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Diabetes & its Complications

Implementation of a National Guideline with Local Changes: Does an Abbreviated Adult Diabetic Ketoacidosis (DKA) Protocol Improve Local Uptake and Overall Clinical Care?

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ABSTRACT

Aims: *To evaluate management of diabetic ketoacidosis (DKA) before and after introduction of a new abbreviated trust DKA guidelines in Sandwell and West Birmingham NHS Trust (SWBHT).*

Methods: *Retrospective review of DKA admission case notes using a revised SWBHT DKA guideline (introduced Aug 2015). An audit proforma was used to evaluate each patient's diagnosis, assessment of clinical severity and management of DKA. Out of 55 DKA admissions from May 2015 – Aug 2016, 33 (60%) were reviewed.*

Results: *Mean admission to diagnosis time of DKA fell by 58min (135 to 77 min), admission to initiation of fixed rate intravenous insulin infusion time fell by 106 min (177 to 71 min), admission to initiation of IV normal saline time fell by 18 min (93 to 75 min), time for resolution of DKA improved by 1hr 10min (16.9 to 15.8 hours) and length of stay of DKA admission fell by 4.3 days (7.5 to 3.3 days). There was a 23% and 29% improvement respectively in basal insulin continuation and use of 10% dextrose when BM was <10mmol.*

Junior doctor survey: *20/26 (77%) felt the protocol was helpful, 16/25(64%) found it easier to use and 17/25 (68%) found it made DKA management easier.*

Conclusions: *The overall clinical management of DKA in the trust has improved significantly since the new DKA protocol was introduced including reduction in length of stay and improved user satisfaction. Our revised DKA protocol can be easily adopted nationally.*

Keywords

Adult Diabetic Ketoacidosis, Type 1 diabetes, Insulin, Clinical management.

Introduction

Diabetic ketoacidosis (DKA) is an acute metabolic emergency characterised by hyperglycaemia, acidosis and ketonaemia. This complex metabolic state usually occurs as a consequence of absolute or relative insulin deficiency. It is more common in type 1 diabetes primarily at the time of diagnosis but can develop later on with precipitating factors. Even though there are lots of advances in diabetes care, DKA management still remains a significant clinical problem [1]. Incorrectly managed DKA can potentially lead to fatal complications and emerging data indicate that this is mostly linked to the quality of hospital care [2]. It accounts for 46% of hospital admissions in people with type 1 diabetes in UK [3]. Unless this life threatening condition is treated quickly and efficiently, there is an increased risk of both mortality and morbidity including prolonged length of hospital stay.

In March 2010, the Joint British Diabetes Society (JBDS) published guidelines (subsequently revised in September 2013) on the management of DKA in adults in UK [4,5]. Current national DKA guidance is a long 10 page document which is seldom followed in real life by junior doctors for a variety of reasons including lack of time and the sheer length of the document. Following lengthy consultation with key stakeholders and an initial pilot, we decided to abbreviate this document into 2 pages essentially following the same principles of the national JBDS guidance in Aug 2015. The key idea was to make it into an easy and concise document for junior doctors to consistently follow and thus, improve overall clinical care and safety for those admitted with DKA in Sandwell and West Birmingham Trust (SWBHT). This new guideline has been split into 4 sections starting from the initial admission 0-60 min, 60min-6 hours, 6-12 hours and beyond 12 hours with detailed step wise action plans in each of the sections.

Objectives

Our main objectives thus were:

- To evaluate the management of DKA before and after introduction of the new abbreviated trust DKA protocol in our Trust.
- To identify clinical errors and improve safety and standards of DKA management.

Methods

Sandwell and West Birmingham Hospitals NHS Trust is a large NHS teaching hospitals in UK with a bed base of 850 patients, employs 7,500 people and has 38,000 admissions each year. 1 in 3 admitted patients have diabetes and nearly 20 - 30% of these are insulin treated. We undertook a retrospective review of DKA admissions (May 2015 – Aug 2016) using our new abbreviated DKA guideline (introduced Aug 2015) at City and Sandwell Hospitals, both being part of SWBHT. Data was collected using an audit tool modelled from the standards derived from JBDS DKA guidance [5]. This audit tool covered all the aspects including diagnostic criteria, investigations, management, resolution, timeline and discharge planning during DKA admission. Overall journey of patient (from Accident & Emergency to discharge) was compared before and after the new DKA protocol. Out of 55 DKA admissions, 33 (60%) were reviewed and the remaining excluded due to unavailability of case notes and incorrect diagnosis (Table 1).

Time Period	Total No. of patients coded as DKA	Excluded	Included
May – July 2015	22	8	14
New DKA SWBH Guidelines – Effective from 1st Aug 2015			
Aug – Dec 2015	21	7	14
Jun – Aug 2016	12	7	5
		Total	33

Table 1: Data collection of case notes from May 2015 to Aug 2016.

Biochemical tests and statistics

All the biochemical tests were carried out using standard operating procedures in the biochemical laboratory at SWBHT. This project was logged with trust clinical effectiveness department and coded data on DKA admissions was provided to us by the trust IT department. Data were recorded on Microsoft excel spreadsheet and analysis of data was carried out by using Minitab statistics software.

Results

Before Aug 2015, 4 out of 14 patients (28%) with DKA admission had no basal insulin given along with DKA protocol and 25% did not have 10% Dextrose infusion started when blood glucose fell below 10 mmol (hypoglycaemia). Close to 50% did not complete the old 10 page protocol completely. There was also a case of delayed diagnosis of DKA after initial management as Hyperglycaemic Hyperosmolar State (HHS).

After Aug 2015, there has been a 23% improvement in basal insulin continuation rate when patients are on the DKA pathway and 29% improvements in switching to 10% Dextrose infusion when blood glucose dropped below 10 mmol – these improvements have resulted in earlier resolution of DKA and significantly reduced hypoglycaemia incidence when managing an acute event like DKA.

As a result of improved uptake of this new protocol along and with widespread communication and both medical/nursing staff education and upskilling, there has been a significant increase in quicker & earlier referral to our in-house Think Glucose diabetes specialist team and therefore, better overall clinical care and safe management of DKA [6].

Mean admission to diagnosis time of DKA fell by 58min (135 to 77 min), admission to initiation of fixed rate intravenous insulin infusion time fell by 105 min (177 to 71 min), admission to initiation of IV normal saline time fell by 18 min (93 to 75 min) and time to resolution of DKA improved by 1hr 10min (16.9 to 15.8 hours) (Table 2).

	Before Aug 2015	After Aug 2015	Difference
Admission to diagnosis	135 min (n=13)	77 min (n=32)	Better by 58 min
Admission to FRIII	177 min (n=13)	71.7 min (n=30)	Better by 105.3 min
Admission to Normal saline	93 min (n=13)	74.5 min (n=31)	Better by 18.5 min
Time to resolution	16.9 hours (n=13)	15.8 hours (n=31)	Better by 1.1 hours
Admission to discharge	7.5 days (n=16)	3.3 days (n=32)	Better by 4.3 days

Table 2: DKA audit results of patient's timeline from admission to discharge before and after new DKA protocol (Aug 2015) introduction.

DKA patients spent significantly less time in hospital as length of stay (LoS) has improved by mean 4.3 days, suggestive of not only better but more effective clinical management -resulting in

less risk of hospital acquired infections for inpatients, improved patient experience throughout admission and overall cost savings for the Trust.

User experience: Junior doctor survey: 20/26 (77%) felt the new protocol was helpful, 16/25(64%) found it easier to use and 17/25 (68%) found that it made DKA management much easier.

Conclusion

The overall safety in correct clinical management of DKA in the trust has improved significantly since the new DKA protocol was introduced including reduction in length of stay and much improved user uptake and satisfaction. We have not only been able to identify human errors but also rectified gaps in DKA management through the design of this new abbreviated DKA protocol – this has led to a positive experience for junior doctors who are now confident to use this protocol consistently. We are continuing to audit locally as well as educate junior doctors and new staff on this new protocol through induction sessions, ward teaching and mandatory training. Our revised DKA protocol (still largely based on the original national JBDS guidance) is being currently considered for more widespread national usage and implementation given our excellent transformation and results locally in our Trust.

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