Improving Capacity to Deliver Evidence-Based Education for People with Gestational Diabetes Mellitus in a Rural Interdisciplinary Clinic: A Quality Improvement Project

Emily R. G. Olson

Oregon Health & Science University

Abstract

A rural interdisciplinary women's specialty clinic lacked updated standardized gestational diabetes mellitus (GDM) patient education materials and access to a registered dietician nutritionist with GDM expertise. A quality improvement (QI) project was conducted in this microsystem of nine prenatal care team members. The project's global aim was to apply best practices in patient education for people with GDM. Its specific aim was to prepare 100% of team members to deliver standardized GDM patient education. The Institute for Healthcare Improvement's Model for Improvement Framework was used to guide a Plan-Do-Study-Act rapid cycle change process over twelve weeks. A QI workgroup of clinic managers and prenatal care team members was formed. Interventions included the development of a GDM toolkit, a provider in-service, and use of questionnaires and monthly meetings to make changes. Pre- and post-surveys were conducted to determine if the aims had been met. A 67% response rate was achieved. The goal to prepare 100% of providers was missed. However, analysis demonstrated progress towards the global aim with differences achieved at the level of significance in the quantity and quality of patient education, and providers' ability to find GDM materials and easily teach patients. In addition to the initial goals, the project addressed repetitive clinical workflow concerns and built capacity to potentiate person-centered care for patients with GDM who experience burden related to structural and social determinants of health.

Improving Capacity to Deliver Evidence-Based Education for People with Gestational Diabetes Mellitus in a Rural Interdisciplinary Clinic: A Quality Improvement Project

The prevalence of gestational diabetes mellitus (GDM) is increasing globally and correlates with an increase in type 2 diabetes mellitus (T2DM), obesity, and sedentary lifestyles (ACOG, 2018). According to the Oregon Health Authority (OHA), the prevalence of GDM in Oregon has doubled in the past 15 years. It is estimated that 10% of all pregnancies are affected by GDM and that the Latinx population experience a disproportionate rate at 17% (OHA, 2015).

Not only do people with GDM have an increased risk of maternal and fetal complications, but offspring have an increased risk for long term implications as well. Up to 70% of people with GDM will develop T2DM within 22-28 years after their index pregnancy (England et al., 2009) with a disproportionate rate of Latinx people (60%) diagnosed with T2DM within five years (Kjos et al., 1995).

While a plethora of recent research exists on GDM, there continues to be debate about the best diagnostic criteria and treatment for GDM (ACOG, 2018). Prenatal providers have reported insufficient capacity to provide patient counseling on GDM interventions related to deficiencies in knowledge, training, education materials, time, or support staff (Oza-Frank et al., 2014). Inconsistent provider-to-patient education and communication about diagnosis and treatment, among other factors, contributes to “maternal distress” in people with GDM (Kopec, 2015).

A rural interdisciplinary women’s specialty clinic desired to update and standardize GDM patient education materials. It also sought to prepare every prenatal care team member to deliver quality evidence-based education to patients diagnosed with GDM on the principles of GDM self-management.

Available Knowledge

The HAPO Trial was a landmark population-based study of 25,505 women that demonstrated independent and continuous linear relationships between maternal glucose levels and maternal-fetal risks including large-for-gestational age, macrosomia, fetal hyperinsulinemia, premature delivery, shoulder dystocia or birth injury, intensive neonatal care, hyperbilirubinemia, and pre-eclampsia with weaker associations found for neonatal hypoglycemia and primary cesarean delivery (HAPO Study Cooperative Research Group, 2008). The HAPO Trial played an instrumental role in prompting the International Association of Diabetes and Pregnancy Study Groups (IADPSG) to recommend new and more stringent criteria for universal screening and diagnosis of GDM at a lower blood glucose threshold (Hod et al., 2015).

In a follow-up study to the HAPO Trial, glucose tolerance tests and other indices of 4,160 offspring (ages 10-14) born to mothers in the original HAPO Trial were analyzed. Compared to the offspring of mothers without GDM, the children of mothers with undiagnosed and therefore untreated GDM (defined post-hoc by the new GDM diagnostic criteria) were found to have higher rates of impaired glucose tolerance (IGT) compared to mothers without GDM (Lowe et al., 2019). Further analysis of the people with untreated GDM demonstrated that across the maternal glucose spectrum, exposure to higher levels in utero was associated with childhood glucose and insulin resistance (Scholtens et al., 2019). A recent review of 20 cohort studies, one cross-sectional study, and two randomized control trials (RCTs) confirmed the findings by Lowe et al. (2019) and Scholtens et al. (2019) of long-term metabolic risk in the offspring of women with GDM and found the effects were stronger at increasing age and more pronounced in females compared to males (Nijs & Benhalima, 2020). The findings from studies showing long-

term effects in offspring have important public health implications as children with IGT are at higher risk for progressing to T2DM (Giannini et al., 2014).

According to a large systematic review and meta-analysis for the U.S. Preventative Services Task Force (Hartling et al., 2013) and a Cochrane Review (Brown et al., 2017), maternal-fetal risks are reduced with medical nutritional therapy, physical activity, self-monitoring of blood glucose, and insulin when nutritional therapy and physical activity alone are insufficient for meeting glycemic goals. Treatment is associated with a reduction in macrosomia, large-for-gestational age (Brown, 2017; Hartling, 2013), pre-eclampsia and shoulder dystocia (Hartling, 2013). Women who were treated were less likely to have post-partum depression and achieve post-partum weight goals (Brown, 2017).

Approximately 70-85% of people with GDM can achieve normoglycemia with changes to nutrition and physical activity alone (ADA, 2020) while 30% require medication management, typically insulin (SMFM, 2018). So clear are the maternal-fetal benefits from lifestyle changes alone that nearly all clinical practice guidelines recommend similar first-line interventions for the treatment of GDM: medical nutrition therapy and physical activity with self-blood glucose monitoring compared with target blood glucose values to evaluate their efficacy (Zhang et al., 2019).

The American College of Obstetricians and Gynecologists (ACOG) GDM clinical management guidelines align with the American Diabetes Association (ADA) guidelines regarding medical nutritional therapy (ACOG, 2018; ADA, 2017). The ADA guidelines recommend that pregnant people with GDM receive individualized medical nutrition counseling and a personalized nutrition plan by a registered dietician nutritionist (RDN) familiar with the management of GDM. According to the ACOG guidelines, in the absence of an RDN, the

prenatal provider "should be able to provide recommendations to the patient based on three major nutritional components: 1) caloric allotment, 2) carbohydrate intake, and 3) caloric distribution" (ACOG, 2018, p. e53).

Evidence on how providers are trained or what they do or do not know about their responsibility to provide GDM counseling is lacking. A literature review on the determinants and barriers for GDM services reported that "Lack of knowledge and perceived seriousness about the issue amongst policy makers, health care providers, affected women and their family and lay people in general is perhaps the biggest hurdle, along with compartmentalization of care" (Nielsen et al., 2014, p.14). A survey of over 900 providers in Ohio found that providers' knowledge, attitudes, and post-partum practices regarding diabetes prevention for women with a history of GDM varied depending on provider type (obstetrician, midwife, family medicine physician, and internist) (Oza Frank et al., 2014). Specific to provider and patient education on GDM, providers in the study suggested the following resources would improve GDM care: 1) additional provider training on GDM (8-25% of providers) and 2) better patient education materials (53-65% of providers).

Qualitative studies that explore people's experiences with GDM reveal that the quality of education and communication received from prenatal providers impacts patients' assimilation of treatments and ultimately GDM outcomes. A systematic review of forty-one studies on women's experiences of a diagnosis of GDM, reported that women experienced conflicting, confusing or insufficient communication from prenatal providers and encountered issues of limited time with the provider, lack of continuity of care, and confusion about the role of the provider at follow-up visits (Craig et al., 2020). As the women's knowledge about GDM increased, their ability to process and accept the GDM diagnosis was improved and this was associated with a sense of

empowerment and perception as an "active agent" in the control of their GDM (Craig et al., 2020, p.11).

The evidence on optimal GDM treatment is mounting: 1) the three principles of GDM self-management—nutrition, physical activity, and blood glucose monitoring—are effective at maintaining normoglycemia for most people with GDM, 2) clinical practice guidelines endorse quality health education on lifestyle interventions, and 3) people with GDM benefit from clear, consistent, and accurate provider-patient education. This evidence, combined with the fact that pregnant people diagnosed with GDM are often motivated to optimize outcomes for their pregnancy and their baby (Van Ryswyk et al., 2015), imparts a clear imperative: maternal health care providers must be prepared to deliver quality standardized evidence-based education on the three principles of GDM self-management.

Rationale

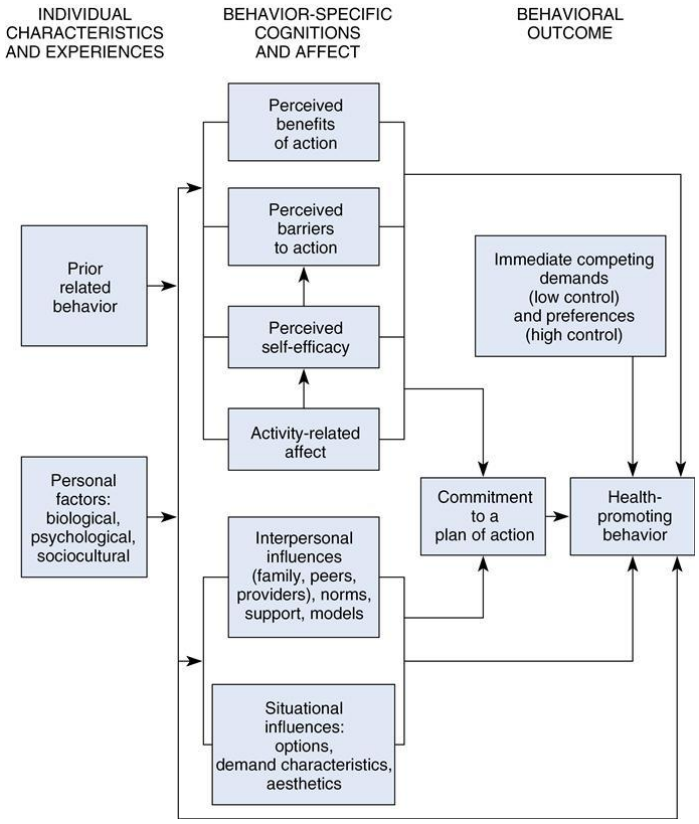
Health Promotion Model

Health care theories and models are an important resource for understanding health behaviors and related interventions (Polit & Beck, 2016). One such model that has been used to promote health behaviors across health care disciplines is Pender's Health Promotion Model (Revised) (Pender et al., 2002). Pender's Model posits that people will commit to engaging in behaviors when they believe the behaviors will be of personal value. Furthermore, there exists an increased likelihood of actual execution of the desired behavior when people have greater perceived competence or self-efficacy of that behavior (Polit & Beck, 2016). Within Pender's Model, adherence to lifestyle changes increases when people understand their disease and can be an active, informed decision maker in their healthcare treatment options. The health care team can increase patient knowledge about their disease and treatment, in addition to addressing other

barriers to action, leading to improved perceived self-efficacy (Pender et al., 2015). Pender's Model (Figure 1) provides a holistic understanding of the relationship between how a person's bio-psycho-social and their environmental factors may or may not support health promoting behaviors (Polit & Beck, 2016), and can further guide individualized counseling and care interventions.

Figure 1

Pender's Health Promotion Model (Revised)



Pender's Health Promotion Model has been used to describe and predict behaviors among people with diabetes and pregnant women as well as design educational interventions to improve care in both populations. For example, a review of literature published between 2000-2012 demonstrated that the Health Promotion Model constructs can predict nutritional behavior among people with diabetes and the authors suggested that this model can be utilized as a framework to

conduct educational interventions (Mohebi et al., 2013). A descriptive study carried out on 300 pregnant women found that three variables—social support, perceived benefits, and perceived barriers—can significantly explain the variance in health-promoting lifestyles in pregnant women (Bahabadi et al., 2020). Using Pender's Health Promotion Model and Bandura's Social Cognitive Theory, Şen & Şirin (2014) conducted a study of 60 women that used a quasi-experimental design comparing usual care with an educational intervention to improve metabolic control and postpartum complications of people with GDM. While no differences were found in the complication rate, the authors found significant differences among women in the intervention group who demonstrated improved GDM knowledge and blood glucose regulation as compared to the control group (Şen & Şirin, 2014). A more recent experimental study compared care as usual with educational interventions (6 education sessions) on health-promotion behaviors and self-efficacy of physical activity among 78 pregnant women. After the intervention, there were significant differences between the groups in the areas of physical activity, nutrition, health responsibility, and stress management (Ghahremani et al., 2017).

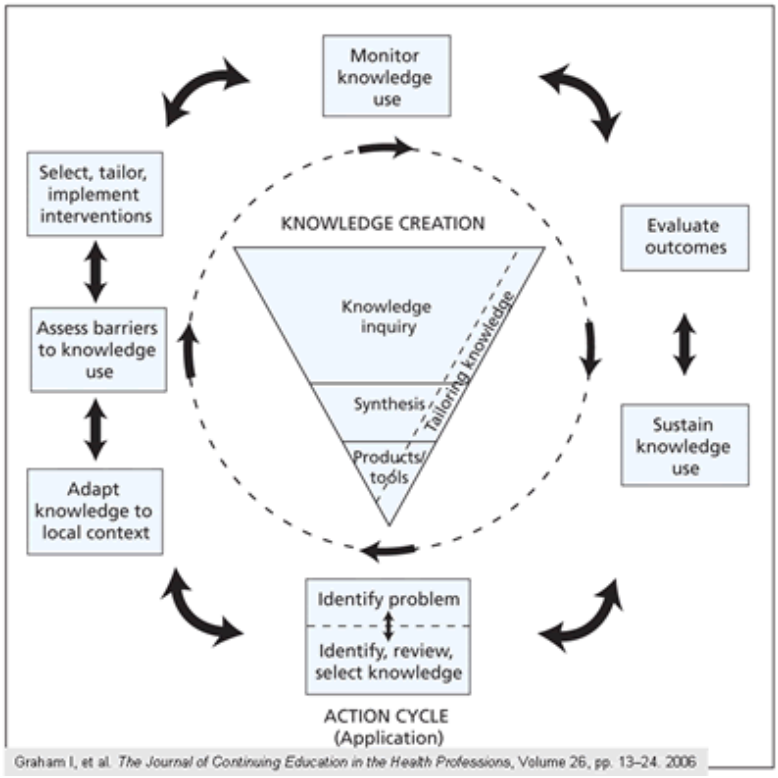
Translation Model

The dissemination and diffusion of innovations in healthcare improvement is often slow and complex. Knowledge translation is "…a dynamic and iterative process that includes synthesis, dissemination, exchange and ethically-sound application of knowledge to improve health…" (CIHR, n.d., Knowledge Translation—Definition section). Because knowledge alone does not lead to improvement in healthcare, the Knowledge-To-Action Framework by Graham et al. (2006) helps to conceptualize how knowledge is applied to real-life situations. The "Knowledge Creation" component of the KTA framework is illustrated by an upside-down

triangular "funnel" (Figure 2) and demonstrates that knowledge needs to be increasingly distilled before it can be developed into a product or tool that is ready for the "Action Cycle" component.

Figure 2

Knowledge-To-Action Framework



Toolkit Use & Efficacy

One such example of a tool is the relatively recent development of GDM education "toolkits". Not unique to health education alone, toolkits have been designed by various organizations to facilitate uptake and implementation of healthcare interventions across settings. While there is not a standardized definition as to what constitutes a toolkit, they may include materials to help introduce an intervention or practical tools to incorporate best practices in clinical care, such as checklists or pocket cards for providers, or patient education materials (Hempel et al., 2019).

A systematic review on the spread of interventions intended to improve healthcare through toolkits found that satisfaction among users of toolkits is often high, but uptake data, while limited, indicated variability between providers and settings (Hempel et al., 2019). Little is known about the process of adoption of toolkits, however "a process of re-invention in the new context is also likely to occur" (Hempel et al, 2019, p. 2), a concept that is also demonstrated by the process of "adapting knowledge to the local context" within the action cycle of the KTA Framework.

GDM education toolkit exemplars include those developed by Intermountain Healthcare (2017), the Ohio Gestational Diabetes Postpartum Care Learning Collaborative (Ohio GDM Collaborative) (n.d.), and California Diabetes and Pregnancy Program (CDAPP) (n.d.). Both provider and patient education toolkits are components of GDM programs in Ohio and California states, respectively. These programs also have provider training modules to complement the provider toolkits (i.e., guidelines for GDM clinical care). The Intermountain Healthcare toolkit is a stand-alone all-in-one provider and patient education toolkit. All toolkits are free and available online.

In 2014, the Ohio GDM Collaborative, with funding by the Ohio Department of Health, undertook a large 18-month multi-center QI project to improve clinical practice to increase postpartum screening rates using provider and patient education toolkits and provider training. The project demonstrated high acceptance of provider and patient toolkit resources and improvements in prenatal education (Shellhaas et al., 2016*).* CDAPP's *Sweet Success* program was started as a pilot project in San Francisco in 1982 and is broadly credited with improved GDM care across California state (CDAPP, n.d.). Like the Ohio GDM Collaborative program, CDAPP's model of care is multi-faceted, and includes the ongoing support of affiliated practices.

The toolkit *Clinical Process Model: Management of Gestational Diabetes* was developed by clinical experts from Intermountain Healthcare's Women and Newborns Clinical Program and the Diabetes Workgroup Primary Care Program and is based on national guidelines and recent research (Intermountain Healthcare, 2017). Literature on the uptake and impact of CDAPP's and Intermountain Healthcare's provider and patient toolkits, is lacking.

More recently, a doctoral QI project in Oregon sought to improve the capacity and expertise of the health care team at a high-volume clinic to deliver best practices to women diagnosed with GDM (Ham, 2020). The team worked to optimize clinical workflow to ensure patients received GDM education within one week of diagnosis using a GDM lifestyle interventions toolkit, a compilation of evidence-based resources on the three tenets of GDM self-management. Within twelve weeks, the practice had achieved the delivery of these best practices at a rate of 52.54% compared to a baseline of 23.37% (Ham, 2020).

Taken together, the Translation Model and Knowledge-to-Action Framework informed this project's rationale for adapting available GDM evidence, resources, and tools, to build a toolkit that meets the educational needs of the local population. Pender's Health Promotion Model situates the three GDM self-management principles of nutrition, physical activity, and self-blood glucose monitoring (behavior-related interventions) within the context of the patient's life. By aligning with the Health Promotion Model, this project maintained the goal of improving RN/provider-to-patient education to increase patients' knowledge of their condition, along with building self-efficacy and confidence to realize and experience the benefits of the three principles of self-management.

Assumptions

This project was designed with the assumption that providing standardized evidence-based GDM patient education improves patient knowledge and self-efficacy for health promoting behaviors related to the three principles of GDM self-management. By developing and making readily available a GDM patient education toolkit, the health care team would deliver improved quality of care over time.

Aims

The global aim was to apply best practices in patient education for people with GDM. The process began with a glucose test that qualified for GDM diagnosis and ended at the patient's six-week post-partum visit.

Specific aim

By March 30, 2021 100% of Columbia Memorial Hospital (CMH) Women's Center providers and registered nurses (RNs) who provide GDM patient education will report they can find and deliver standardized evidence-based education on the three principles of GDM self-management: nutrition, physical activity, and self-blood glucose monitoring.

Context

This project took place in a women's health outpatient clinic (microsystem) in two locations in Clatsop County, Oregon. The clinic is one part of a larger multi-specialty medical group operating within a non-profit macrosystem which includes a 25-bed critical access hospital. In 2019, 93.8% of patients served by the clinic identified as non-Hispanic and 4.7% identified as Hispanic or Latinx. Patients were 96% White, 0.9% Asian, 0.6% Black or African American, 0.4% Alaska or American Indian, 0.3% Pacific Islander, 1.2% unknown (E.

Weidemaier, personal communication, Aug. 17, 2020). Patients are covered by the following insurance plans at the clinic: 44% Medicaid, 42% Commercial, 7.5% Tricare, 3.5% Medicare, and 3% self-pay (E. Weidemaier, personal communication, October 14, 2020).

The microsystem team is made up of three certified nurse-midwives (CNM), four obstetricians (OB), two RNs, six certified medical aides (CMA), two clinic managers, one ultrasound technician, one social worker, and administrative personnel. As an interdisciplinary practice, the providers (CNMs and OBs) share the patient panel, with OBs assuming primary responsibility for high-risk patients, which includes patients with GDM who require medication to maintain normoglycemia (A2GDM). Patient appointments occur in-person. Communication between the clinic and patients takes place during in-person appointments, via telephone or through the Cerner electronic health record (EHR) secure patient portal. Communication pattems between staff include once weekly RN/provider meetings with the clinic manager to conduct a chart review of high-risk patients and clinic updates. Similarly, the clinic manager and RNs meet on a weekly basis. A 15-minute morning huddle includes clinic managers, the front office lead, CMAs, and the on-call provider, if available to discuss clinic updates, the day's workflow and identify and troubleshoot potential issues and a daily email communication is sent to all clinic staff with a summary of this huddle. Electronic communication between providers, RNs and CMAs regarding patient care is accomplished through Cerner EHR using tools such as Patient To-Dos, Situational Awareness, Messenger Center as well as via email, and in-person.

The clinic's CNMs and OBs provide prenatal, intrapartum, and postpartum care for 300-350 women each year. In 2019, the clinic had 307 deliveries of which 41 patients had a diagnosis of GDM (E. Weidemaier, personal communication, Oct. 23, 2020), a GDM rate of 13.4%. Providers are responsible for communicating to the RNs when a patient has a diagnosis of GDM.

Prior to project implementation, after a GDM diagnosis, a 20-minute RN clinic visit would be scheduled as soon as possible. At this point, the RNs, using CDAPP's *Sweet Success* patient education materials, would deliver initial GDM education. One week following this visit and of self-blood glucose testing, a second clinic visit with a provider would be scheduled to review blood sugar values and manage their ongoing treatment accordingly. However, patient-specific barriers such as obtaining glucose monitors and strips, among other structural and social determinant of health as described in Pender's Health Promotion Model (Pender et al., 2002; Pender et al., 2015), meant that there could be delays with patients having a timely follow-up visit with a provider. The RNs maintain a "GDM Tracker List" which lists the name of each patient with GDM, whether they are diet- or medication-controlled (A1GDM or A2GDM, respectively), when they were last seen by a RN or provider, which medication(s) they use, and the name of their pharmacy. The RNs use this information to help ensure GDM patients are receiving timely care and help troubleshoot issues of patient access to blood glucose monitoring supplies (B. Harvey, personal communication, Sept. 9, 2020).

This project included pregnant patients who were diagnosed with GDM excluded patients with a prior diagnosis of type 1 or type 2 diabetes mellitus or patients who did not speak English or Spanish.

Interventions

The project had several parts: 1) development of an education toolkit for patients with GDM on the three principles of GDM self-management, 2) an educational in-service for all prenatal providers and RNs on the contents and delivery of the toolkit, 3) rapid cycle feedback using three PDSA cycles to promote engagement, monitor progress and make changes, and 4) a

pre- and post-project survey (Appendix B) of the providers and RNs to determine if the aims of the project had been met.

To guide development and implementation of the project, a QI workgroup was formed and composed of two RNs, two clinic managers, and two providers, one of whom was the doctoral student. One member of the workgroup was proficient in written and oral Spanish. Throughout the project, the workgroup utilized team members' recommendations provided via verbal and written feedback to develop, adapt, and adopt patient education materials for inclusion in the toolkit.

Prior to implementation, an in-person educational in-service on the toolkit was given and included all prenatal team members (providers and RNs) responsible for patient education and/or clinical workflow of patients with GDM. Copies of the PowerPoint slide presentation used during the in-service and brief description of the clinical workflow were made available for reference in the clinic's shared drive. The in-service served to: 1) familiarize the team with toolkit location and contents, 2) provide helpful teaching strategies to educate patients using the toolkit, 3) finalize systems (i.e., clinic workflow, roles and responsibilities), and 4) prepare the team for PDSA cycles.

Study of the Interventions

The IHI's Model for Improvement Framework and PDSA rapid cycle process was used to monitor progress and promote effectiveness of the project (IHI, 2017). The *plan* phase included completion of a pre-project survey by each team member who might conduct GDM patient education, finalized details on the tested change (Who? What? When? Where?), and the delineation of the data to be collected. The *do* phase included the implementation of GDM education with patients utilizing the new toolkit and use of toolkit questionnaires (Appendix A).

Monthly check-ins at RN/provider meetings was another mechanism to solicit and document recommendations for the following cycle. In the *study* phase, the workgroup conducted a qualitative data analysis of the total feedback from the *do* phase. The *act* phase included determining which feedback to develop and integrate, modifications of the existing toolkit contents, and adjusting clinical parameters and workflow for the following PDSA cycle. Three (3) PDSA cycles each lasted four weeks. In the final *study* phase at the end of the third cycle, a post-project survey was completed by six of the nine team members and their pre- and post-surveys were analyzed to evaluate the extent to which the project met its stated goals. The workgroup then decided to *adopt* the changes that had been made (IHI, 2017).

Measures & Analysis

The toolkit questionnaires were collected and compared with an audit of patient charts to determine toolkit usage rates. Descriptive and nonparametric statistics were used to analyze pre- and post-project survey results. Data were examined using Excel 2016. Descriptive statistics were used to describe the intervention team members, the mean values of pre- and post-intervention responses to each of the Likert-Scale survey questions. Nonparametric statistics using the Paired Sample T-Test were used to determine if there were significant differences in individual team member's pre- and post-project responses.

Ethical Considerations

GDM is strongly linked with stress, sedentary lifestyle, and poor nutritional status and is increasing in all socioeconomic strata. However, the risk for GDM is increased in women of color (Carolan-Olah, 2017) and studies have shown that structural and social determinants of health are inextricably linked to GDM. Access to nutritious and affordable food and physical exercise affect the development of GDM (Ragnardottir & Conroy, 2010).

Adherence to treatment recommendations is poorest for women with socioeconomic barriers (Carolan-Olah, 2017). Across a diversity of racial and ethnic representations, low-income women with GDM experience similar communication, personal, and environmental barriers to care. Increased cost of different healthy foods, transportation, and competing demands limit improvement to nutrition and physical activity (Oza-Frank et al., 2018).

A "one size fits all" treatment plan has been a common approach to the treatment of GDM (Yuen & Wong, 2015). Indeed, studies of diverse populations of women have found that there is a dissonance of the GDM eating regimen with cultural practices and lack of information about traditional foods (Craig et al., 2020). It is unethical to subject women to treatment without regard to cultural preferences or language, which, when combined with a fragmented system of care, has been shown to increase confusion (Ghaffari et al., 2016), diabetes distress (Kopec et al., 2015), and further marginalize populations of women with ethnic descent in western societies (Parsons et al., 2018). Because the diagnosis and treatment of GDM can have wide-reaching consequences, it may also be important to consider the harms and where possible, avoid unnecessary burden to vulnerable women (Craig et al., 2020).

In this QI project, toolkits were developed in English and Spanish languages and therefore had the greatest impact on these populations. To help reduce the dissonance between medical nutrition therapy and cultural practices, the Spanish version of the Ohio GDM Collaborative toolkit was selected, in part, because it included examples of traditional foods from Mexico, the natal geography most represented by the local patient population. The Ohio GDM Collaborative has made available their materials in other languages (Arabic, Somali, and French) and could be used in future QI projects depending on the needs of the local patient population.

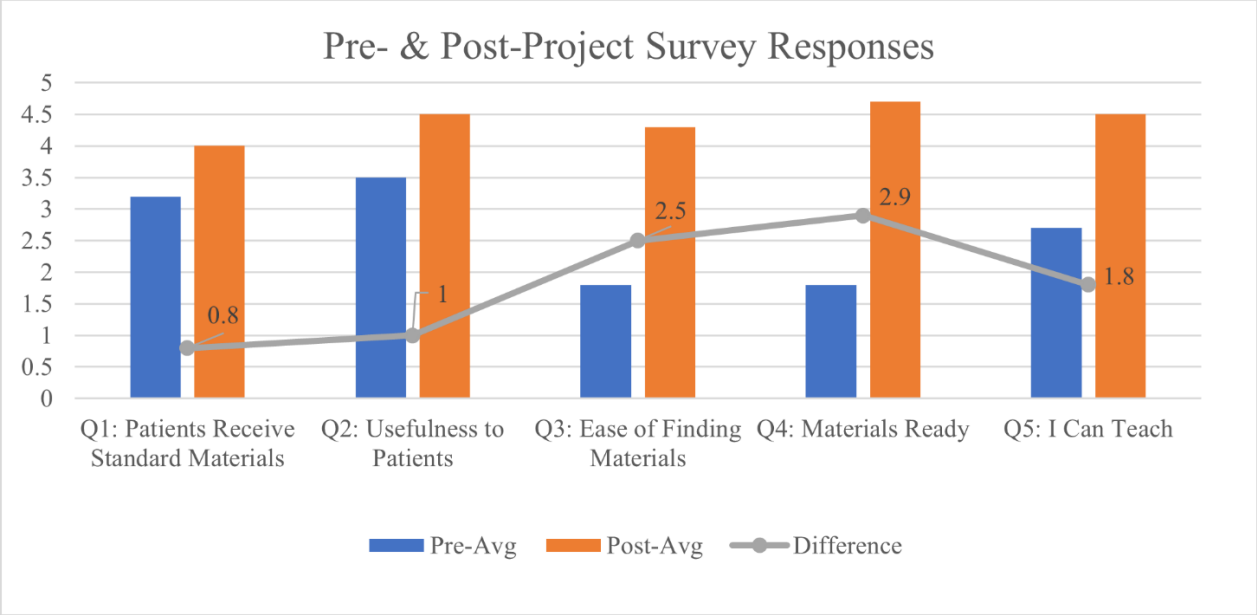
This project was submitted to the Oregon Health & Science University Institutional Review Board (IRB) and was determined not to be human research. There was minimal risk to patients. Upon delivery of a toolkit to a patient, a member of the healthcare team used the toolkit questionnaire to report on use of the toolkit, their perception of its usefulness to the patient, and to provide feedback for improvement. An EHR report of new GDM diagnoses during the project period was compared with the number of toolkits delivered to ensure a 100% usage rate; however, no patient identifiers were retained for the analysis or reporting of data. Pre- and post-project survey data were collected on the healthcare team only. No conflicts of interest were identified.

Results

Because the total number of patients diagnosed in each PDSA cycle was anticipated to be very few, each patient diagnosis represented a significant opportunity to gather RN or provider feedback on the toolkit contents. Thus, the goal was to reach 100% of patients diagnosed with GDM. A query of the EHR reported there were four GDM diagnoses during January through March 2021, all of whom received the new toolkit during their initial GDM education visit. Thus, a 100% delivery rate was achieved. Additional toolkits were delivered to two patients who had GDM during the study period (but had been diagnosed prior to the project's initiation) and to one patient with obesity who desired information on eating better in pregnancy. Thus, seven toolkits were delivered in total. GDM toolkit questionnaires were completed after the delivery of each toolkit (7) and the resulting feedback gathered from all questionnaires was used to make changes for the following PDSA cycle.

Figure 3

Pre- and Post-GDM Education Project Survey Results

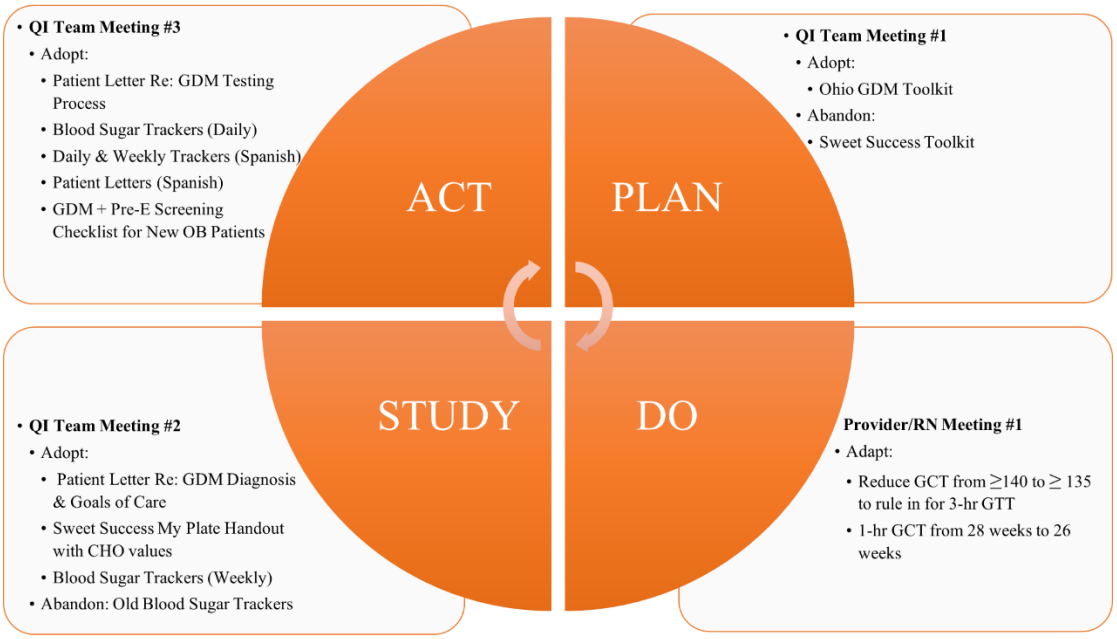


Six out of nine team members (67%) completed both the pre- and post- project surveys. Surveys were matched using a self-assigned unique identifier number specific to that individual (their birth month and day, excluding year), and remained anonymous to the data analyst. Using the Paired-T Test and a 95% confidence interval, the mean of the differences for each of the Likert-Scale survey questions were determined to be significant. However, the specific aim of 100% rate of RNs and providers reporting they can find materials and easily teach the tenets of GDM self-management was not achieved. While five out of six members reported that materials were easily found and ready for use either *most of the time* (4) or *all the time* (5), one individual reported they *disagreed* (2) that they could easily find materials although *agreed* (4) they were ready for use. Similarly, five of six members ag*reed* (4) or *strongly agreed* (5) they could easily teach patients, with the same individual reporting a slight improvement from *disagree* (2) to *neutral* (3) on being able to easily teach patients. Thus, the project achieved its stated specific

aim for 83% of survey respondents, with the remaining 33% of clinic providers and RNs opinions not being known.

Figure 4

Summary of PDSA Cycle Actions



During the first workgroup meeting, it became apparent that to improve GDM patient education, the timeline for when patients receive a GDM diagnosis was an important aspect to address. Provider-to-RN and RN-to-patient communication, patient-specific barriers, and self-blood glucose testing supply/pharmacy issues had all contributed to delays in patients' diagnoses, education, and treatment. Thus, the first RN/provider meeting included a discussion of changes to clinical workflow and diagnosis parameters in addition to the education in-service on the GDM toolkit. To address identified barriers resulting in delayed care and better align with clinical guidelines, the timing and threshold values of the 1-hr glucose challenge test (GCT) were adjusted. To rule in for the 3-hr glucose tolerance test (GTT), a new value of ≥135 (reduced from ≥140) was adopted. The timing was changed from 28-weeks to 26-weeks gestation. As a result

of the change in timing, the four patients diagnosed during the PDSA cycles received treatment an average of 2¼ weeks earlier compared to the four patients with GDM who were diagnosed just prior to the initiation of the project. Also of clinical importance to accurate and timely diagnosis, risk assessment guidelines for conducting early glucose testing were not uniformly being followed for patients with risk factors for pre-existing T2DM. ACOG Clinical Risk Assessment Guidelines for Overt Diabetes (2018) were adopted and a new risk assessment form for all new prenatal patients was agreed upon and created (via email communication) in the first cycle but not implemented until the third PDSA cycle.

The second and third RN/provider meetings were more time-limited and addressed questions that clarified other workflow related to GDM screening and diagnosis, such as when third trimester labs should be drawn (with or separate from the 1-hr GCT) and how to use the GDM clinical risk assessment checklist without RN availability to conduct new OB patient intake. Feedback about toolkits was solicited at each meeting, however only one provider apart from the doctoral student had the opportunity to use the new toolkit with a patient. The provider reported that they liked the new toolkit and the patient found it "very helpful and motivating". Both RNs and providers reviewed and gave edits to new toolkit materials that were adapted or developed via email communication.

Challenges

By choosing to address clinical parameters and workflow issues in addition to the original aims of the project, more of the already-limited RN/provider meeting time was required to consider each change proposed by the GDM workgroup. Using the meeting time in this way may have detracted from the project's specific aim to prepare RNs and providers to use the toolkit.

Instruction given to providers on the contents and use of the toolkit was pushed towards the end of the meetings and was somewhat rushed to cover everything while not going over time.

Due to the COVID-19 pandemic and increased concerns for exposure, workplace gathering rules required that in-person RN/provider meetings be changed to a virtual format. As a result, several barriers to full attendance became evident. Some providers joined the meeting by phone instead of by computer, and therefore did not have access to the visual presentation of materials. It is well understood that by using a phone one can easily miss important discussion points (Oeppen et al., 2020). Even when virtual online attendance is possible, by using a computer interface to attend meetings, it is easy to become distracted by other work-related matters (Oeppen et al., 2020). There was no mechanism in place to track who had been present for each meeting, and meeting notes were inconsistently produced, thus some project details were likely missed. As decided by the workgroup, a partial solution to these challenges was to include an additional slide set with voiceover about the project and toolkit contents that could be accessed in the clinic's shared drive.

Staff changes and shortages during the study period impacted this QI study. A critical shortage of MAs necessitated that RNs were needed to fill their role and this reduced the capacity to follow-through on workgroup tasks. One example of how this impacted the project is that prior to the shortage, the RNs conducted the new OB patient intake. However, the new GDM workflow necessitated RNs to complete the ACOG Risk Assessments for overt diabetes (2018) as a part of their intake. With RNs no longer available, a patient self-risk assessment checklist was created, and this required a system "Forms Committee" approval, resulting in not only a delay for implementation of this aspect of the improvement project, but also an inability to gather feedback about the risk assessment prior to the end of the project. Additional shortages

have occurred since the project finale, and while outside the scope of this report, point to the need for under-resourced settings to have a well-documented workflow and easy-to-use, standardized, accessible materials for use with patients who have GDM.

Discussion

This project, with the work of a new QI workgroup and an interdisciplinary team of prenatal care providers, adopted standardized GDM patient education materials, a risk assessment tool to identify patients who qualify for early screening, nutrition and blood glucose monitoring logs, and patient communication materials ("CMH Women's Center GDM Toolkit"). The toolkit, along with workflow changes to the GDM clinical risk assessment process, diagnostic parameters and timeline were accomplished using the IHI's Model for Improvement and PDSA rapid cycle process. In its entirety, the CMH Women's Center GDM Toolkit contents include: 1) patient self-risk assessment checklist for early glucose screening, 2) two letters to patients about the screening and diagnosis/treatment processes, respectively, 3) Ohio GDM Collaborative patient education toolkit, 4) daily diet, blood sugar, and medication log, 5) weekly blood sugar and medication log, and 6) CDAPP's *Sweet Success* MyPlate for Gestational Diabetes handout. All toolkit contents are available in English and Spanish as hard copies at the RN's workstation or on the clinic's electronic shared drive.

The costs of the project were minimal and included Spanish translation services of a third-party vendor of patient materials, including letters, blood sugar trackers, and risk assessment form. Other costs included shipping of the Ohio GDM Toolkits, and photocopy and folder costs.

Different aspects of this work could be generalized to many settings. They may be most relevant to under-resourced smaller settings where RNs and providers are called upon to be

"generalists" and need to be prepared to teach patients on the three principles of GDM self-management. According to ACOG, in the absence of a RDN, providers must "…be able to provide recommendations to the patient based on three major nutritional components" (2018, p. e53).

Improvement in the RN and provider experience of clinical workflow and education materials was a good first step towards the betterment of the patient experience. A future effort of this kind could conduct a formative assessment of RNs and providers to identify and fix gaps in knowledge, rather than assume that knowledge translation has occurred after a meeting or e-mail communication. It may also prove helpful to track provider participation (rather than remaining anonymous) in pre- and post-surveys so that supportive follow-up can occur with team members, if needed. Other creative ways to engage prenatal care team members could be further explored.

Limitations of the project are that beyond the improvement, which focused on the prenatal care team, it remains unknown to what extent the patient experience of their diagnosis and treatment, knowledge, and self-efficacy improved. Valuable future research projects could evaluate whether this QI project impacted the patient experience of their diagnosis or treatment. Clinical outcomes could also be analyzed as well, i.e., the rate at which patients maintain A1 versus A2 GDM diagnosis or reduce the rate of T2DM following a GDM diagnosis. Additional limitations are that the toolkit was designed for English and Spanish speakers, which was specific to the patient population in this microsystem.

This QI process, which made available all toolkit materials in an electronic format and the coinciding COVID-19 pandemic, which necessitated the improvement of access to virtual telehealth visits, elucidated new ways in which this rural clinic could expand person-centered

care. Because toolkit materials were made available in an electronic format on the clinic's shared drive, they could be sent to patients via the EHR. Then, GDM education and follow-up visits could be done virtually, diversifying the avenues in which patients receive standardized GDM education. This would be a new process that could benefit the clinic's patients who are impacted by structural and social barriers to healthcare—the clinic's most rural patients, those with limited access to transportation, and/or have other children, but due to COVID-specific clinic policies are not allowed to bring their children to appointments.

Conclusions

This rapid cycle change process improved the prenatal care team members' ability to find and use standardized GDM education materials. Team members reported improvements had been made to provide standardized materials to patients with GDM and that the materials are more useful to patients than prior to the project's initiation. The toolkit questionnaires completed after each GDM education visit and the feedback solicited at monthly meetings and via email communication allowed for multiple avenues for team members to participate in the improvement process. Recommendations were developed and integrated into successive PDSA cycles.

While the project's specific aim was missed, the global aim was achieved. The GDM workgroup believed this QI project exceeded expectations because the process also addressed ongoing clinical workflow concerns that had previously resulted in delayed care to people with GDM or pre-existing T2DM. Furthermore, it built the capacity to advance person-centered care of the clinic's most vulnerable population. The initiation of a more formalized QI process, which included the formation of a team and use of PDSA rapid improvement cycles, was a new process

for this clinic and could be used as a framework for future QI projects at this clinic and other specialty clinics within the macrosystem.

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Appendix A

GDM Toolkit Questionnaire

Instructions: Please fill out this brief questionnaire each time you use a GDM toolkit and return to GDM inbox. They will be used to monitor progress and guide improvement of the toolkits.

Your Name:_____ Date:_____ Toolkit #: ____

1. Including this pregnancy, how many times has this patient been diagnosed with GDM? (Check One):

   - ☐ 1st Time
   - ☐ ≥ 2 Times

2. How much time did you spend on GDM education with this patient?

   _____ minutes

3. Which toolkit materials did you use in your teaching of this patient?

	Yes	No	If no, please explain why not
Blood Glucose Self-Monitoring			
Physical Activity in Pregnancy			
Nutritional Therapy			

4. After your teaching of the toolkit contents, did you perceive that there was any information that remained unclear to the patient?

   - ☐ No
   - ☐ Yes (please describe) _____

5. Did you have any problems accessing or using the toolkit? (Check One):

   - ☐ No
   - ☐ Yes (please describe)_____

6. What should be changed about the toolkit to make it more useful to patients? _____

   _____

7. What should be changed about the toolkit to make it more useful to you? _____

   _____

Additional Comments/Recommendations:

Appendix B

Pre- and Post-GDM Education Project Survey

Date: _____ Your Birthday Day & Month (i.e., Feb. 4 = 0204): _____

1. Astoria Women's Center patients with GDM *receive standardized evidence-based materials* on the three principles of GDM self-management (nutrition, physical activity, & self-blood glucose monitoring)…
   - ☐ All of the time (5)
   - ☐ Most of the time (4)
   - ☐ About half the time (3)
   - ☐ Less than half of the time (2)
   - ☐ Rarely (1)

2. The GDM education materials used at Astoria Women's Center are *useful to patients*…
   - ☐ All of the time (5)
   - ☐ Most of the time (4)
   - ☐ About half the time (3)
   - ☐ Less than half of the time (2)
   - ☐ Rarely (1)

3. I can easily *find materials in the clinic* to help teach patients about the three principles of GDM self-management (nutrition, physical exercise, & self-blood glucose monitoring).
   - ☐ Strongly Agree (5)
   - ☐ Agree (4)
   - ☐ Neutral (3)
   - ☐ Disagree (2)
   - ☐ Strongly Disagree (1)

4. GDM education materials are *copied, compiled and ready for use*…
   - ☐ All of the time (5)
   - ☐ Most of the time (4)
   - ☐ About half the time (3)
   - ☐ Less than half of the time (2)
   - ☐ Rarely (1)

5. Using the patient education materials available in the clinic, I can *easily teach patients* on the three principles of GDM self-management (nutrition, physical exercise & self-blood glucose monitoring).
   - ☐ Strongly Agree (5)
   - ☐ Agree (4)
   - ☐ Neutral (3)
   - ☐ Disagree (2)
   - ☐ Strongly Disagree (1)