Improving Continuous Glucose Monitoring Use in Emerging Adults With Type 1 Diabetes

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Quality Improvement Success Stories are published by the American Diabetes Association in collaboration with the American College of Physicians and the National Diabetes Education Program. This series is intended to highlight best practices and strategies from programs and clinics that have successfully improved the quality of care for people with diabetes or related conditions. Each article in the series is reviewed and follows a standard format developed by the editors of *Clinical Diabetes*. The following article describes a quality improvement (QI) project focused on increasing the use of continuous glucose monitoring (CGM) among emerging adults (EAs) with type 1 diabetes enrolled in a health care transition program in the state of Washington.

Describe your practice setting and location.

The Achieving Health in Emerging Adults with Diabetes (AHEAD) Program is a collaboration between Seattle Children's (SC) and the University of Washington Medicine Diabetes Institute (UWMDI). SC is a tertiary care pediatric hospital that serves the largest geographical region of any children's hospital in the country, with regional clinics located throughout the state of Washington. UWMDI is a hospital-based specialty clinic serving adults with diabetes in the Pacific Northwest and integrating clinical care, research, and education.

The AHEAD Program is designed to meet the diabetes education, mental health, and health care transition needs of EAs with diabetes. EAs with diabetes (15–23 years of age) can be referred to either an SC or a UWMDI AHEAD Program clinic site. If an EA initially enrolls in the AHEAD Program at an SC AHEAD Program clinic, a structured health care transition process is in place to facilitate transfer to the AHEAD Program at UWMDI, with an overall goal for EAs to graduate the program and successfully transfer their diabetes care to a local adult diabetes provider.

This QI initiative took place at AHEAD Program clinics located at the SC hospital campus and UWMDI diabetes clinics in Seattle, WA, as well as one regional SC clinic in Federal Way, WA. During the QI initiative, the AHEAD Program included four pediatric endocrinologists, two adult endocrinologists, an advanced practice provider, a social worker, a registered dietitian, three certified diabetes care and education specialists (CDCESs), a clinical psychologist, and an administrative transition coordinator.

Describe the specific quality gap addressed through the initiative.

EAs with type 1 diabetes experience unique challenges marked by social, financial, and geographical changes, which is compounded by a shift in diabetes self-management responsibility. As a result, a majority of EAs do not meet glycemic targets (1,2). This places them at a higher risk of developing acute and chronic diabetes-related complications.

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This article contains supplementary material online at https://doi.org/10.2337/figshare.26169325.

https://doi.org/10.2337/cd23-0104

Studies have shown the benefit of CGM systems in improving clinical outcomes such as lower A1C and reduced episodes of diabetic ketoacidosis and severe hypoglycemia (3–5). However, an examination of diabetes technology use in U.S. diabetes centers in 2018 found that <25% of 13- to 25-year-olds use CGM to support diabetes management (1). Multilevel barriers that contribute to this limited uptake are well-documented and include self-image concerns, inadequate patient and parent health literacy, provider prescribing behaviors, CGM wear-related issues (e.g., disruptive alarms, painful insertions, and skin/adhesive problems) and real or perceived financial costs to patients and family (6–8). Health insurance and racial/ethnic disparities in CGM use have also been reported. In a 2019 study analyzing six pediatric and two adult U.S. diabetes clinics, CGM use was more likely in non-Hispanic White patients and those with private insurance compared with non-Hispanic Black or Hispanic patients and those with public insurance (3).

Given the known clinical benefits of consistent CGM use, this QI project focused on increasing CGM use for EAs with type 1 diabetes enrolled in the AHEAD Program.

How did you identify this quality gap? In other words, where did you get your baseline data?

We identified this gap in quality through a medical record chart review of all patients with type 1 diabetes enrolled in the AHEAD Program from 1 July 2017 to 30 June 2018.

Summarize the initial data for your practice (before the improvement initiative).

The medical record chart review identified that, of the 113 patients with type 1 diabetes enrolled in the AHEAD Program from 1 July 2017 to 30 June 2018, 44% were prescribed a CGM system. Based on this initial data, we aimed to increase CGM use by 10% after 12 months of AHEAD Program enrollment over a 4-year period.

What was the time frame from initiation of your QI initiative to its completion?

This QI initiative began on 1 July 2018. Data analysis was limited to a 4-year time frame from 1 July 2018 to 30 June 2022.

Describe your core QI team. Who served as project leader, and why was this person selected? Who else served on the team?

The project leader was a pediatric endocrinologist with QI research experience who serves as medical co-director of the AHEAD Program. All interventions were carried out by the program's multidisciplinary care team. Clinical research coordinators facilitated patient registry data collection efforts, and a biostatistician conducted all data analysis. The AHEAD Program team met monthly to review clinic processes. An AHEAD Program advisory board comprising members of the regional diabetes community meets to advise the team on program interventions and QI projects.

Describe the *structural* changes you made to your practice through this initiative.

Structural changes to our practice targeted health insurance barriers that influence CGM use in the EA population (Supplementary Figure S1). Many AHEAD Program patients were experiencing health insurance denials for CGM coverage. For example, some health insurance providers required evidence of reliable glucose monitoring practices for CGM approval (e.g., frequent self-monitoring blood glucose more than four times per day).

To address these issues, a durable medical equipment coordinator was incorporated to support health insurance preauthorization and approvals. For those reporting concerns about CGM wear and/or challenges implementing required glucose checks per day, CGM system samples were provided. This trial period provided patients with the opportunity to experience the potential benefits of CGM use and facilitated patients in meeting health insurance requirements regarding reliable glucose monitoring.

Describe the most important changes you made to your *process* of care delivery.

To support shared decision-making with AHEAD Program patients, our process of care changes targeted increasing patient and caregiver education and addressing modifiable patient-reported CGM use barriers and provider prescribing behaviors (Supplementary Figure S1). As part of this initiative, we delivered standardized diabetes technology education to all patients at one of the first two AHEAD Program visits. The education included information about currently available CGM systems for use in type 1 diabetes and the potential benefits of CGM use to support diabetes management. This education

was delivered by the medical providers or in-clinic nurses who are CDCESs. In addition, the AHEAD Program team provided opportunities to the EAs to share potential concerns about using CGM and discussed potential limitations to its use. For non-English speaking families, video or telephonic interpreters were integrated into the program to facilitate education and training in patients' preferred language of care when in-person interpreters were not available.

Our program also integrated mental health screening at each visit to assess diabetes distress, anxiety, depression, and disordered eating. All patients were provided access to a clinical psychologist in tandem with their provider visits to discuss these issues and any concerns about wearing a diabetes technology device. Specifically, the psychologist addressed concerns such as using devices around peers, needle/device fear, and diabetes distress. When indicated, individual, evidence-based treatment (e.g., cognitive behavioral therapy) was provided.

Summarize your final outcome data (at the end of the improvement initiative) and how they compared to your baseline data.

CGM prescriptions were tracked at every AHEAD Program clinic visit. We calculated proportions and 95% CIs using generalized linear models with a log link and robust variance estimator to cluster on individual to account for repeated measures. We also assessed for possible effect modification by health insurance and race/ethnicity.

Between July 2018 to June 2022, 413 EAs were seen in the AHEAD Program (mean age 20.1 years, mean A1C 8.8%, 28% with public insurance) (Supplementary Table S1). Adjusted CGM use for AHEAD Program patients at their first visit during the QI project study period was 64% (95% Cl 60–69%). By 12 months of receiving care in the AHEAD Program, CGM use increased to 82% (95% CI 76–87%), and by ∼24 months after their baseline AHEAD Program visit, CGM use increased to 88% (95% Cl 82–94%).

At baseline, we found differences in CGM use by health insurance but not by race/ethnicity. Baseline adjusted CGM use was significantly lower among AHEAD Program patients with public health insurance (50%, 95% CI 41–59%) compared with those on private insurance (69%, 95% CI 64–74%). However, this difference was no longer present after 6 months of program participation (public insurance 77%, 95% CI 65–89% vs. private insurance 80%, 95% CI 74–86%) (Supplementary Figure S2).

What are your next steps?

This QI initiative proved to be successful in increasing CGM use and mitigating health insurance disparities in diabetes technology use seen at program enrollment. Because most of our patients are now current CGM users, our next step is to support effective CGM use and provide education on how CGM data can be used to improve glycemic time in range, reduce the frequency of hypoglycemia, and facilitate insulin dose adjustments. Given our success, we are also working to standardize education and processes around other diabetes technology such as automated insulin delivery systems for our EA population.

What lessons did you learn through your QI process that you would like to share with others?

We learned that consistent feedback in the form of monthly team meetings and regular advisory meetings were crucial to strengthening stakeholder involvement and increasing QI project engagement. We also realized the value of being able to reliably offer patients trial periods to experience the potential benefits of CGM use.

Prioritizing the maintenance of our program registry allowed our team to successfully track CGM use. We did not, however, track any balancing or process measures as part of this QI initiative, such as number of CGM samples provided or time allocated to support insurance approvals. We learned that these measures could have given us additional insight into resource allocation.

Through this project, we learned of the effectiveness of QI strategies in reducing disparities within the EA with type 1 diabetes. Research shows that inequities in health outcomes and medical access persist for patients with type 1 diabetes with different socioeconomic backgrounds. QI initiatives provide a promising approach to address these disparities within diabetes clinics. However, it is important to note that these initiatives have the potential to either improve, maintain, or widen existing disparities (9). Thus, it is crucial for diabetes clinics engaging in QI to apply a health equity lens when designing and implementing projects to ensure improvement in disparities.

DUALITY OF INTEREST

I.B.H. has served as an independent consultant for Abbott, Hagar, and Roche separate from this work and has received research funding from Dexcom and Tandem. No other potential conflicts of interest relevant to this article were reported.

AUTHOR CONTRIBUTIONS

F.S.M. and S.G.P. contributed to the study design and interpretation of data and drafted the manuscript. S.L. contributed to the study design and conducted the analyses. K.W.W., I.B.H., C.P., A.C.M., and N.E. contributed to interpretation of data. A.J.R. contributed to the study design and interpretation of the data. All authors critically reviewed and edited the manuscript before approving the final version. F.S.M. is the guarantor of this work and, as such, had full access to the data presented and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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