

# Improving delays in Time to diagnosis and treatment of Diabetic Ketoacidosis (DKA) in Sheffield Emergency Department: A quality improvement project in its second cycle

Narramore R; Willis R; Jepson R; Creagh F; Elliott J  
Sheffield Teaching Hospitals

## Background and Audit Methods

There are 4.7 million people in the UK with Diabetes. Diabetic ketoacidosis is a life-threatening complication. Conventional perception has been that DKA is exclusive to people with Type 1 Diabetes but is increasingly recognised in other patient groups <sup>1</sup>.

In our audit an average of 9 patients a month presented to A&E. Of these 57% were known Type 1, 23% were Type 2 and 20% were first presentation of diabetes. Morbidity and mortality data relating to DKA is sparse. A single Scottish study quotes the absolute rate of death in DKA to be 0.16%, although a single episode of DKA was associated with a 5.2% risk of death increasing to 23.4% in recurrent admissions. This would seem to correlate with clinical practice where recurrent DKA reflects poor compliance often due to issues surrounding mental health and difficulty coping with a long term illness <sup>2</sup>.

Retrospective data was collected for all patients diagnosed with DKA through clinical coding. The trust has a protocol to aid diagnosis and management. This has been produced in line with NICE guidelines.

## Initial Results and Analysis (2017-2018)

Taking initial clinical contact as the start time key steps in diagnosis and management were identified. The main outcome target being treatment commenced within 30 minutes. In the first audit cycle this was exclusively taken from written documentation.

Data was divided into two patient pathways due to significant differences in the presentation and management: direct admission to Resus via pre-alert and Non-Resus (ambulance or walk-in).

Overall outcomes in the Resus patients (n=7) were good with all patients being treated within an hour of admission and half an hour of seeing a clinician. The Non-Resus (n=8) pathway however showed significant variability. Range of time to treatment was 44 to 221 minutes. Generally patients waited at least an hour to see a prescriber and a further hour to receive treatment.

Minutes	Resus	Non-Resus
Prescriber (mean)	16	27
Glucose (median)	9	47
Ketone (median)	18	47
Fluid (median)	20	55
Insulin (median)	25	80

## Morbidity and Mortality in DKA

## Second cycle Interventions

Using the more detailed breakdown of data we were able to further target our interventions. These interventions have now been completed and we are planning a third cycle.

The new interventions remained at no cost and utilised changes already being made within the department.

1. New nursing care bundles were under development for Medical admission pathways. We ensured that within this it was standard for all patients to have blood glucose monitoring at initial assessment.
2. Education has been provided to Reception staff to help them recognise potential DKA and to pre-alert Triage staff.
3. We have also incorporated DKA into the A&E Induction for all medical staff at every rotation.
4. We have incorporated a longer teaching session into the weekly FY1 teaching programme.

## First cycle Interventions and Results (2018-2019)

Through discussion with A&E we identified key issues that we could modify feasibly in a timely fashion at no cost.

- Not all machines were ketone enabled in A&E causing delay in ketone checking and diagnosis
- Education to nursing and medical staff with emphasis on gaining access and commencing intravenous fluids whilst awaiting a Resus bed to commence intravenous insulin.

There were major drawbacks to the audit itself in that it was heavily reliant on written documentation for time points which were often retrospective or approximate. We re-designed the audit accordingly to improve data capture. We used electronic time stamps for blood glucose, VBG and patient transfers.

It is likely that this will have significantly impacted on the data in the second cycle and does limit the conclusions we can draw about their impact. The data seems to show improvements although a few non-resus patients still waited a significant time prior to treatment. The changes in data collection allowed a more detailed breakdown of the areas of delay. This showed that time to diagnosis was the main delay as following this treatment was timely (<30mins).

Minutes	Resus	Non-Resus
Seen by prescriber (mean)	10	16.5
Glucose (median)	0	6.5
Ketone (median)	0	8
Fluid (median)	19	65.5
Insulin (median)	26	59

## Lessons Learnt

1. It is invaluable to have a Diabetes Champion within A&E to understand the barriers to treatment, and how to work within the processes of the department to bring about positive change.
2. To emphasise to clinicians the severity of DKA and to initiate early treatment with a focus on IV access and IV fluids.
3. Interventions around DKA within A&E need to safeguard against missing new diagnosis of diabetes.

## References

1. Gibb FW, Teoh WL, Graham J, Lockman K. Risk of death following admission to a UK hospital with diabetic ketoacidosis. *Diabetologia*. 2016 Jul. 59(110): 2082-2087
2. Diabetes UK. Us, diabetes and a lot of facts and stats. 2019. Available from: [https://www.diabetes.org.uk/resources-s3/2019-02/1362B\\_Facts%20and%20stats%20Update%20Jan%202019\\_LOW%20RES\\_EXTERNAL.pdf](https://www.diabetes.org.uk/resources-s3/2019-02/1362B_Facts%20and%20stats%20Update%20Jan%202019_LOW%20RES_EXTERNAL.pdf)