



Type 1 Diabetes – DKA: What's New?

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Disclosures

- In the last 12 months I have received honoraria, travel or fees for speaking or advisory boards from
 - AstraZeneca
 - Novo Nordisk
 - Boehringer-Ingelheim
 - Eli Lilly
 - Menarini

Management of Hyperglycemic Crises in Patients With Diabetes

First reports of successful DKA treatment – Joslin reports that 31 out of 33 patients with DKA survive – with gentle fluid replacement

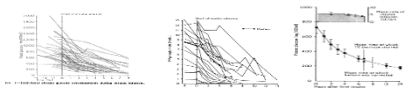


Identification of acetone in the urine

Kaussmaul breathing first described

RD Lawrence advocates very aggressive fluid management

3 consecutive papers in the BMJ showed that low-dose insulin infusions (5–6 units/h) work just as well as high-dose in lowering glucose and ketones



1st ADA consensus on the management of DKA

Euglycemic Diabetic Ketoacidosis: A Potential Complication of Treatment With Sodium–Glucose Cotransporter 2 Inhibition

Reports of SGLT-2i associated DKA

Clinical Trial of Fluid Infusion Rates for Pediatric Diabetic Ketoacidosis
First RCT on fluids in children

ADA consensus document revised



Type 1 diabetes universally fatal

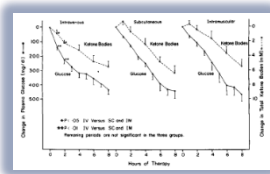


First detailed report of 'diabetic coma'



High dose insulin used - reports reduction in mortality from 12% to 1.6% between 1940 and 1944 using between 500 and 2000 units depending on severity of coma

Rate of fluid administration in children questioned – reports of cerebral oedema
And then in the NEJM



The first UK national guideline for managing DKA published



Call for the ADA criteria to be updated

DKA mortality in adults and children reported at <1% in the USA and other developed nations – although remains up to 30% elsewhere

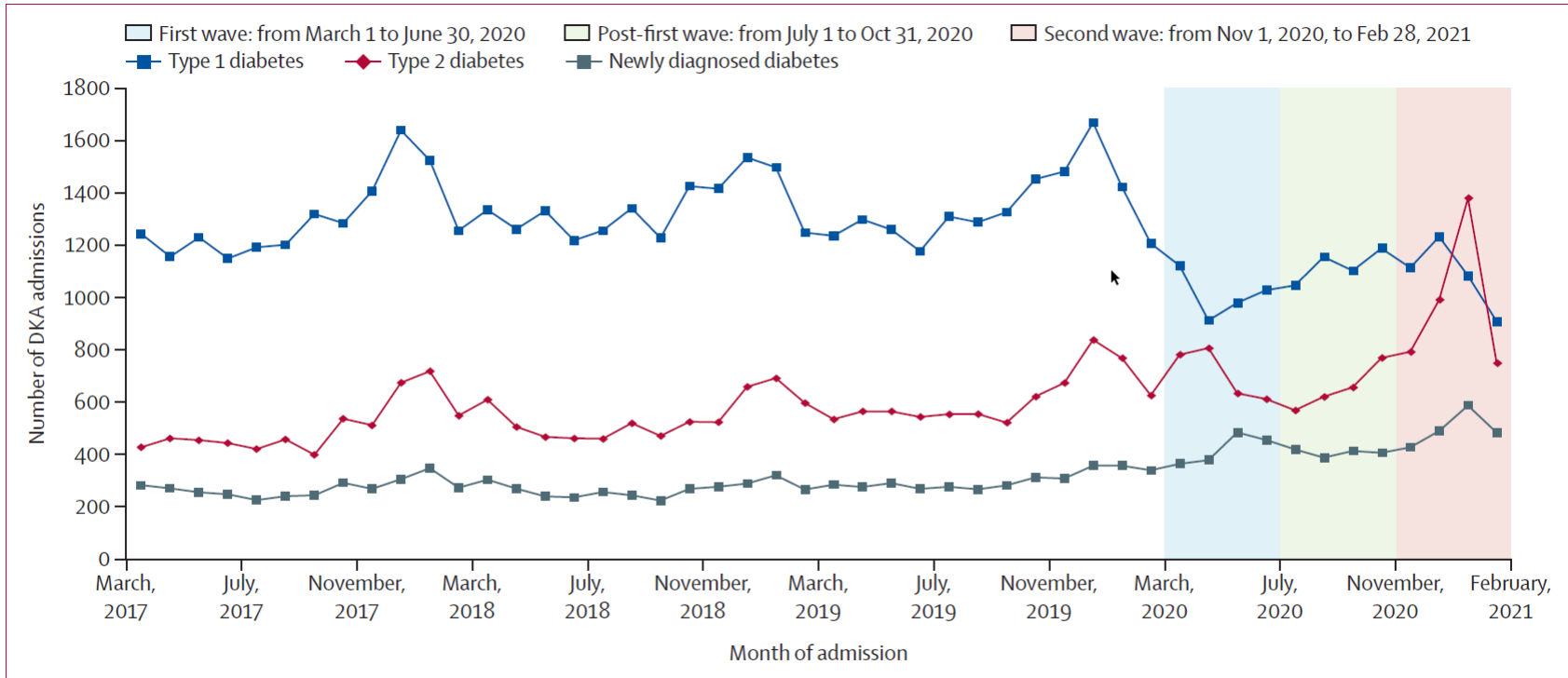
Trends in Diabetic Ketoacidosis Hospitalizations and In-Hospital Mortality – United States, 2000–2014



Revised UK guideline published

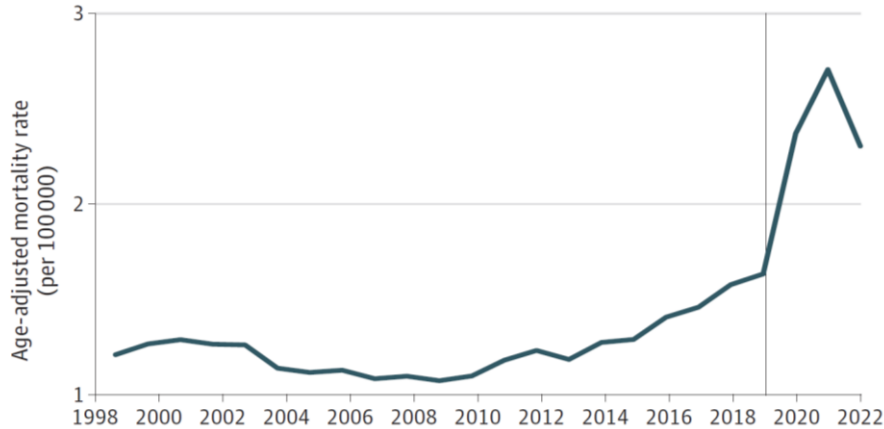
Guidelines for management of diabetic ketoacidosis: time to revise?

Admissions for Hyperglycaemic Crises – UK Data

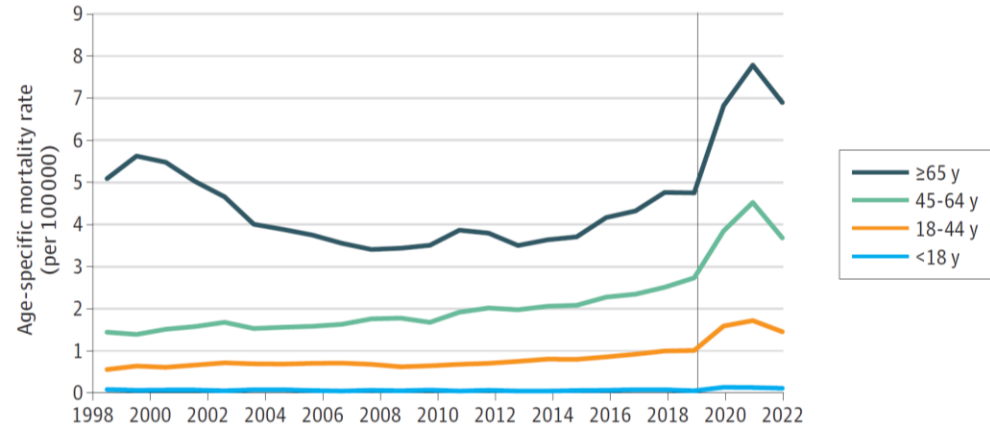


People are Still Dying of Hyperglycaemic Crises

A Age-adjusted mortality rate overall

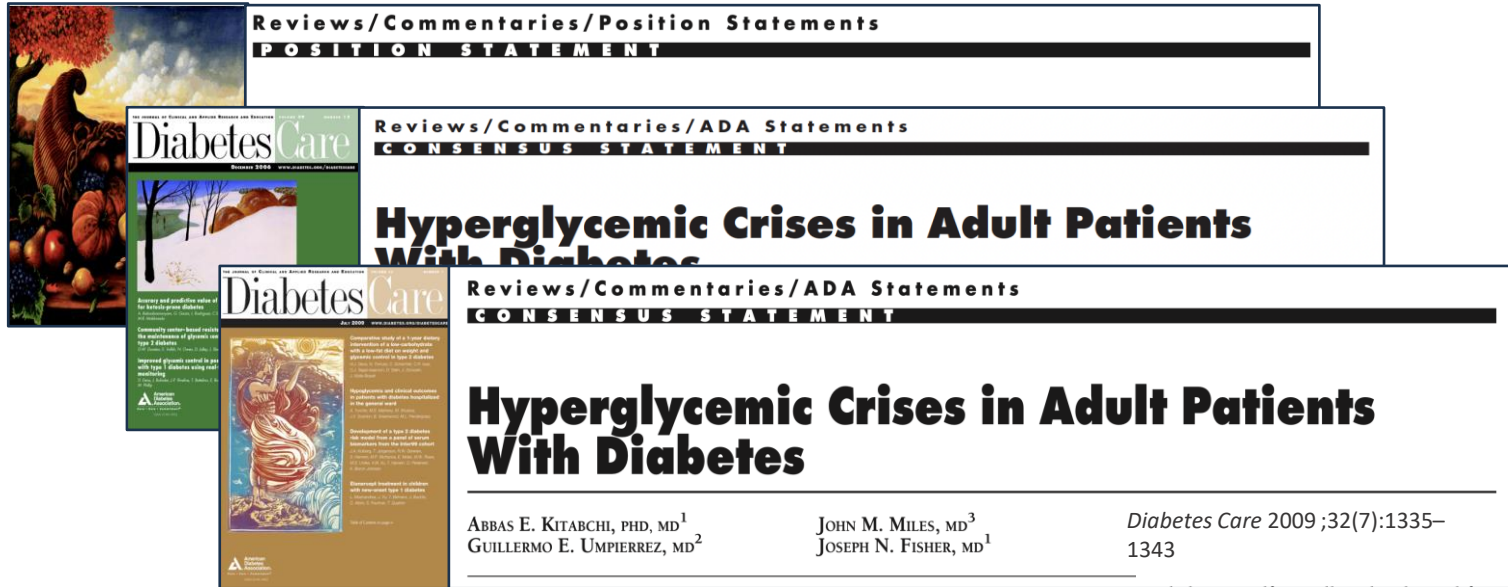


B Age-specific mortality rate by age group



ADA Consensus Statements

- Objective: Update the ADA consensus statement on hyperglycemic crises in adult patients with diabetes, published in 2001 and last updated in 2009



Reviews/Commentaries/Position Statements
POSITION STATEMENT

Reviews/Commentaries/ADA Statements
CONSENSUS STATEMENT

Hyperglycemic Crises in Adult Patients With Diabetes

Reviews/Commentaries/ADA Statements
CONSENSUS STATEMENT

Hyperglycemic Crises in Adult Patients With Diabetes

ABBAS E. KITABCHI, PHD, MD¹
 GUILLERMO E. UMPIERREZ, MD²

JOHN M. MILES, MD³
 JOSEPH N. FISHER, MD¹

Diabetes Care 2009 ;32(7):1335–1343

2023 Consensus Statement



- **Guillermo Umpierrez**, MD, Emory University, Atlanta, Ga
- **Irl Hirsch**, MD, University of Washington, Seattle, WA
- **Rosalina McCoy**, MD, University of Maryland, Baltimore, MD
- **Nuha El-Sayed**, MD, Harvard Medical School, Boston, and American Diabetes Association, Arlington, VA
- **Robert Gabbay**, MD, Harvard Medical School, Boston, and American Diabetes Association, Arlington, VA

EASD

- **Gian Paolo Fadini**, MD, University of Padova, Italy
- **Shivani Misra**, MD,, Imperial College Healthcare NHS Trust, London, UK



- **Georgia Davis**, MD, Emory University, Atlanta, GA

JBDS-IP

- **Ketan K. Dhatariya**, MD, Norfolk and Norwich University Hospitals NHS Foundation Norwich, UK



- **Rodolfo J. Galindo**, MD, University of Miami, Miami, FL
- **David C. Klonoff**, MD, Mills-Peninsula Medical Center, and UCSF, CA

2023 Consensus Statement:

Objective:

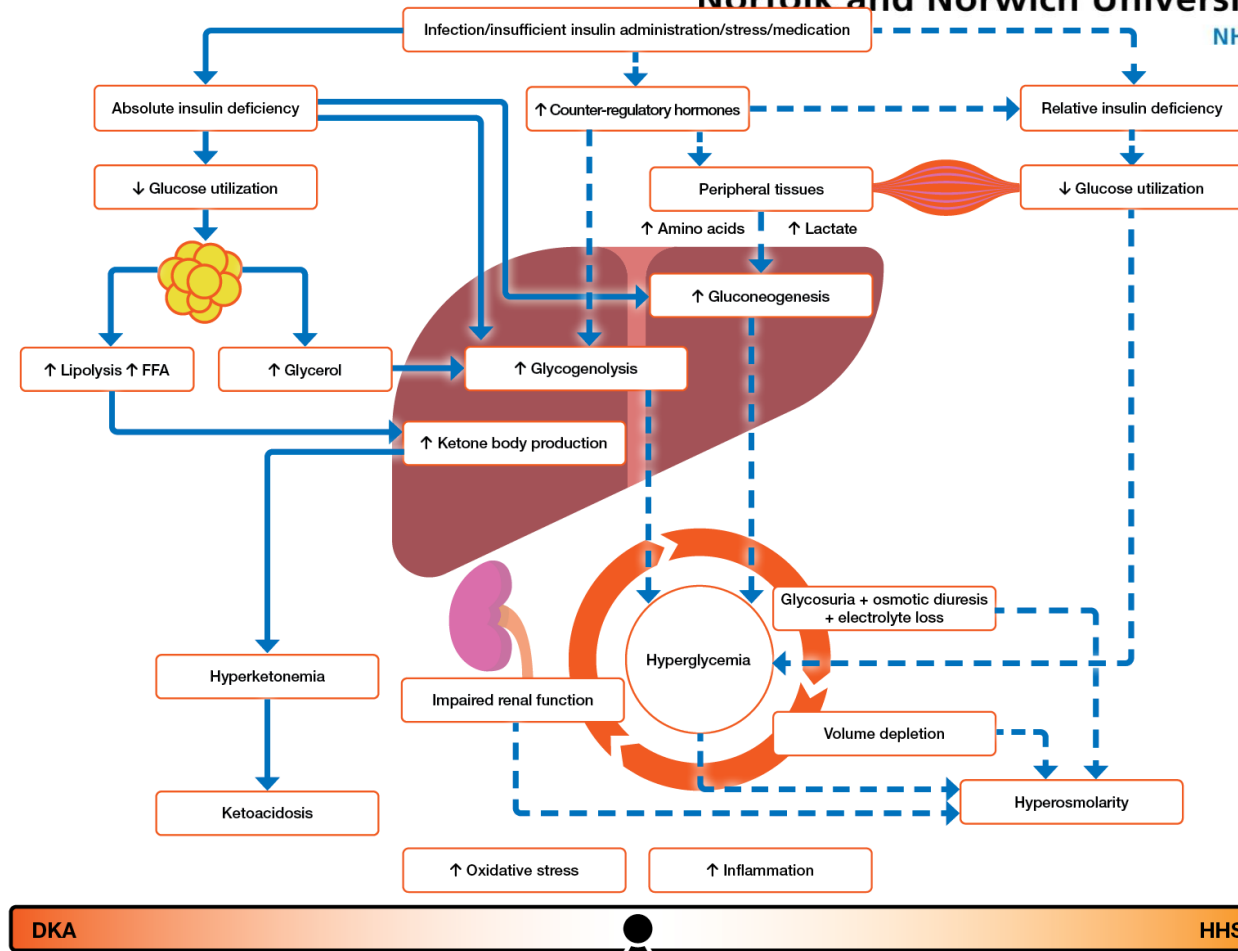
- To provide up-to-date knowledge about the epidemiology, pathophysiology, clinical presentation, and recommendations for the diagnosis, treatment, and prevention of DKA and HHS in adult subjects.
- A systematic examination of publications since 2009 informed new recommendations.

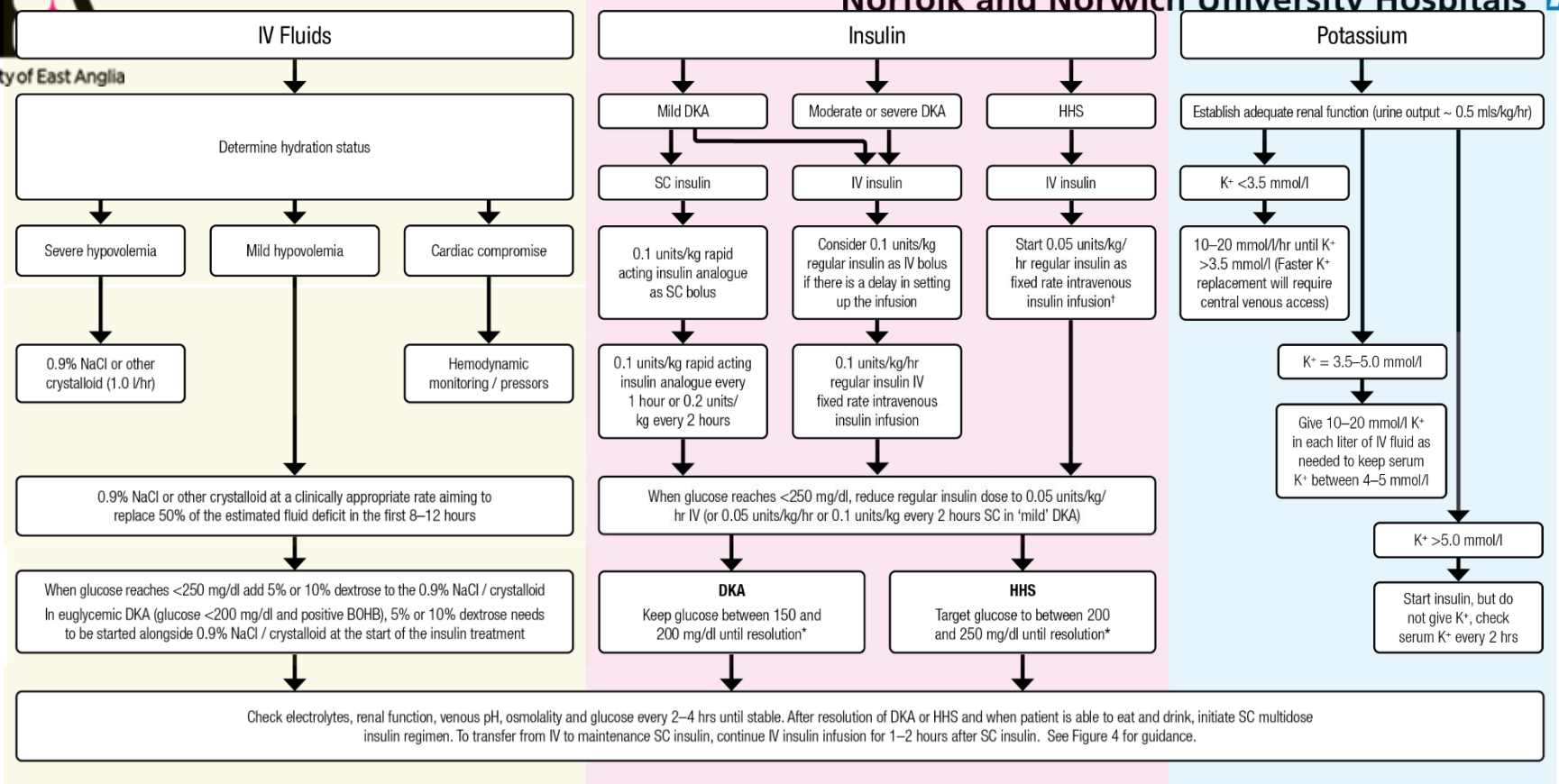
Target audience:

- Full spectrum of healthcare professionals including clinicians, diabetes care teams, diabetes educators, other health care professionals and stakeholders, and individuals with diabetes.

Questions in the Consensus Update

1. What are recent global trends in epidemiology and outcome of hyperglycemic crises?
2. What is the pathogenesis of hyperglycemic crises
3. What are the diagnostic criteria of DKA and HHS?
4. What is the recommended treatment of hyperglycemic crises?
5. What is recommended management after hospital discharge?
6. What are the complications of treatment of hyperglycemic crises?
7. What are specific management recommendations in special populations?
8. What are areas of future research





† Some have recommended that insulin be withheld until glucose has stopped dropping with fluid administration alone - see text.
 * Definitions of resolution (use clinical judgement and do not delay discharge or level of care if these are not met):
 > DKA: Venous pH >7.3 or bicarbonate >18mmol/l and plasma / capillary ketones <0.6 mmol/l
 > HHS: Calculated serum osmolality falls to < 300 mosm/kg and urine output is > 0.5 ml/kg/hr and glucose is < 250 mg/dl

150 mg/dl = 8.3 mmol/l
 200 mg/dl = 11.0 mmol/l
 250 mg/dl = 13.9 mmol/l
 300 mg/dl = 16.6 mmol/l

① Bicarbonate should only be considered if pH is <7.0
 ② Phosphate should not be given unless there is muscle weakness, respiratory compromise and a phosphate <1.0 mmol/l

Lots is Different from the Previous ADA Consensus!

- Change in definition is the main one

| | |
|-----------------------------------|--|
| <u>D</u> iabetes / Hyperglycaemia | Glucose ≥ 200 mg/dl (11.0mmol/l) <u>OR</u> a prior history of diabetes |
| <u>K</u> etosis | β -OHB of ≥ 3.0 mmol/l <u>OR</u> urine ketone strip 2+ or greater |
| Metabolic <u>A</u> cidosis | pH < 7.3 and / or bicarbonate < 18mmol/l |

Anion gap, mental status are much less important, & choice of fluid
 The use of bedside ketone monitoring is recommended

Lots of Unanswered Questions

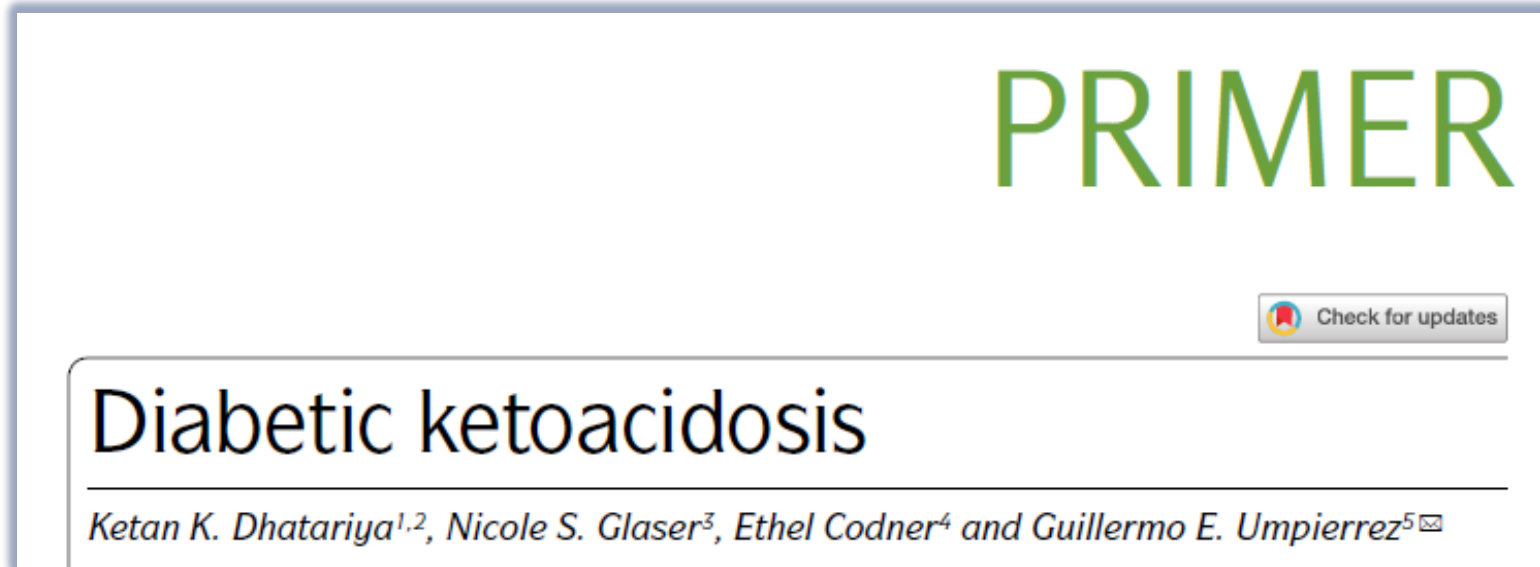
REVIEW

DIABETIC
Medicine

Gaps in our knowledge of managing inpatient dysglycaemia and diabetes in non-critically ill adults: A call for further research

Ketan K. Dhatariya^{1,2}   | Guillermo Umpierrez³

If Anyone is Interested



The image shows the cover of a PRIMER article. The word "PRIMER" is written in large, green, sans-serif capital letters in the top right corner. Below it, on the right side, is a button with a refresh icon and the text "Check for updates". The main title "Diabetic ketoacidosis" is centered in a large, black, sans-serif font. Below the title is a horizontal line, and underneath that line, the authors' names are listed in a smaller, italicized black font: "Ketan K. Dhatariya^{1,2}, Nicole S. Glaser³, Ethel Codner⁴ and Guillermo E. Umpierrez⁵ ✉".



What's New in the 2023 Global Consensus DKA Guidance?

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