Integrating Ketone and Glucose Monitoring for Optimized Diabetes Management

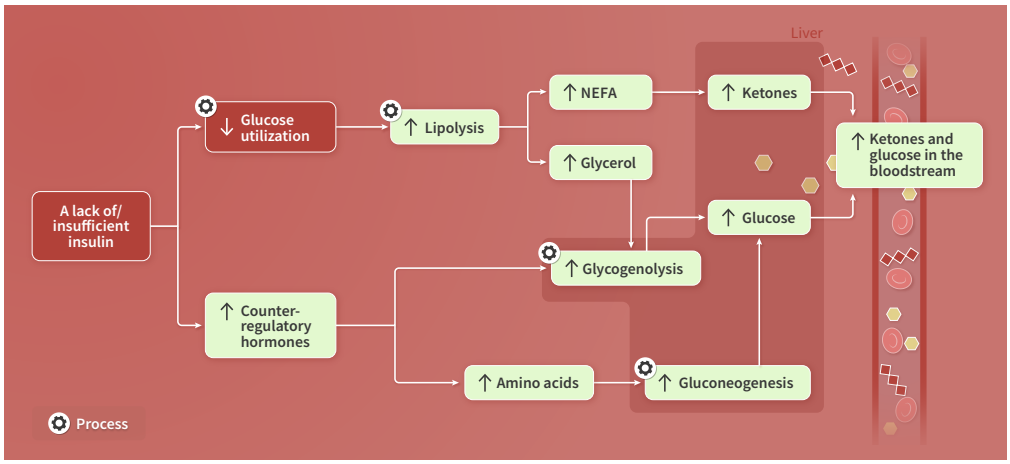
Pathways to Prevention: Understanding the Mechanisms Driving DKA

Unpack the biochemical breakdown and patient-level risks fueling DKA

Over the past decade, the number of adults and children being diagnosed with diabetic ketoacidosis (DKA) has been rising despite advances in treatments for diabetes.[1]

The good news is that DKA is almost entirely preventable, and with improvements in technology and better understanding of the biochemical breakdown and patient-level risks driving DKA, primary care clinicians can play a major role in the early detection and prevention of DKA in both type 1 and type 2 diabetes.

The metabolic processes leading to DKA can be divided into two main categories:[2]



Insulin deficiency and lipolysis – DKA begins when there is insulin deficiency, allowing for uncontrolled lipolysis (the release of free fatty acids, which are immediately converted to ketone bodies), resulting in anion gap acidosis.

- This insulin deficiency can be absolute (e.g., not enough exogenous insulin is given) or relative (e.g., increased insulin needs during illness or stress are not met).
- In addition, due to this insulin deficiency, there is reduced peripheral uptake of glucose and increased endogenous glucose production, resulting in significant increases in blood glucose levels.

Increased counterregulatory hormones – in response to low insulin levels, the body releases counterregulatory hormones (glucagon, catecholamines [epinephrine and norepinephrine], cortisol, and growth hormone), leading to an increase in hepatic glucose production by the liver and less glucose uptake by muscles.

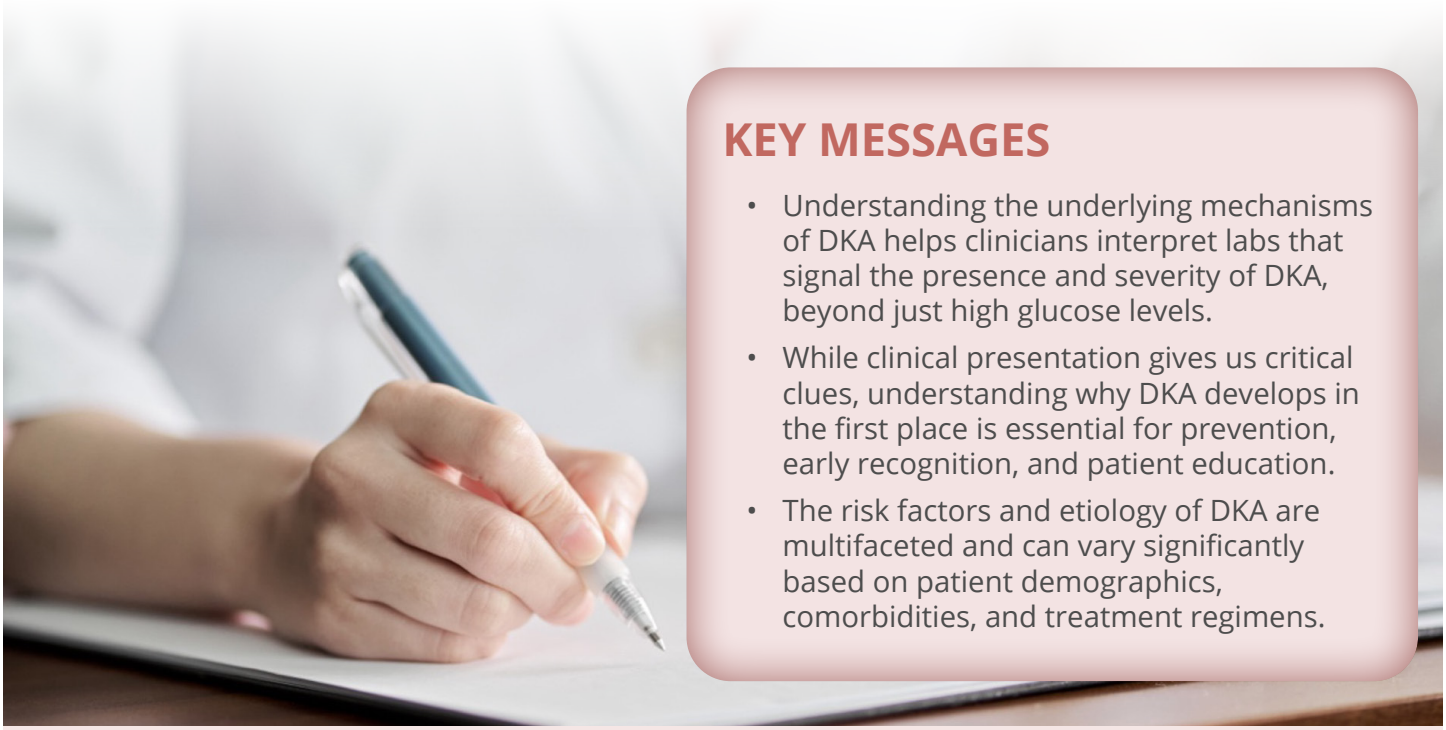
Key risk factors for DKA:

In the US, the leading risk factors for DKA in people with an established diagnosis of diabetes include suboptimal engagement with treatment (leading to insulin omission or under-dosing) and intercurrent infection or other illness.[3]

DKA is more common in adolescents and among individuals from a minority race or ethnicity.[4-6]

The use of sodium-glucose cotransporter 2 (SGLT-2) inhibitors is also associated with increased risk of DKA.[7]

In children, DKA most commonly occurs at the time of a diabetes diagnosis with children under the age of 5 years, and those who have difficulty accessing medical care have the highest rates of DKA at diabetes onset.[8]



KEY MESSAGES

- Understanding the underlying mechanisms of DKA helps clinicians interpret labs that signal the presence and severity of DKA, beyond just high glucose levels.
- While clinical presentation gives us critical clues, understanding why DKA develops in the first place is essential for prevention, early recognition, and patient education.
- The risk factors and etiology of DKA are multifaceted and can vary significantly based on patient demographics, comorbidities, and treatment regimens.

References: 1. McCoy RG. *Diabetes Care.* 2023;46:e69-e71. 2. Umpierrez GE, et al. *Diabetes Care*. 2024;47:1257-1275. 3. Umpierrez G, et al. *Nat Rev Endocrinol.* 2016;12:222-232. 4. Dhatariya KK. *Rev Diabet Stud*. 2016;13:217-225. 5. Randall L, et al. *Diabetes Care*. 2011;34:1891-1896. 6. Reid LA, et al. *Pediatr Diabetes*. 2022;23:982-990. 7. He Z, et al. *Acta Diabetol*. 2023;60:401-411. 8. Wolfsdorf J, et al. *Diabetes Care*. 2006; 29:1150-1159.