

Nurse Driven Diabetic Ketoacidosis Fluid Titration Protocol Outside the ICU

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Introduction

- Treating diabetic ketoacidosis (DKA) requires careful titration of a 2 bag IV fluid system, continuous insulin delivery, and hourly glucose monitoring.
- Current practice: Nursing notifies provider with blood glucose hourly, receives written order for 2 bag IV fluid rate change.
- At baseline, this process took an average of 16 minutes to complete.
- Our team identified an opportunity to reduce the time between blood glucose collection and fluid rate change.
- Nurse driven fluid titration is common in the ICU, but has not been reported outside the ICU in pediatric literature

SMART aim: Decrease the time from blood glucose to rate adjustment from 16 minutes to <5 minutes within 3 months in pediatric patients in DKA admitted to 12E.

Methods

- A multidisciplinary team was formed: Nursing, Quality, Pediatric Endocrinology, Pediatrics, and Pharmacy
- An RN driven protocol was developed to allow nursing to titrate the rates of the 2 bag system. Insulin was not titrated.
- The focus population was patients with DKA, aged 2-18 years on 1.5x maintenance fluids outside of the ICU. Children with a mixed pictures, concerns for cerebral edema or requiring critical care were excluded.
- Using our existing DKA policy and guideline, a calculator was built into the EMR which identifies the rate change needed based on the nurse entered blood glucose.
- Time to rate change was collected through EMR report, and complications assessed through a unit-based tracking system.

INCLUSION CRITERIA
Pediatric patient (age 2-18 years) with

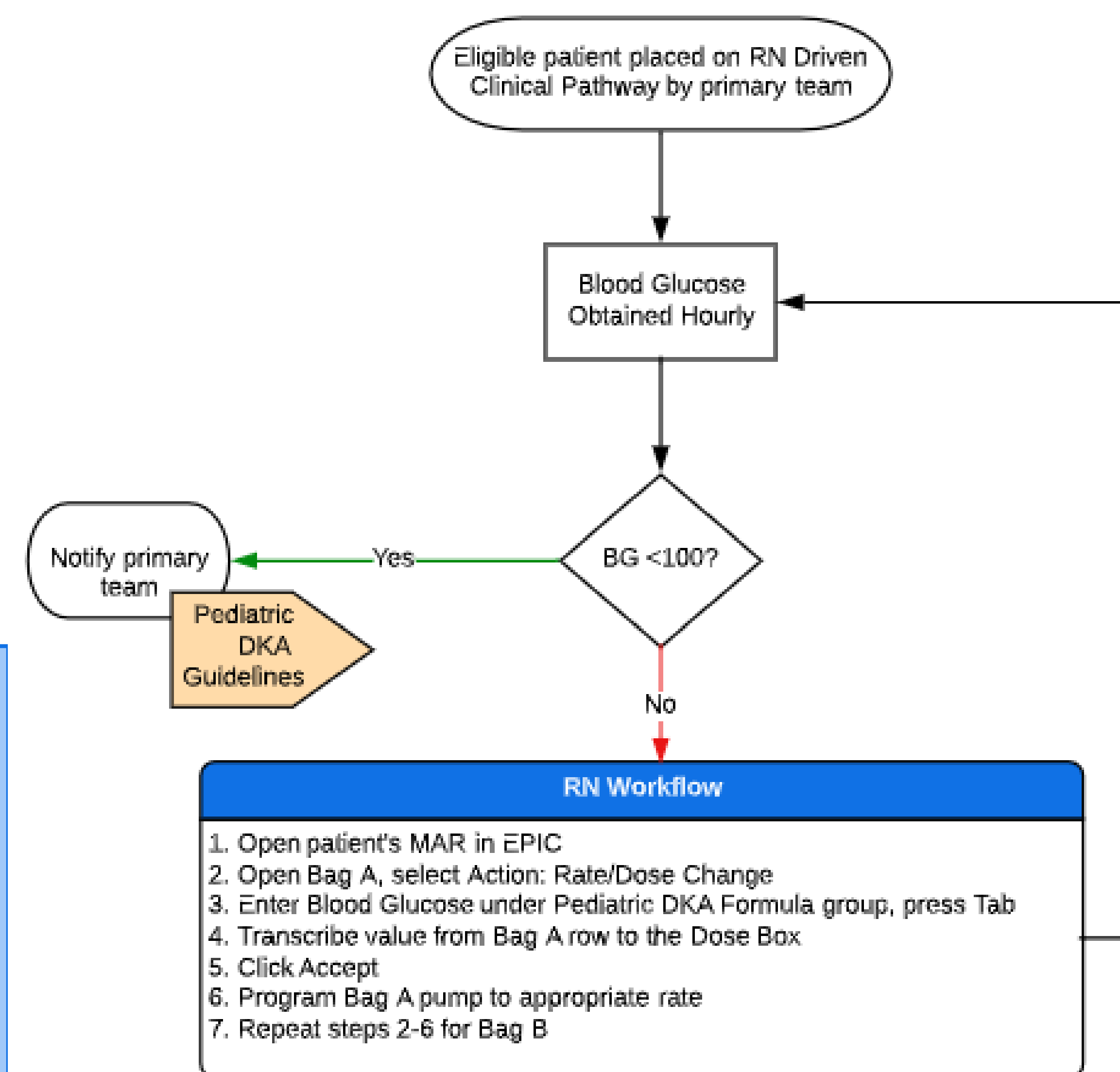
- Primary diagnosis of DKA
- Diabetes Type I
- Admitted to inpatient pediatric medicine
- On 1.5x total maintenance fluids

EXCLUSION CRITERIA

- Age <2 years
- DKA with HHS mixed
- Diabetes Type II
- Presence of severe headache or concern for cerebral edema upon presentation
- On maintenance or 2x maintenance fluids
- Admitted to PICU or in PED

PRIMARY TEAM NOTIFICATIONS:

- BG <100 mg/dL
- BG increase by >50 mg/dL/hour within 1 hour
- BG decrease by >100 mg/dL/hour within 1 hour
- Abrupt decrease in heart rate \geq 20 BMP
- Diastolic BP >90 mmHg
- Insulin infusion interruption for any reason
- Mental status changes, recurrent vomiting, worsening/severe headache, age inappropriate incontinence



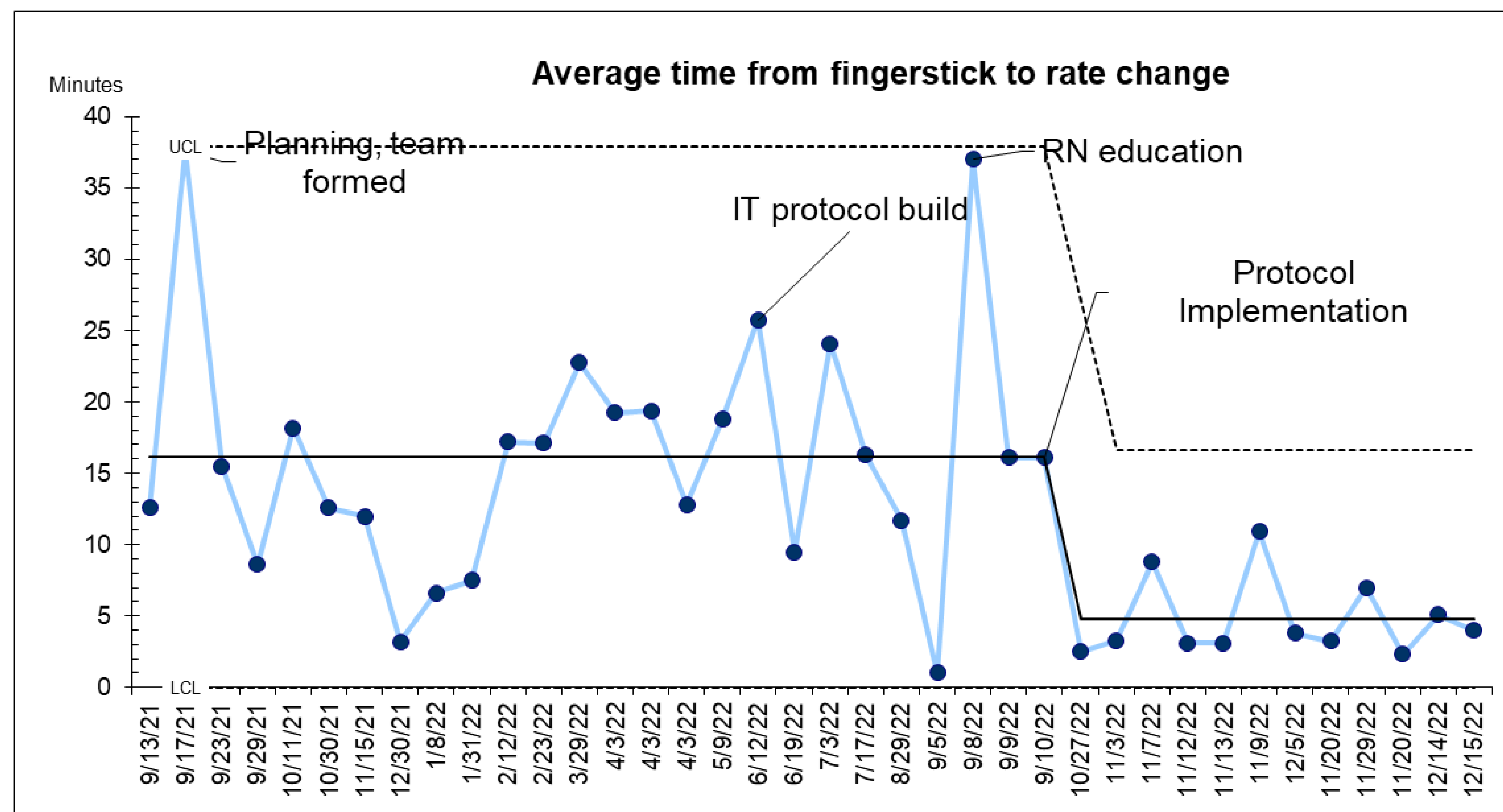
Pediatric DKA Formula

Blood Glucose (mg/dL)

1.5X Maintenance Infusion Rate

NaCl 0.9% base fluid - BAG A

NaCl 0.45% base fluid - BAG B



Results

- Twelve patients have been treated on the protocol with an average time to rate change of 5 minutes.
- No complications have been reported.
- Time on insulin has remained unchanged at 14.4 hours.
- Nursing and residents stated increased satisfaction with the RN driven protocol as care is more efficient.

Discussion

This nurse driven protocol has been effective in streamlining care for our patients with DKA outside of the ICU. Fluid titration has been described in the literature as an ICU based skill, pediatric floor nurses were able to accomplish this easily and achieved improved care for their patients. Using a EMR calculator facilitated safe and efficient care. Providing the RN with the ability to measure the blood glucose hourly and perform the fluid rate adjustment in real-time maximizes the patient time spent on appropriate fluid rates before the next hourly blood glucose collection. Future steps include expanding the protocol to other units and patients with DKA on alternative fluid regimens, as well as assessing other factors that influence time on insulin.

Acknowledgments

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