



Caring for Pediatric Patients with Diabetes amidst the Coronavirus Disease 2019 Storm

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Coronavirus disease 2019 (COVID-19) caused by the novel severe acute respiratory syndrome (SARS-CoV-2) virus is a rapidly progressing pandemic with more than 2.5 million infected persons worldwide and a World Health Organization estimated mortality rate of 6.9% at the time of writing. As clinicians, it is imperative that we keep ourselves informed of the daily emerging scientific evidence in order to understand the impact of COVID-19 on our patients, particularly those belonging to a high-risk group, such as the diabetic population.

Although the evidence to date has shown that children are generally less prone to COVID-19 infection, with those infected tending to have a milder disease course, children with existing comorbidities continue to remain highlighted as an at-risk group.¹ A report released by the International Society of Pediatric and Adolescent Diabetes dated March 25, 2020, reassuringly stated that there were no cases of COVID-19 in children with diabetes or adolescents who had required hospitalization. Although it seems that children with diabetes have not shown a different disease pattern compared with their counterparts without diabetes, clinicians caring for children with diabetes should not become complacent, particularly in these early days when new evidence is still emerging. We continue to recommend a cautious approach in management strategies for children with diabetes, as individuals with underlying diabetes are at increased risk of severe pulmonary infections, and diabetes was found to be a risk factor for mortality in patients infected with severe acute respiratory syndrome and Middle East Respiratory Syndrome coronavirus.²

The main strategy in decreasing the risk and severity of the SARS-CoV-2 infection in children with diabetes is to optimize glycemic control. In addition, the general recommendations for infection prevention cannot be emphasized enough during this pandemic. All patients with diabetes should receive pneumococcal and influenza vaccinations and be specifically reminded about the importance of good hand hygiene, avoiding touching their faces, and observing appropriate social distancing to decrease risk of infection. We echo the specific recommendations outlined by Gupta et al for patients with diabetes infected with SARS-CoV-2.³ Specifically, those with type 1 diabetes should adhere to standard sick day guidelines, with increased frequency of monitoring of blood glucose and ketones. In addition, frequent

changes in dosage and correction in insulin boluses may be required to maintain normoglycemia. In ill patients with type 2 diabetes, dosage of oral antidiabetic drugs such as metformin need to be adjusted to decrease the risk of lactic acidosis.

Notably, diabetologists should pay attention to recent reports on the use of angiotensin-converting enzyme (ACE)-inhibiting agents in patients with COVID-19, because many patients with diabetes, including children, are receiving this medication for albuminuria. Although there is some suggestion that ACE inhibitors may increase the severity of COVID-19, reports are conflicting, suggesting that both an increased ACE level may be a poor prognostic factor for severe pneumonia and that use of ACE-inhibiting agents decrease the severity of pulmonary inflammation.⁴ The evidence has not been sufficient to change the practice for patients with diabetes thus far, but the endocrine community should remain vigilant for new evidence and guidance as more information on this issue emerges. On a similar note, there is some suggestion that ibuprofen may increase expression of ACE-2 receptor, potentially increasing binding of the virus to target cells and potentiating the SARS-CoV-2 infection.⁵ Although this theoretical concern requires further substantiation, the advice from the World Health Organization is to use paracetamol over nonsteroidal anti-inflammatory agents for the treatment of fever associated with COVID-19, which is prudent.⁵

It is important for clinicians to be cognizant of the possibility of delayed presentation of new cases of type 1 diabetes, because parents may delay medical attention for their children owing to fear of exposure to infection in emergency services. Moreover, parents of children with suboptimal diabetic control who require closer follow-up may postpone their appointments owing to fear and anxiety. Where available, these patients should be offered the option of remote teleconsultation with their doctors to review their glycemic control and insulin titration, especially for young children. With many countries instituting policies to mandate home quarantine, clinicians also should be mindful of the potential of changes in dietary habits and available food choices as well as decreases in physical activity, which impact glycemic control.

ACE	Angiotensin-converting enzyme
COVID-19	Coronavirus disease 2019
SARS-CoV-2	Novel severe acute respiratory syndrome

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There has been advancement in technologies now available commercially to aide diabetes management, including telehealth monitoring technologies, diagnostic tools, and monitoring kits. Amidst this COVID-19 crisis, endocrinologists can leverage these systems and devices to provide remote care to their patients with diabetes. The use of continuous glucose monitoring systems is now the standard of care in many centers worldwide. Closed-loop continuous glucose monitoring systems that incorporate the use of automated decision support systems between insulin pumps and continuous glucose monitoring systems provide an added benefit, which is that insulin titration can be achieved accurately with good comparability to endocrinologist decision making.⁶ This can reduce the need for intensive physician monitoring.⁶ Home testing of glycated hemoglobin will be welcomed by patients with diabetes and their endocrinologists in the face of the COVID-19 crisis. Possibilities exist for home glycated hemoglobin testing in which patients need only perform finger-prick sampling, similar to a standard blood glucose monitoring procedure. Glycated hemoglobin readings from finger-prick samples have been shown to agree favorably with gold standard assays using venipuncture samples.⁷ Collected samples can be submitted via postal mail and assay has been shown to remain accurate up to 4 days after collection, a feature that can be used during a pandemic such as this.⁷ In addition, state-of-the-art technology for screening complications, such as the hand-held non-mydratic portable fundus camera linked to a smartphone, has been shown to be reliable for diabetic retinopathy screening.⁸ The use of such technology potentially could decrease in-person visits for ophthalmologic care and can be implemented easily and with reasonable reliability, at least for use during this pandemic. These remote consulting and prescribing services should be made possible through the establishment of telehealth consultation systems. Importantly, although these services should keep patients safe and lighten the ambulatory aspect of diabetes care, families must be made aware they do not replace emergency care, especially if the child is unwell, in which case a visit to the nearest acute care center would be strongly advised.

Although we are learning more about SARS-CoV-2 by the day, there remain many grey areas and uncovered blind spots,

some of which may apply to children with diabetes. It is essential that we keep ourselves updated on the continuous stream of information that may concern our patients. As healthcare providers caring for these vulnerable patients, our role and commitment to them remains unbroken. We should continue to provide diabetes care through the safest possible way, and remain accessible to our patients, either through telehealth platforms or specifically planned face-to-face visits that would incorporate measures to minimize risk of infection to the patients and the healthcare team. ■

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References

1. Ludvigsson JF. Systematic review of COVID-19 in children shows milder cases and a better prognosis than adults. *Acta Paediatr* 2020;109:1088-95.
2. Song Z, Xu Y, Bao L, Zhang L, Yu P, Qu Y, et al. From SARS to MERS, thrusting coronaviruses into the spotlight. *Viruses* 2019;11.
3. Gupta R, Ghosh A, Singh AK, Misra A. Clinical considerations for patients with diabetes in times of COVID-19 epidemic. *Diabetes Metab Syndr* 2020;14:211-2.
4. Bavishi C, Maddox TM, Messerli FH. Coronavirus disease 2019 (COVID-19) infection and renin angiotensin system blockers. *JAMA Cardiol* 2020 [Epub ahead of print].
5. Sodhi M, Etminan M. Safety of ibuprofen in patients with COVID-19: causal or confounded? *Chest* 2020 [Epub ahead of print].
6. Nimri R, Dassau E, Segall T, Muller I, Bratina N, Kordonouri O, et al. Adjusting insulin doses in patients with type 1 diabetes who use insulin pump and continuous glucose monitoring: variations among countries and physicians. *Diabetes Obes Metab* 2018;20:2458-66.
7. Hall JM, Fowler CF, Barrett F, Humphry RW, Van Drimmelen M, MacRury SM. HbA1c determination from HemaSpot blood collection devices: comparison of home prepared dried blood spots with standard venous blood analysis. *Diabet Med* 2019 [Epub ahead of print].
8. Jin K, Lu H, Su Z, Cheng C, Ye J, Qian D. Telemedicine screening of retinal diseases with a handheld portable non-mydratic fundus camera. *BMC Ophthalmol* 2017;17:89.