

Specific Care Question

In the pediatric patient with type I diabetes experiencing diabetic ketoacidosis (DKA), are continuous glucose monitoring (CGM) system results as accurate as fingerstick (i.e., capillary) glucose results?

Recommendations from the DKA CPG Committee Based on Current Literature (Best Evidence) Only

No recommendation can be made for or against use of CGMs in the inpatient setting instead of fingerstick, based on expert opinion and review of current literature by the subject matter expert and the Department of EBP. There was no evidence to support change from fingerstick glucose monitoring to continuous glucose monitoring for patients experiencing DKA. When there is a lack of scientific evidence, standard work should be developed, implemented, and monitored.

Literature Summary

Background

In pediatric patients with established type 1 diabetes, DKA and its complications are the most common cause of hospitalization, morbidity, and mortality. The overall incidence of DKA is 8% in children and adolescents. For patients diagnosed with Type 1 diabetes, one-third have an initial presentation of DKA (Levy-Shraga et al., 2017).

Frequent glucose level monitoring is essential for patients with type 1 diabetes to manage glucose levels. CGM systems were approved for use in the ambulatory setting by the Food and Drug Administration in 1999 and provide an option for automated interstitial glucose level monitoring every few minutes compared to point of care (POC) glucose level monitoring, which requires repeated fingersticks as frequently as once each hour. In the hospital setting, POC fingersticks require frequent patient interaction with staff to obtain samples, increasing the time burden and exposure of staff to the patient as well as disruption to the patient and family. Though not approved for use in hospitalized patients, CGM use was employed during the COVID-19 pandemic following guidance from the Food and Drug Administration as a means of lessening the exposure of staff and reducing use of personal protective equipment (PPE). A systemic review found that CGMs used in hospitalized patients were found to be accurate, useful in early detection and prevention of hypoglycemia, and useful as a tool to decrease hyperglycemia (Gothong et al., 2022). However, this systematic review included patients with type 2 diabetes and excluded pediatric patients. Further evidence of use with hospitalized pediatric patients with type 1 diabetes experiencing DKA is needed to answer the question.

Study characteristics. The search for suitable studies was completed on September 13, 2022. R. McDonough, DO and T. Musick, DO reviewed the 36 titles and/or abstracts found in the search and identified^a one single study believed to answer the question. After an in-depth review of the single study^a, it did not answer the question.

Identification of Studies

Search Strategy and Results (see Figure 1)

- 1) 'inpatient care' OR 'hospital admission' OR 'hospital medicine' OR 'pediatric intensive care unit' OR 'child hospitalization' OR 'hospital patient' OR hospitalization OR 'critical illness' OR 'intensive care nursing' OR 'pediatric intensive care nursing' OR inpatient:ti,ab,kw OR hospitalized:ti,ab,kw
- 2) 'continuous glucose monitoring'/exp OR 'continuous glucose monitoring' OR 'continuous glucose monitoring system'/exp OR 'continuous glucose monitoring system' OR 'continuous glucose monitor'/exp OR 'continuous glucose monitor' OR 'continuous glucose monitoring device'/exp OR 'continuous glucose monitoring device' OR 'cgm':ti,ab,kw
- 3) 'diabetic ketoacidosis'/exp OR 'diabetic ketoacidosis' OR 'dka':ti,ab,kw
- 4) #1 AND #2 AND #3
- 5) #4 AND (2010:py OR 2011:py OR 2013:py OR 2014:py OR 2015:py OR 2016:py OR 2017:py OR 2018:py OR 2019:py OR 2020:py OR 2021:py OR 2022:py) AND ([adolescent]/lim OR [child]/lim OR [infant]/lim OR [newborn]/lim OR [preschool]/lim OR [school]/lim)

Search Dates: 2010-Current

Records identified through database searching $n = 36$
Additional records identified through other sources $n = 0$

Studies Included in this Review

Citation	Study Type
None	

Studies Not Included in this Review with Exclusion Rationale

Citation	Reason for exclusion
Galindo (2021)	Consensus review

Methods Used for Appraisal and Synthesis

^aRayyan is a web-based software used for the initial screening of titles and / or abstracts for this analysis (Ouzzani, Hammady, Fedorowicz & Elmagarmid, 2017).

^bThe Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram depicts the process in which literature is searched, screened, and eligibility criteria is applied (Moher, Liberati, Tetzlaff, & Altman, 2009).

References to Appraisal and Synthesis Methods

^aOuzzani, M., Hammady, H., Fedorowicz, Z., & Elmagarmid, A. (2016). Rayyan-a web and mobile app for systematic reviews. *Systematic Reviews*, 5(1), 210. doi:10.1186/s13643-016-0384-4

^bMoher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med* 6(7): e1000097. doi:10.1371/journal.pmed1000097 **For more information, visit www.prisma-statement.org.**

Question Originator

R. McDonough, DO

Medical Librarian Responsible for the Search Strategy

K. Swaggart, MLIS, AHIP

EBP Medical Director Responsible for Reviewing the Literature

K. Berg, MD, FAAP

EBP Team Member Responsible for Reviewing, Synthesizing, and Developing this Document

M. Gripka, MLS (ASCP) SM

Acronyms Used in this Document

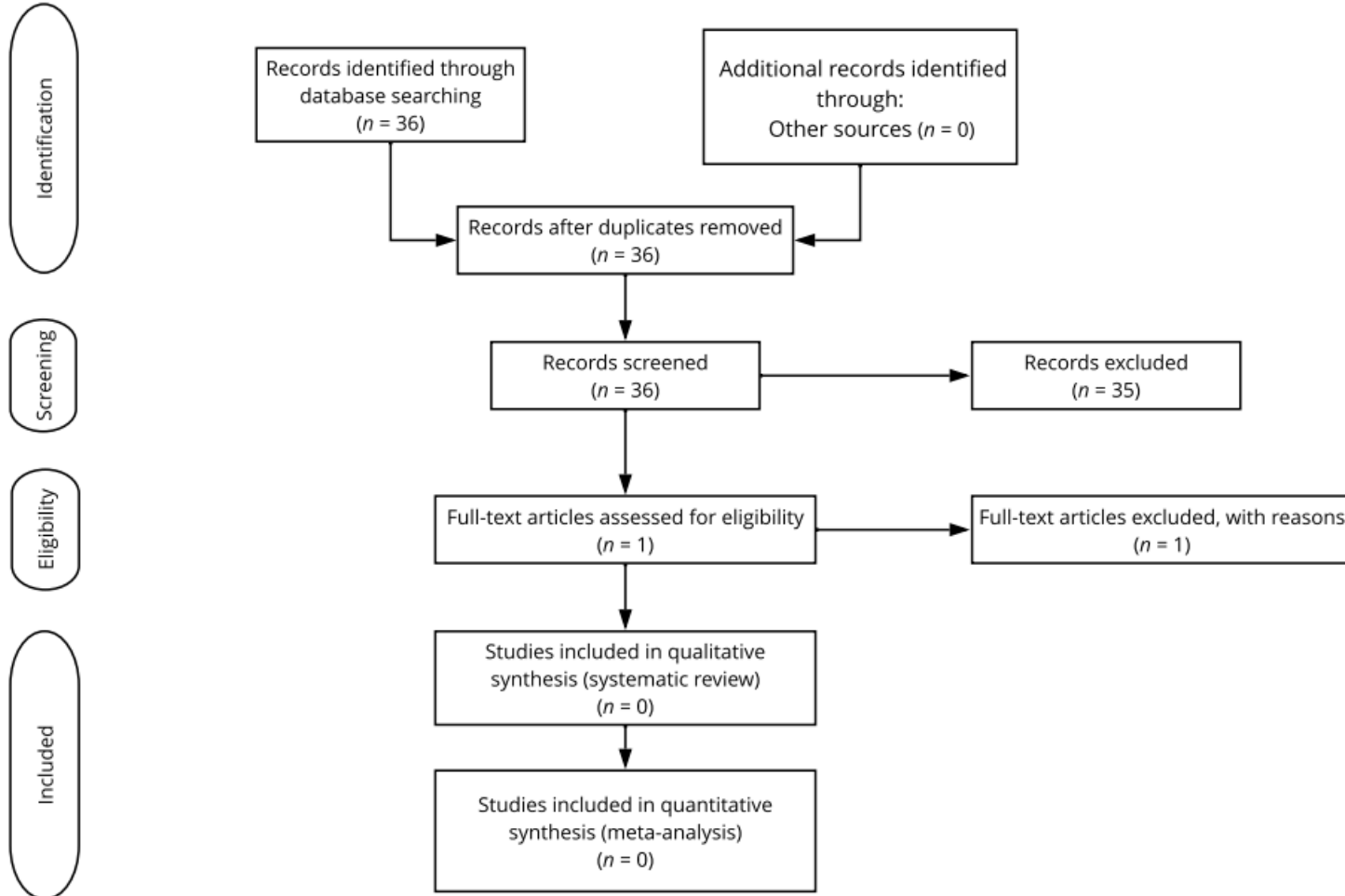
Acronym	Explanation
CAT	Critically Appraised Topic
EBP	Evidence Based Practice
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses

Figure 1

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)^b



Critically Appraised Topic (CAT): Diabetic Ketoacidosis (DKA) Continuous Glucose Monitoring (CGM) versus Fingerstick



References

- Galindo, R. J., Umpierrez, G. E., Rushakoff, R. J., Basu, A., Lohnes, S., Nichols, J. H., Spanakis, E. K., Espinoza, J., Palermo, N. E., Awadje, D. G., Bak, L., Buckingham, B., Cook, C. B., Freckmann, G., Heinemann, L., Hovorka, R., Mathioudakis, N., Newman, T., O'Neal, D. N., . . . Klonoff, D. C. (2020). Continuous Glucose Monitors and Automated Insulin Dosing Systems in the Hospital Consensus Guideline [Article]. *Journal of Diabetes Science and Technology*, 14(6), 1035-1064. <https://doi.org/10.1177/1932296820954163>
- Gothong, C., Singh, L. G., Satyarengga, M., & Spanakis, E. K. (2022). Continuous glucose monitoring in the hospital: an update in the era of COVID-19. *Curr Opin Endocrinol Diabetes Obes*, 29(1), 1-9. <https://doi.org/10.1097/MED.0000000000000693>
- Levy-Shraga, Y., Hamiel, U., & Pinhas-Hamiel, O. (2017). DKA in an Adolescent with Established Diagnosis of Type 1 Diabetes. *International Journal of Diabetes and Clinical Research*, 4(1). <https://doi.org/10.23937/2377-3634/1410067>