

EXPLORING AMBULANCE AND EMERGENCY DEPARTMENT CLINICIAN EXPERIENCES OF CAPILLARY BLOOD KETONE METER USE IN THE AMBULANCE SETTING: SEMI-STRUCTURED INTERVIEWS

KARMA2 

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Background

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):

Patient assessment

Ambulance clinicians reported positive experiences about blood ketone meters

'We've been saying for a long time we need ketone meters on the vehicles... we've really wanted to do ketones because they look unwell...'

Participant 4

'I've loved the [KARMA2] ketone meters... I think it allows us, as pre-hospital clinicians, to make better judgment calls on if we can leave someone at home or if they need to reach out to a GP or whether they need to go to hospital.'

Participant 10

Recognising hyperglycaemia

Ambulance clinicians had inconsistent approaches to determining hyperglycaemia

'...you always associated it with a 'HI' reading on the, on the BM [blood glucose] machine or, you know, reading in the 30s or, or high 20s.'

Participant 6

'[It] is just knowing what's normal for that patient and whether they're outside of what's normal for them and whether their concerns and their family and their carers...'

Participant 2

Current fluid therapy

Ambulance fluids for hyperglycaemia and DKA are non-compliant with JRCALC clinical guidelines

'I would have chosen to use fluids, possibly given them a small bolus [of fluids], depending on the [glucose] reading, probably wouldn't have necessarily looked it up in JRCALC, just given them a little bolus...'

Participant 3

'...if their sugars are reading high, I'd probably treat them with fluids anyway.'

Participant 5

Patient handovers

Inclusion of ketone status was considered informative and beneficial for hospital and primary care handovers

'...it's great to have that information, um, you've got much more of a complete picture.'

Participant 7

'...it would give them another, another nugget of information and it ...will be better, ringing up and saying, 'by the way, do you know Mrs X's blood sugars are 18 today and incidentally the ketones are 1.2 and this is what I've done about it.'

Participant 3

Decision support tool

Ambulance clinicians reported improved clinical decision-making with ketone meter use

'I think it's helped having that discussion with the patient and asking them whether they had been following sick day rules and whether they can... whether they're going to be safe to discharge and whether then it's better to get them somewhere where they can be monitored.'

Participant 2

'...it probably did change my perspective on whether, and whether we should take them to hospital or not.'

Participant 9

Diabetes education

There is scope for improved ambulance hyperglycaemia education: 'sick day rules' and euglycaemic DKA

'I am 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... Probably wouldn't be considering DKA if their blood sugars weren't elevated and stuff. Probably wouldn't have crossed my mind previously.'

Participant 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

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 be easily done in the back of the ambulance, ...and getting the patients straight to Resus, bypassing the ambulance assessment. ...Number two, if the information says that it's not DKA, then we can think about the other places where this patient can, er, go.'

Participant 15

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 levels safer to bring this patient then in ...and get their treatment, like their insulin and things started from their [Venous Blood Gas].'

Participant 19

Barriers to hospital DKA care

Resuscitation bed capacity and nursing staff resources were identified as key barriers

'...if we know that they are ...definite like a DKA, we know that they need to go in, and if that's on a pre-alert, say that gives us 15 minutes or 10 minutes to then juggle things around ...and get patients out where we can and escalate it early, we can then try and get that flow to get the patient in quickly.'

Participant 18

'Gaining access is probably the most helpful, um, because obviously it takes time for us to try and gain access and DKA patients need two points of access.'

Participant 14

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.

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