

Urea: 11.8 mmol/L (2–8 mmol/L).

Creatinine: 148 μmol/L (45–85 μmol/L).

Random plasma glucose on admission was 25 mmol/L (3.5–6.0 mmol/L).

HbA_{1c}: 72 mmol/mol (<42 mmol/mol).

Scenario 3.

A 77-year-old female cyclist is admitted to the orthopaedic ward after being injured in a road traffic collision. She received initial fluid resuscitation and analgesia before transfer to the ward. The patient is nil by mouth for the next 24 h whilst awaiting a femoral fixation.

Her daily glucose reading had been between 6 and 10 for the last few days on her glucose meter. On admission, it was 15 mmol/L.

PMH: Type 2 Diabetes Mellitus.

DH: Metformin 500 mg bd. Sitagliptin 100 mg od.

On examination.

HR: 92 bpm regular.

BP: 88/64 mmHg, then 140/86 after 1.5 L Crystalloid. Now clinically euvolaemic.

RR: 26/min.

Sats: 96% on 2 L Nasal Prongs.

Body weight 70 kg.

Investigations.

Haemoglobin 118 g/L.

$[Na^+]$: 135 mmol/L (135–145 mmol/L).

$[K^+]$: 4.1 mmol/L (3.5–5.3 mmol/L).

Urea: 7.8 mmol/L (2–8 mmol/L).

Creatinine: 103 μmol/L (45–85 μmol/L).

HbA1c: 58 mmol/mol (<42 mmol/mol).

Scenario 4.

A 58-year-old man is in the surgical ward after undergoing a right hemicolectomy 2 days previously, but his recovery has been hindered by post-operative ileus, with severe nausea and vomiting despite intravenous anti-emetics. The surgical team had inserted a nasogastric tube. His glucose on that day was 5.5 mmol/L.

PMH: Type 2 Diabetes Mellitus.

DH: Metformin 500 mg bd. Anti-emetic drugs are given parenterally.

On examination.

He was clinically hypovolaemic.

HR: 88 bpm regular.

BP: 122/72 mmHg.

RR: 24/min.

Body weight 70 kg.

Investigations.

$[Na^+]$: 129 mmol/L (135–145 mmol/L).

$[K^+]$: 3.4 mmol/L (3.5–5.3 mmol/L).

Urea: 14.8 mmol/L (2–8 mmol/L).

Creatinine: 152 μmol/L (45–85 μmol/L).

HbA1c: 60 mmol/mol (<42 mmol/mol).

The fluid replacement options (asked to choose one only for each scenario) were;

1. 0.18% saline and 4% dextrose.
2. 0.45% saline and 4% dextrose.
3. 0.9% saline.
4. 5% dextrose.
5. 10% dextrose.
6. Hartmann's Solution or Ringer's Lactate.

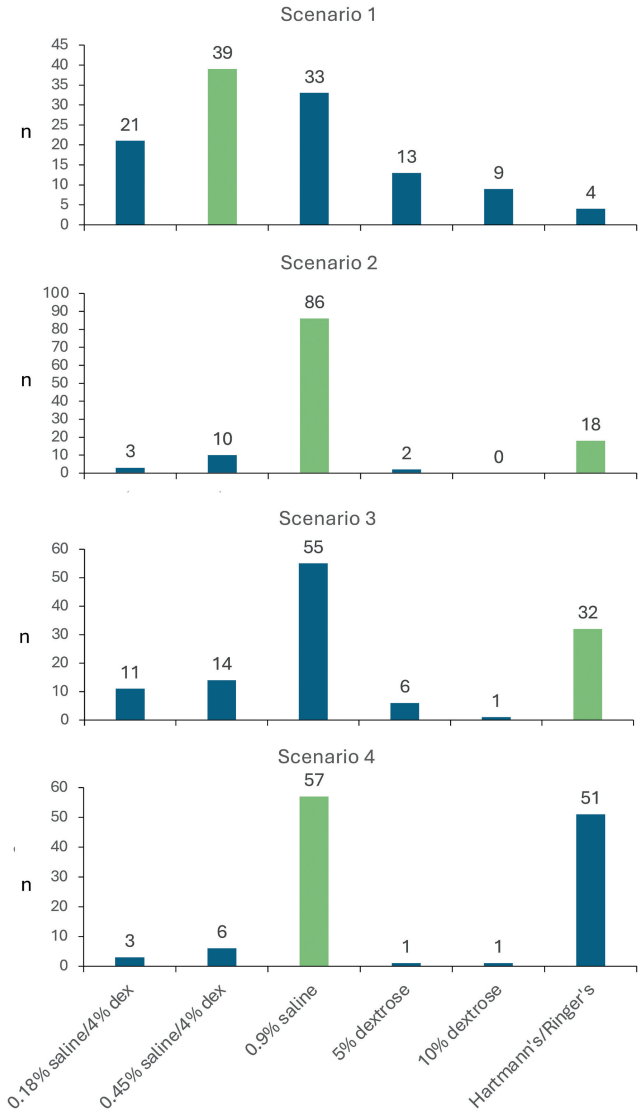

FIGURE 1 Proportion of people choosing fluids in each scenario. The green bars depict what the authors believe to be the most appropriate evidence-based answer(s).

4 | DISCUSSION

This study has found that for three out of the four scenarios, the fluid of choice was most often chosen by delegates. In addition, even though the correct fluid was chosen by the majority in those three scenarios, there remained a large proportion who chose a variety of other fluids, suggesting that there remain gaps in their knowledge of fluid prescribing.

Fluid prescribing is most commonly done by the most junior members of the team and is often dependent on the preferences of the more senior staff, regardless of their own level of knowledge.[1,6,7] The correct answers advocated by the authors are based on the recommendations from several organisations including the Joint British Diabetes Societies for Inpatient Care, the Centre for Peri-operative Care, the Advanced Trauma Life Support course and guidance from the National Institute for Health and Care Excellence.[5,8,9] Based on these data, the level of knowledge about fluid prescribing among middle grades remains variable, with inconsistent levels of knowledge and with prescribing not in accordance with the current recommendations. The most likely explanations for this are likely to be suboptimal education because fluid prescribing is not given as much attention as the prescribing of other drugs and lack of awareness of the guidance. Thus, we advocate for more formal education on fluid prescribing to be part of the undergraduate and postgraduate curriculum.

AUTHOR CONTRIBUTIONS

KD and DNL developed the initial idea for the manuscript. Both authors critically reviewed and revised the manuscript for important intellectual content. Both authors read, amended and approved the final manuscript. No AI was used in the writing of this manuscript.

ACKNOWLEDGEMENTS

None. The authors accept that there was no PPI representation in the writing of this manuscript.

FUNDING INFORMATION

None.

CONFLICT OF INTEREST STATEMENT

The authors have no financial interests that impact their responsibilities towards the scientific value or potential publishing activities associated with the study. DNL has received an unrestricted educational grant and speakers honoraria from Abbott, Corza and Nestlé for unrelated work.

DATA AVAILABILITY STATEMENT

The data sets generated and/or analysed during the current study will be made available from the corresponding author on reasonable request, provided appropriate credit is attributed to the original authors and the data source.

ETHICS STATEMENT

Did not require ethical approval, and no patient-identifiable information was included.

ORCID

Ketan Dhatariya https://orcid.org/0000-0003-3619-9579
Dileep N. Lobo https://orcid.org/0000-0003-1187-5796

REFERENCES

1. Lobo DN, Dube MG, Neal KR, Simpson J, Rowlands BJ, Allison SP. Problems with solutions: drowning in the brine of an inadequate knowledge base. *Clin Nutr*. 2001;20:125-130.

2. Leach R, Crichton S, Morton N, Leach M, Ostermann M. Fluid management knowledge in hospital physicians: 'Greenshoots' of improvement but still a cause for concern. *Clin Med*. 2020;20:e26-e31.
3. Ramsay G, Baggaley A, Vaughan Shaw PG, et al. Variability in the prescribing of intravenous fluids: a cross sectional multicentre analysis of clinical practice. *Int J Surg*. 2018;51:199-204.
4. Sampson M, Jones C. Joint British diabetes societies for inpatient care: clinical guidelines and improving inpatient diabetes care. *Diabet Med*. 2018;35:988-991.
5. *ATLS® Advanced Trauma Life Support® Student Course Manual*. 10th ed. American College of Surgeons Committee on Trauma; 2018.
6. Lobo DN, Dube MG, Neal KR, Allison SP, Rowlands BJ. Perioperative fluid and electrolyte management: a survey of consultant surgeons in the UK. *Ann R Coll Surg Engl*. 2002;84:156-160.
7. Callum KG, Gray AJ, Hoile RW, et al. *Extremes of Age: The 1999 Report of the National Confidential Enquiry into Perioperative Deaths*. National Confidential Enquiry into Perioperative Death; 1999.
8. Ayman G, Dhatariya K, Dhesi J, et al. Guideline for perioperative care for people with diabetes mellitus undergoing elective and emergency surgery. 2022 Accessed March 20, 2024. https://cpoc.org.uk/sites/cpoc/files/documents/2022-12/CPOC-Diabetes-Guideline-Updated2022.pdf
9. National Institute for Health and Care Excellence. Intravenous fluid therapy in adults in hospital. Clinical guideline CG174. 2017 Accessed March 20, 2024. https://www.nice.org.uk/guidance/cg174

How to cite this article: Dhatariya K, Lobo DN. People with diabetes undergoing surgery: Level of knowledge of fluid prescribing in trainees in diabetes. *Diabet Med*. 2024;41:e15324. doi:10.1111/dme.15324