Ambulance clinicians may rely on non-specific clinical signs and symptoms for diabetic ketoacidosis (DKA) recognition and management. The feasibility research study, KARMA2 (NCT04940897), explored whether ambulance clinicians could reliably and safely identify DKA using capillary blood ketone meters and commence fluid therapy (0.9% saline) in accordance with the study protocol. One aim of this study was to understand the experiences of ambulance and hospital clinicians regarding ambulance hyperglycaemia care and impacts of blood ketone meter use.

Methods

During May to September 2022, twenty online, semi-structured qualitative interviews were carried out with emergency care staff involved with the KARMA2 study: a convenience sample was obtained comprising 10 paramedic and non-paramedic KARMA2 participants from the East of England Ambulance Service and 10 Emergency Department (ED) doctors and nursing staff employed at study partner hospitals. Following transcription, interviews were analysed using an inductive thematic approach.

Results

Ten key themes were identified (Ambulance clinicians: Participants 1 – 10; ED clinicians: Participants 11 – 20):

1. **Diabetes education**
   - There is scope for improved ambulance hyperglycaemia education: ‘sick day rules’ and euglycaemic DKA
   - ‘I’m embarrassed to say I was not aware of sick day rules…’
   - Participant 3
   - ‘I had heard of [euglycaemia DKA], but it’s not something I would have been very aware…’
   - Participant 2

2. **Patient engagement**
   - Patient feedback indicated they felt positively about ambulance ketone meter use
   - ‘…all of the patients have been very receptive… But actually, everybody has been very positive about it. I’ve been to some patients who have their own ketone meters anyway, and these patients are very happy that that’s something that we’re considering including.’
   - Participant 2
   - ‘…it’s been really good to have conversations with patients, especially Type 2 diabetics, about ketones, which is something they might not know.’
   - Participant 8

3. **Hospital diagnosis and care**
   - Ambulance ketone assessment and pre-alert messaging can expedite hospital DKA management
   - ‘That information [blood ketones] will change a lot of things. …Number one will be where to put this patient, the space. …If I know the ketones are high, they go to Resus. It’s clear cut DKA, initiate fluids, which could easily done in the back of the ambulance,…and getting the patients straight to Resus, bypassing the ambulance assessment…’
   - Participant 15

4. **Prioritisation of fluid therapy**
   - Paramedic-led cannulation and fluid therapy considered to facilitate DKA care in ED
   - ‘…um, getting that fluid in… does help significantly ‘cos it is all about fluid replacement… The fluids are the first point of our call where we start treatments…’
   - Participant 13
   - ‘…at least if [ketone] reading has already been done and fluids have already been started, it gives us a little bit of time to…organise our…Resus area and get our nurses safer to bring this patient then in… and get their treatment, like their insulin and things started from their [Venous Blood Gas].’
   - Participant 19

Conclusions

- There is scope for improved ambulance clinical care of hyperglycaemia and DKA.
- KARMA2 ambulance clinicians considered capillary blood ketone meters a beneficial diagnostic tool for DKA recognition, commencement of fluid therapy for patients with ‘high-risk DKA’, improved clinical handovers and safety-netting.
- Ambulance hyperglycaemia education should include ‘sick day rules’ and euglycaemic DKA - these were unfamiliar for most ambulance participants.
- ED clinicians considered ambulance blood ketone assessments, ‘high-risk DKA’ pre-alert messaging and pre-hospital fluid therapy opportunities to expedite in-hospital DKA care.
- The findings are supporting a content update to the Joint Royal Colleges Ambulance Liaison Committee Glycaemic Emergencies clinical guidelines.
- Study limitation - Ambulance clinician participants: only those who had used a ketone meter volunteered to participate in a study interview.

Ethical Approvals: Health Research Authority and NHS Research Ethics Committee approvals were obtained. (PDF ID: 302639)

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