



Pediatric Endocrinology Nursing Society

## Addressing the type 2 diabetes epidemic in the pediatric population: A nurse-led clinical pathway☆☆☆

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### Introduction

Type 2 Diabetes Mellitus (T2DM) is a disorder of hyperglycemia caused by peripheral insulin resistance and dysfunction of insulin producing pancreatic beta cells. Although previously seen mostly in adults, incidence in the pediatric population is rising rapidly, parallel to rising rates of childhood obesity (Valaiyapathi et al., 2020). Unique aspects of T2DM in children include higher rates of treatment failure and more rapid onset of health complications compared to adults, necessitating more aggressive approaches to care (Savic Hitt & Levitt Katz, 2020).

Optimal treatment requires a combination of pharmacologic and lifestyle interventions with close follow-up by a multidisciplinary team. Historically, pharmacological treatment options for children were limited to oral metformin and insulin therapy. Weight gain is a side effect of prolonged insulin use, which is in direct contrast to goals of therapy. Studies show that traditional approaches to the care of this population, which often mirror that of Type 1 diabetes treatment, have not yielded satisfactory outcomes in terms of lower A1c, weight loss, and development of complications (Bjornstad et al., 2021).

Recent pediatric FDA approval of GLP-1 receptor agonist (GLP1-RA) medications, which may allow for discontinuation of insulin to assist in weight loss efforts, motivated the Endocrine nursing team at an academic medical center to develop a T2DM clinical pathway. The pathway aims to address the unique needs of pediatric T2DM patients utilizing metformin and GLP-1 RA medications alone whenever possible, with close follow up by an expert nursing team.

### Background

The Endocrine nursing and dietetics team at an academic medical center implemented the T2DM clinical pathway in November 2020

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following months of development and planning. The team identified three main deficiencies related to the traditional approach to the care of children and teens newly diagnosed with T2DM. These included inadequate comprehensive patient and family education, gaps in communication, and lack of aggressive medication and insulin titration. Table 1 depicts the inclusion and exclusion criteria for patients admitted to the T2DM pathway (See Table 2).

### Care obstacles

Preceding initiation of the T2DM pathway, patients newly diagnosed with T2DM were admitted to the hospital for two to three days for initiation of insulin and metformin, medical nutrition therapy (MNT), and diabetes self-management education (DSME). MNT was delivered by the Registered Dietitian (RD) and DSME by the inpatient nurse along with a diabetes nurse educator. The patient and family returned for new onset education training with the RD and diabetes nurse educator two to eight weeks following hospital discharge. Regular clinic follow-up visits were scheduled every three months with their endocrinologist or advanced practice registered nurse (APRN). The team identified many opportunities to improve the care of this growing patient population. Identified areas of deficiency included insufficient education and sporadic communication with patients and families, leading to delays in increasing metformin dose and initiation of GLP1-RA medications. Medication side effects were not being addressed, which often led to non-adherence. Finally, patients often experienced prolonged periods on high insulin doses, which may have contributed to weight gain.

### Clinical pathway overview

The goals of the T2DM pathway are to wean newly diagnosed T2DM patients off insulin as soon as feasible, rapidly optimize metformin doses, increase utilization of GLP1-RA medications, and improve follow up education through increased frequency of communication with patients and families.

### Education

Ongoing comprehensive MNT and DSME with the RD and diabetes nurse educator is the foundation for the T2DM clinical pathway. Because

**Table 1**  
Criteria for inclusion in T2DM pathway.

Inclusion Criteria	Exclusion Criteria
New diagnosis of T2DM A1C ≥ 8.5%	Positive Type 1 DM autoantibodies May include patients with mildly + GAD antibody in pathway if multiple risk factors and signs of insulin resistance
Initiation of basal and/or bolus insulin at diagnosis	

T2DM treatment often focuses on changing behaviors, frequent visits to the dietitian and/or practitioner may be needed for ongoing assessment and support (Laffel & Svoren, 2021). The T2DM clinical pathway created continuity of MNT and DSME for children and their families with the addition of telemedicine education visits performed jointly with the RD and diabetes nurse educator. These visits are scheduled at regular intervals for one year, then continue annually. MNT education at all sessions focuses on reducing carbohydrate containing beverages, meal structure and portion sizes, replacing high caloric snacks with fruits and vegetables, healthy choices when dining out, and increasing physical activity. DSME education includes blood glucose (BG) review, medication and insulin titration, goal setting, and promoting close communication with the multidisciplinary team.

**Communication**

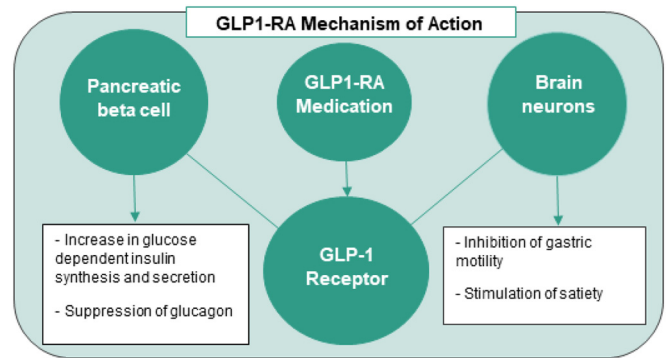
Regular structured points of contact aimed at addressing the prolonged periods between clinic follow-up visits and minimal ongoing communication with patients and families, are another foundational aspect of the pathway. Weekly phone calls from the diabetes nurse educator to the patient/family occur following discharge and continue until the new onset education appointment. Goals of the weekly calls include BG review, optimization of metformin dose, weaning of rapid acting insulin if feasible, assessing for medication side effects, and setting goals for physical activity.

*Medication and insulin*

Preceding the T2DM pathway, metformin dose maximization, initiation of GLP1-RA, and weaning from high insulin doses were all delayed up to months after discharge. These delays presumably restricted weight loss efforts. Additionally, many patients using metformin and GLP-1 RA medications experience gastrointestinal side effects at the initiation of therapy. Lack of communication about experienced side effects and advice about methods to minimize these effects were leading to non-adherence. The T2DM pathway guides the diabetes nurse educator to maximize metformin doses at the first weekly phone call along with weaning rapid acting insulin doses if appropriate. The team developed clear insulin titration guidelines to allow for consistency among all patients when tapering insulin doses with a goal to safely discontinue rapid acting insulin by six to eight weeks after diagnosis. GLP1-RA medications are now initiated at the new onset

**Table 2**  
T2DM clinical pathway follow up schedule.

Type of follow up	Responsibility	Purpose	Timeframe
Weekly call to family	Diabetes nurse educator	Review BG levels, optimize metformin, lower insulin, educate and set goals	Weekly for up to 8 weeks
New onset education class	RD – 1 h RN – 3 h	In-person comprehensive education, initiate GLP-1 RA, lower insulin	2–8 weeks after hospital discharge
Endocrine clinic visit	APRN or Endocrinologist (Psychologist as needed)	Comprehensive medical visit and exam	6 weeks after discharge then quarterly
Telemedicine visit	RD – 15 min RN – 15 min	MNT, BG review, follow up education, medication/insulin titration	1, 2, 3, 6, and 12 months after discharge then annually until adult transition



**Fig. 1.** GLP1-RA effects.  
Note: GLP1-RA medications activate these receptors to enhance glucose control, increase insulin sensitivity and assist in weight loss.

education session, providing there are no contraindications, allowing the diabetes nurse educator to demonstrate proper use and administration with patients and families.

*Glucagon-like peptide 1 receptor agonist (GLP1-RA) medications*

GLP1 is a receptor protein with important roles in maintaining glucose control (Chadda et al., 2021) (Fig. 1). Results of the ELLIPSE trial showed significant improvements in glycemic control and blood lipid profiles without need for insulin in pediatric patients treated with metformin and GLP1-RA medication compared with metformin alone (Laffel & Svoren, 2021). Liraglutide (once daily injection titrated to 1.8 mg over 3 weeks) and exenatide extended release (2 mg once weekly) received pediatric approval for children ≥10 years of age as 2nd line therapy with metformin in 2019 and 2021, respectively. The most common side effects include gastrointestinal upset (lessened with liraglutide titration and long acting exenatide preparation) and hypoglycemia. Contraindications include pregnancy, family history of medullary thyroid cancer, or multiple endocrine neoplasia 2 (MEN2).

**Clinical implications**

Prevalence of T2DM in the pediatric and adolescent population is rising at alarming rates. Rapid disease progression, treatment failure, and quicker development of complications compared to adult onset of disease, heighten the need to optimize treatment. Clinical experiences, consistent with results of the TODAY2 study, indicate that traditional treatment approaches are frequently ineffective and often promote weight gain due to reliance on insulin therapy (TODAY Study Group, 2021). The new nurse-led clinical pathway incorporates ongoing education, MNT, and support of lifestyle changes utilizing an RD and diabetes nurse educator to manage patients solely with metformin and a GLP1-RA medication whenever possible. Since implementation at an

academic institution in November 2020, 91 patients have been managed with this effective and simplified treatment approach. Future opportunities exist to examine the clinical outcomes of this innovative approach to care for this growing population.

## References

- Chadda, K. R., Cheng, T. S., & Ong, K. K. (2021). GLP-1 agonists for obesity and type 2 diabetes in children: Systematic review and meta-analysis. *Obesity Reviews*, 22(6), Article e13177. <https://doi.org/10.1111/obr.13177>.
- Laffel, L., & Svoren, B. (2021). Management of type 2 diabetes mellitus in children and adolescents. *UpToDate*, Topic last updated: Nov 16, 2021. Literature review current through: Mar 2022. Retrieved from: <https://www.medilib.ir/uptodate/show/5821>.
- Savic Hitt, T. A., & Levitt Katz, L. E. (2020). Pediatric type 2 diabetes: Not a mini version of adult type 2 diabetes. *Endocrinology and Metabolism Clinics of North America*, 49, 679–693. <http://doi.org/10.1016/j.ecl.2020.08.003>.
- TODAY Study Group (2021). Long-term complications in youth-onset type 2 diabetes. *New England Journal of Medicine*, 385(5), 416–426. <https://doi.org/10.1056/NEJMoa2100165>.
- Valaiyapathi, B., Gower, B., & Ashraf, A. A. (2020). Pathophysiology of type 2 diabetes in children and adolescents. *Current Diabetes Reviews*, 6(3), Article 220229. <https://doi.org/10.2174/15733998>.