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Navigating a 'Perfect Storm' on the Path to Prevention of Type 2 Diabetes Mellitus After Gestational Diabetes: Lessons from Patient and Provider Narratives

Lois McCloskey[1] · Marlena L. Sherman[1] · Meryl St. John[1] · Hannah Siegel[1] · Julie Whyte[1] · Ronald Iverson[2] · Aviva Lee-Parritz[2] · Judith Bernstein[1]

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Abstract
Objectives Complications of pregnancy such as gestational diabetes mellitus (GDM) forewarn future chronic illness and disability, and demonstrate the need for a life course approach to prevention. Our study had two aims: (1) to elucidate how experiences reported by patients and providers converge to facilitate or impede follow-up care after GDM, and (2) to elicit recommendations for system-level changes to enhance prevention across key care transitions. *Methods* We conducted in-depth interviews with 30 GDM patients and 29 providers of maternity, specialty and primary care in an urban safety hospital network, and used a three-tiered thematic analysis to interpret their narratives. *Results* Findings reveal that a 'perfect storm' gathers on the path to prevention across stages of care. At diagnosis, patients feel profound anxiety about the debilitating effects of type 2 diabetes mellitus in their communities, providers choose reassurance over risk communication, and both focus primarily on the birth of a healthy baby. Providers report that clinical teams often lack coordination, and confuse patients with a barrage of often-inconsistent advice. In the postpartum period, providers juggle competing clinical priorities and mothers juggle overwhelming demands; for both, the recommended 2-h oral glucose tolerance test is too arduous for women and providers to do as prescribed. Finally, the transition from maternity to primary care is complicated by communication barriers between clinicians and patients, and between maternity and primary care providers. *Conclusions for Practice* Respondents propose systems innovations to open communication between provider specialties in order to bridge the chasm between reproductive care and life course prevention.

Keywords Pregnancy · Gestational diabetes mellitus · Diabetes · Postpartum · Life course · Prevention

Significance

Low rates of postpartum type 2 diabetes screening and the myriad barriers to follow up of women with a gestational diabetes mellitus (GDM)—affected pregnancy, are well documented. Our study is the first to integrate the analyses of patient and provider narratives, uncovering how their respective challenges—from diagnosis of GDM through the transition to primary care- coalesce, reinforce each other, and further magnify the systems failures that impede ongoing monitoring and self-care to prevent the onset of T2DM. Our findings point to the need and promise of a woman-centered medical home to knit together maternity and primary care.

Introduction

In an important article marking the twentieth anniversary of the National Center for Chronic Disease Prevention and Health Promotion (NCCDP) in 2009, Collins and colleagues highlighted the strong "ties that bind" maternal and child health (MCH) and chronic disease prevention and called for more collaboration between the fields. Evidence continues to mount from basic and population science to support

✉ Lois McCloskey
loism@bu.edu

[1] Department of Community Health Sciences, Boston University School of Public Health, 801 Massachusetts Ave., Ste 436, Boston, MA 02118, USA

[2] Department of Obstetrics and Gynecology, Boston University School of Medicine, Boston, MA, USA

their call, demonstrating how the key chronic illnesses of our time—obesity, diabetes, and asthma—have roots in the womb and are transferred across generations (Dabelea et al. 2000). At the same time, the life course perspective has come to prevail in MCH theory and practice, and provides an ideal framework to enhance the connections between MCH and chronic illness prevention (Lu et al. 2010; Pies and Kotelchuck 2013). Health complications that emerge as a result of added metabolic stress during pregnancy, such as gestational diabetes mellitus (GDM), gestational hypertension, and excessive weight gain, signal underlying risk for women's own future health as well as their infants', and present the impetus for a coherent longitudinal approach to prevention.

Unfortunately, there is compelling evidence to suggest that links between maternity and preventive care for women are weak and often non-existent (Walker et al. 2015). For example, an analysis of claims data among women with either commercial or Medicaid insurance showed that 40% of women with a pregnancy complication associated with future chronic disease risk do not visit a primary care provider (PCP) in the year after giving birth (Bennett et al. 2014). If the pathways to the chronic illnesses anticipated by pregnancy complications are to be interrupted and subsequent disease prevented, we need health care practices and systems able to respond to 'flashing yellow signals' in pregnancy.

Our study addresses one pregnancy complication that is common, costly, and a harbinger of risk for type 2 diabetes mellitus (T2DM)—GDM. The condition is present in 7–18% of pregnancies, with disproportionately high rates among Native American, Asian, Hispanic, and African American women (Dabelea et al. 2005; Shai et al. 2006). Women with a GDM-affected pregnancy have a sevenfold higher risk for T2DM in the decade after delivery than their non-GDM counterparts, a cumulative incidence of 60% over 10–20 years, and a 45% chance of recurrence in subsequent pregnancies (Kim et al. 2002, 2007).

Prevention is possible, yet often not pursued. As a first step to prevention, the American Congress of Obstetrics and Gynecology (2013) and the American Diabetes Association (2004) recommend postpartum glucose tolerance testing, followed by yearly glucose screening for those with elevated postpartum levels and every 3 years for those with normal levels. Early detection as well as lifestyle changes can delay or check the progression to T2DM (Ratner et al. 2008). Despite the evidence of preventability and high levels of knowledge about the professional guidelines among obstetricians (less so among family medicine physicians), glucose tolerance testing and follow-up of women after a GDM-affected pregnancy during and after the postpartum period is exceedingly under-utilized (McCloskey et al. 2014; Shah et al. 2011).

A growing number of qualitative and multi-method studies have investigated facilitators and barriers to postpartum follow up after GDM (Bennett et al. 2011; Paez et al. 2014; Steub et al. 2010; Van Ryswyk et al. 2014) from the perspective of patients or providers. Collectively, studies have identified a range of emotional and practical barriers to follow-up after GDM, including fear of T2DM, the need for childcare and other concrete supports, and competing demands of new mothers. Our study broadens the inquiry to include the trajectory from prenatal through postpartum care (and beyond) and is the first to integrate perspectives of patients and providers. Our aim is to elucidate how the experiences of providers and patients converge to either impede or facilitate attention to women's ongoing health after a complicated pregnancy, and to identify strategies, particularly at the systems-level, to pave the way for continuity in ongoing preventive care for women at risk of T2DM.

Materials and Methods

Study Design

The qualitative study used in-depth interviews to elicit the narratives of women about their experience of GDM, following the timeline from diagnosis and managing the complexities of the condition during pregnancy, through delivery, the postpartum care and the months beyond; and the narratives of providers about their experience caring for patients with GDM, along the same continuum of care (Thorne 2008). The providers and patients were not matched, as it was not our intent to compare the perspective of patients and providers on a case by case basis. Rather, our aim was to more generally examine the tensions and complementarities in how patients and providers approach GDM and its follow up, with an eye toward postpartum testing and counseling and education related to future risk. Methods of design, recruitment, conduct of the study, and thematic analysis were guided by and conformed to CORE-Q standards for study quality (Tong et al. 2007).

Setting

The setting was Boston Medical Center (BMC), an academic safety-net hospital that serves a diverse urban population, and one affiliated neighborhood health center. The study was approved by the Boston University Institutional Review Board, and conducted between March, 2013 and June, 2014.

Sample and Recruitment

We recruited two convenience samples consisting of: (1) clinicians whose practices include the management of GDM

during and/or after a GDM-affected pregnancy (N = 29), and (2) GDM-affected patients who had given birth within the prior 5 months (N = 30). Clinicians: We sought to interview a total of 30 clinicians from a range specialties, including: (1) obstetrics and maternal fetal medicine; (2) family medicine; (3) nurse-midwifery; (4) endocrinology; and (5) internal medicine. We successfully recruited 30 clinicians, though at the end of the study one was not able to complete the interview. BMC-based clinicians were informed about the study via announcements at grand rounds, emails from a co-investigator and word-of-mouth. Those interested were invited to contact the study manager. Interviews were conducted by telephone or in person, after consent and with assurance of confidentiality. Upon completion, clinicians received a $75.00 *Amazon* gift card. Patients: We sought to and successfully interviewed 30 women who had had GDM within the prior 5 months, and who were from diverse racial and ethnic backgrounds. We posted flyers in prenatal clinics and also recruited through provider referrals. Women who had been diagnosed with GDM within the prior 5 months, who were > 18 years of age and whose primary language was English, Haitian Creole, or Spanish were eligible for the study. Patients were prompted to contact the study manager if interested, and upon completion of an interview, each was given a $50.00 *Target* gift card.

Data Collection

We used a semi-structured interview format to elicit providers' and patients' experiences and challenges related to GDM, following a timeline from prenatal care through the postpartum period and transition to primary care. The interview schedule, provided as an online supplement, included both known challenges derived from the literature and open-ended questions to elicit the narratives of interviewees. Interviews with providers were conducted in person or by phone by the principal investigator or project manager. Interviews with patients were conducted by a research assistant, matched by language and to the extent possible, racial/ethnic background of the interviewees, in a place of their choosing. They were audiotaped with consent and transcribed verbatim. The co-investigators trained the research assistants in the art and science of conducting in-depth interviews.

Data Analysis

Our analysis followed a grounded theory approach (Glaser and Strauss 1967) and applied standard qualitative analysis procedures and methods (Rice and Ezzy 1999). The analysis team consisted of the two principal investigators (LMC, JB), the project manager (MSJ), and three MCH fellows (MS, HS, JW). We used the first five transcripts of patients and providers to develop a coding scheme for each, identifying key themes within each stage of care. To assure interrater reliability, two team members were coded the same transcripts (x five transcripts); we discussed differences and came to consensus about how to apply the codes. We then used cloud-based qualitative data analysis software (Dedoose®) to apply codes (themes and sub-themes) to the remaining interviews texts. Upon completion, we grouped material by themes and sub-themes, and produced analytic reports for each. Such reports allowed us to retain the context for all spoken narratives/quotes and to summarize the key meanings within each theme or sub-theme. Our interpretive and comparative analysis focused on three 'big picture' questions: (1) what are the salient themes for each (patients and providers) along the time line; (2) how do the experiences of patients and providers from diagnosis through 1 year postpartum converge to facilitate or impede postpartum glucose tolerance testing and the launch of long-term preventive care; and (3) what do their narratives tell us about the systems-level challenges to a life course approach to prevention of T2DM among women with known risk? We use illustrative quotes to flesh out the meaning of identified themes.

Sample Characteristics

The 29 providers included six obstetricians, five family medicine physicians, eight certified nurse-midwives, two endocrinologists, and three internal medicine primary care physicians, with 1–25 years of practice. Among the 30 patients, eight identified as Latina (Salvadoran, Colombian, Puerto Rican, and Brazilian); seven as Haitian; five as African; two as African-American; and three as Asian; and two White, with race/ethnicity data missing for three participants. Interviews with women were conducted predominantly in English (16), Haitian Creole (7) and Spanish (7). The age of participants ranged from 18 to 44, with the majority 30–39. Approximately half of the patients (14) were unemployed at the time of the interview; seven were employed full-time and four, part-time; and three women reported being food and housing insecure. The majority of women in the sample were insured by Medicaid.

Results

Tables 1 and 2 show the key themes at the three stages along the continuum of care, with illustrative quotes derived from patient (Table 1) and provider (Table 2) narratives.

Prenatal Care: Diagnosis, Education, and Management

Patients' fears, overwhelm, and confusion about the meaning of GDM converge with providers' reluctance to emphasize future risk, leading to communication gaps.

We found fear and overwhelm to be common themes in patients' narratives recalling their GDM diagnosis and the

Table 1 Themes and illustrative quotes from patient narratives (N = 30)

Prenatal care		Postpartum care	Transition to primary care
GDM diagnosis	GDM education and management	Screening and follow up	Ongoing monitoring and prevention
Fear and overwhelm (n = 15) *Fear* "My biggest fear was to keep suffering diabetes, because it's a very treacherous disease…. I have a sister-in-law who suffers of that and she lived here with me, when my son's father died, she helped me a lot, but she's a diabetic and I saw her, how she suffered when her sugar got too low or too high I said "Oh God, I hope I don't suffer that because.." that was my panic. When I had the girl, "God, don't let her have anything like that." But thanks to God…" *Overwhelm* "It was crazy. I really didn't…it was very overwhelming when I heard I had diabetes, especially when they show you, um, how much the sugar is supposed to be, how much you're supposed to eat and what you're not supposed to eat. And so I start to feel like maybe the child is going to be so big and all of that, so that was one thing. It was big for me because I used to have high blood sugar before, so after this diabetes was the second big thing I ever heard"	**Confusion (n = 22)** *Disease* "Um..they told me she's healthy 'cuz that was like my first thing you know, if I had diabetes is she going to have diabetes? ... and they told me that as far as gestational diabetes is [concerned] it's really me it's not really her. I said well damn then how come—how come I got it from being pregnant with her and she ain't got it and I got it" *Diet* "That things like pasta broke down to become sugar and I couldn't really eat, I had to eat portioned and I never really knew how to do portions and had to do that, so it was so much work. And I was already underweight and pregnant, so to cut out the pastas and stuff like that really sent me into a funk. It was like, well I'm underweight but I can't eat two portions of rice a day and I like rice. It was so confusing" *Test* "I told her [mom] that they say I have diabetes" and she said, "Don't mind what they do, they give you sugar water to drink and then they test you for diabetes." [laughs] It was funny. She said, "They give you the sugar water?" I said, "Yes." She said, "You see there? How can you give somebody sugar to drink and then you're going to have to test it? That means they're going to find the sugar"	**No one's priority (n = 13)** *Not my priority* "I supposed to be ask them to continue the test but I didn't ask because I have not time…yeah, so now I didn't have time to shower, how I get a blood test?" *Not my provider's priority* "No one asked me to do that, and I tested it myself, and everything was good. And so I didn't make an appointment to check that." [When asked if she had thoughts about her GDM after delivery] "No, because since I went to the appointment of six weeks and the doctor didn't mention anything, I stayed calm. Maybe it's over"	**Relief (n = 15)** *Relief and no test* "Yeah, and I had a test for cholesterol and for this diabetes and she said everything is perfect; I don't have it now. I can tell you I was so happy. I feel like I was, I have something heavy and I throw it now" *Relief after test results* "It was hard for me to know that I had it. That morning [of diagnosis], I cried because I always hear people talking about high blood sugar but I thought, "Me?" I didn't want to suffer and that really surprised me. But what comforted me afterwards was when they told me it could be temporary…. So, that made me feel better and that's why I was eager to return to the hospital again after my delivery to see if they still saw it, but I didn't have it"

Table 2 Themes and illustrative quotes from provider narratives (N = 29)

Prenatal care		Postpartum care	Transition to primary care
GDM diagnosis	Education and management	Screening and follow up	Ongoing monitoring and prevention
Risk vs. reassurance (n = 14) "Yeah, exactly, they don't feel they are sick. They're pregnant, [...] we present it like 'okay, you have GDM, it's a potential risk, but it's not technically affected the baby per se.' I think we may be part of it… that we maybe simplify it so they don't see it as 'oh it's not going to kill my baby right'" [CNM]	**Complex message/needs (n = 23)** **"**I give the spiel. But we aren't good at figuring out on the menu of items a patient needs …to make sure they get the information they absolutely need that day from that provider. *So I, just like many doctors, have become an educator …and I will spend over 50% of my time on teaching nutrition*" [Endo]	**Wrong time, wrong test (n = 24)** *Wrong time* "It's not a really easy test to coordinate because we tend to see people up to 6 weeks and then the disengagement happens and it's not ideal" [CNM] *Wrong test* "...You know, a 2 h test is exponentially more difficult to arrange than a 1 h, especially when people have babysitters and a lot of people do and they are taking public transportation. In my previous practice, we were able to give people the glucolas to take home, and then have them drink it before they came, and have them get their blood test. And that was very successful, and that was an entirely different patient population" [OB]	**Who's responsible? (n = 15)** *OB responsibility ends at 6 weeks* "A two hour GTT should be done at six weeks postpartum, but … um… how often that actually gets done I actually don't know because I don't find out, unless they have some complication that brings them back to me in the hospital, I don't really follow up on them" [OB] *PCP gap* "Sometime we are not as good at that. Sometimes I think we our self, forgot about the follow up care, you know". We say, "Oh, pregnancy's all done, she's had baby, you know, she's doin' fine….We don't really follow up and see how's she doing a year after. And so, I don't think we really, know, until she's pregnant again and that's part of not being the PCP, yeah, you're not really following up closely. You are just like, we're done. She's had the baby" [OB]
Baby vs. mom (n = 10) "I focus on the effects of the baby being too large and how that could affect the baby. I don't get hung up on percentages and risk necessarily for the GDM population" [Endo]	**Team without a manager (n = 18)** "I think [GDM Management] takes multiple conversations to make that kind of sink in. Um, so I think the nutritionist comes to my exam room. The teaching nurse comes to see her, and she has her own office and schedules and patients, right? So I don't feel like I have the resources for that. So that makes it hard" [OB]		

information they received from their providers. For many, 'diabetes' is a personal and devastating reality in the lives of their families, and to realize that it would now be part of their pregnancy was deeply disturbing. Interviewees commonly told stories of an aunt, uncle, parent or friend suffering under the weight of endless blood monitoring, strict diets, as well as dialysis and amputations. For those without such stories, many were confused about how they could have the diagnosis when it 'does not run in the family'. A majority of women in our sample also expressed confusion about everything from the possible impact of GDM on their babies to how they could manage all of the dramatic and sudden lifestyle changes that the condition required.

Providers described two difficult balancing acts as they communicate the diagnosis of GDM: (1) communicating risks but still providing reassurance, and (2) addressing immediate dangers to the infant without minimizing future risks to the mother. Maternity care providers in our sample were all hyper aware of the significant fears that a GDM diagnosis can trigger among their patients, and did not wish to sound alarm bells during a vulnerable time. Providers noted the range of ways they reassure patients: empathy, partnering to negotiate lifestyle changes, and focusing on GDM as a short-term challenge. A few said they did acknowledge future risk by re-framing the diagnosis as a 'wake-up call' and opportunity to initiate self-care during a time [pregnancy] when there is emphasis on health and increased motivation for healthy behaviors. Overall, however, faced with juggling multiple agendas, crunched time, and anxious patients, most providers said they focus on immediate dangers to the infant and under-play long term risks to the mothers' health.

The complex messages that GDM entails and a multimember clinical team without a manager accentuate the prevailing confusion among patients as they try to understand and navigate GDM.

The large majority of women in our sample were confused by the disease, the diet, and the rationale behind glucose testing. Advice from various providers often made no sense to them: for example, how could the mom have a condition when the baby doesn't have it but there is risk for both of them; why would sugar water be required before a test for sugar in the blood; how could they be asked to eat fewer carbohydrates when already underweight? The majority of women in our sample told stories of extraordinary efforts to change their lifestyles despite this confusion, even re-thinking culturally-embedded eating habits and going against advice from family members, in order to follow clinical instructions for the sake of their baby's health.

Providers described the need for multiple referrals to nutritionists, nurse educators, maternal fetal medicine physicians, diabetes specialists, and endocrinologists to manage different facets of patient education and monitoring. All acknowledged that no one team member has sufficient knowledge or time to manage the totality of patient care on their own, and yet no one is designated to direct or coordinate the care. Thus, the theme, "team without a manager". As one interviewee stated, "The right hand does not know what the left hand is doing;" clinicians have no idea if or how other team members are advising the patient. One endocrinologist, for example, estimated that while every patient received a nutrition referral, only about 50% of patients ultimately had a visit with a nutritionist. Thus, she feels compelled to build nutrition education into her own visits. Providers describe major systemic barriers, including the absence of adequate time, to communicating with each other and assuring patients receive consistent messages. These pervasive challenges during the diagnosis and management of GDM set the stage for a confluence of obstacles to postpartum follow up and testing and transition to primary care.

Both providers and patients report frustration with the complexity and overwhelming demands of the disease. At the intersection of disorganized communication among providers and women's sense of overwhelm, it is easy for postpartum screening and future prevention messages to get lost during prenatal care.

Postpartum Care: Glucose Tolerance Testing and Follow-Up

Providers and patients have no time and no support for 'wrong test at wrong time.'

All women in our sample were quick to talk about the postpartum period as a busy and demanding time; their own health and health care is at the bottom of their list. Almost half reported that the prenatal care provider had not emphasized the postpartum glucose test, and women felt excused from acting on it if the test was barely mentioned. Even when informed about the test, women were deterred for logistical reasons: the need to fast overnight; the need for yet another appointment which challenges of child care and transportation; and the test itself (awful tasting sugar drink and need to wait 2+ h after drinking). In addition, some respondents repeated their fears about diabetes when talking about the postpartum test; they had no desire to show up for a test that might deliver bad news.

Providers also reported the crunch of competing priorities and the infeasibility of conducting the recommended test. More urgent matters, such as breastfeeding, infection management, and c-section healing crowd out conversations about glucose testing, especially in light of the complexity and inconvenience of the test and the absence of workable systems and protocols. Most were aware of the guidelines but described myriad logistical and systems issues that impede their motivation and ability to order, conduct, and communicate results of glucose tolerance tests in the postpartum period. Who takes responsibility for arranging a test? Should it be the delivering physician in case the patient does not return for a postpartum visit? And when? Providers are frustrated by the lack of discharge protocols and an electronic record system that does not allow for advance orders of lab procedures. And whose responsibility is it to issue a follow-up reminder or report results, when the patient has been appropriately discharged from a maternity practice weeks before an arranged test?

Both providers and patients have little time and motivation to perform or receive postpartum testing, and thus miss the opportunity to launch ongoing monitoring and the conversation about life course prevention.

Transition to a Primary Care Provider (PCP): Ongoing Monitoring and Prevention

After delivery, neither patients nor providers are focused on specific next steps and the brevity of the official postpartum period leaves little room for transition to primary care. Patients are relieved that GDM is over, and providers are plagued by murky job roles and a haphazard system for handoff from maternity to primary care.

Many patients reported enormous relief once the complicated pregnancy is over and the baby born safely. They can "throw it all down", as one respondent said—the fears, the worries, the restrictive diet and demands for lifestyle change. In some cases, patients described the relief (and accompanying worry) as an explanation for why they did not return for a postpartum test, and in other cases, they expressed the relief as a result of a negative glucose tolerance test after delivery.

Most maternity care providers stated that they leave follow-up care to the PCP. Once women complete the postpartum visit(s), obstetricians and nurse-midwives know little of what happens to the patients until they become pregnant again. As one CNM stated: "That is one of the biggest weaknesses in our system. I send a flag… I end up kind of dumping it in the lap of the PCP." All reported that there is no set protocol and no clear roles for completing the test nor reviewing results with the patient. There is a flag posted in the EMR alerting the PCP to the patient's GDM history and test and the hope that the PCP will pick it up from there. Of course, the most troublesome barrier of all is, "Some of my patients can't identify a primary provider."

Providers and patients view the end of the official postpartum period (and visit) as a discharge from the complications of pregnancy. Communication between maternity and PCPs is absent and their respective roles regarding GDM follow up, murky at best.

Providers' Recommended "Single Changes"

We asked each provider to reflect on the challenges they had described and to name a single systems change that s/he would recommend to improve GDM follow-up care. The most frequently mentioned "single system changes" consisted of electronic communications and data tracking initiated during prenatal care to patch the gaps in information across stages of care. Strategies range from e-flags in the EMR to the PCP or pediatrician and a lab order inserted in the discharge instructions, to a longitudinal tracking system of GDM patients managed by the diabetes educator who would remain connected to the patient. Several PCPs recommended that their training and continuing education be revitalized to clearly focus their role as 'glue people' to connect pregnancy follow-up to long-term preventive care. The next most frequently noted 'single systems changes' consisted of more labor-intensive and evidence-based innovations in the model of women's health care, such as group postpartum care for women with GDM (modelled after *Centering Pregnancy*™), and patient navigation (modelled after follow-up of abnormal pap smears and mammograms) (Zapka et al. 2004; Ickovics et al. 2007).

Discussion

GDM lies at the important intersection of pregnancy and chronic illness and presents enormous opportunities for prevention of T2DM over a woman's life course. Our qualitative study is unique in its inclusion of the perspectives of patients and providers across the spectrum of prenatal, postpartum and primary care, in order to elucidate how and why the known gaps in postpartum glucose tolerance testing and the less well-known gaps in the transition to primary care, occur. Because of the diversity of the women we interviewed, our findings have particular importance for minority communities who shoulder the disproportionate burden of GDM and T2DM (Dabelea et al. 2005; Shai et al. 2006).

In a meta-review of lessons learned from follow-up after an abnormal mammogram, Zapka et al. (2004) describe two major findings that apply to other processes of care for women: (1) it is critical to examine barriers to follow-up at patient, provider and systems levels, especially when care transition is involved; and (2) strategies to address these barriers must be multi-pronged.

We found a pattern of patient- and provider- and system-level barriers that coalesce into a "perfect storm" that gathers turbulence as the official postpartum period ends—in the void between reproductive and primary care for women. The storm batters the path to prevention of T2DM with heightened intensity at two key points: (1) the transition from pregnancy to the postpartum period (6–10 weeks), and (2) the transition from postpartum to primary care (11 weeks–1 year).

The Transition from Pregnancy to Postpartum Care: Technical and Interpersonal Barriers

Our study reinforces the findings of prior research regarding the logistical and emotional barriers to postpartum testing for new mothers (e.g. time pressures, emotional demands after childbirth and fear of long-term diagnosis) (Van Ryswyk et al. 2015a). We elaborate the technical/practical aspects of postpartum glucose testing that present huge challenges to patients and providers. By the postpartum period, clinicians know patients have 'blood sugar test' fatigue, especially for an OGTT, which requires an extra visit, fasting, long waits, and an unpleasant drink. The uncertainties about which test is 'really' necessary (OGTT, A1C, or PFG), when the test should be administered (at 6 or 10 week visit, or after), and how to implement it (order at discharge, or give lab slip at postpartum visit—and how to assure fasting and follow-up) are compounded by the competing demands on both postpartum providers and new mothers.

We add to the literature an understanding of how the communication dynamics between patients and providers during pregnancy pave the way for poor follow up of GDM in the postpartum period. Even as women in our sample experienced fear and trepidation upon hearing the "diabetes" diagnosis in light of the havoc the disease wreaks in their communities, providers are highly attuned to their fears and choose to tamp down the importance of future risks for mothers. Instead, they focus on mothers' immediate needs and the well-being of the baby. Thus, women enter the postpartum period without strong internal motivation for prevention or a clear directive from their provider about the importance of postpartum testing and ongoing monitoring. Likewise, women's profound belief and relief that their 'diabetes' is over once the baby is born converges with providers' overcrowded agenda for the postpartum visit and their wish not to disrupt the lives of new mothers with what they deem as a bad test at a bad time, and potentially bad news.

Communication obstacles among clinical providers on the GDM management team also emerged as early barriers to postpartum testing. GDM, a complex condition diagnosed late in pregnancy, calls for specialists, nurse educators, nutritionists at least, yet in our health system and likely many others, no one is designated as the team director or connector. Without a channel or system for cross-provider communication to let the team's 'right hand knowing what the left hand is doing', patients in our study reported being overwhelmed and confused by the barrage of information from various providers, often conflicting with advice of family members, with no one to help them sort it all out. Their confusion is matched by that of clinical team members who

find themselves in the dark about what others are saying or doing. Any solutions to poor follow up of GDM must address the technical complexities of glucose testing guidelines and protocols, the dynamics of patient-provider communication and obstacles to intra-provider communication as it extends from diagnosis through postpartum care.

Transition from Postpartum to Primary Care Gap: System Lacking, Roles Murky

Our study further elaborates what others have speculated based on separate patient (Martinez et al. 2017; Paez et al. 2014) and provider (Van Ryswyk et al. 2014) reports—how the absence of set protocols, existing infrastructure, and clarity in provider roles during the transition from postpartum to primary care, leads to uncertainty about who is responsible for what after the postpartum visit. Provider- and system-level ambiguities intersect with patients' preference to avoid further attention to their own risk for T2DM, and lead to an uncertain future of monitoring and prevention. At the same time, critical messages to women about the importance of preventive self-care, not emphasized during pregnancy and postpartum care, are also lost in the chasm that exists between the official postpartum period and the initiation of primary care. In fact, in light of low rates of postpartum screening after GDM and the systems void that exists after the postpartum visit, the ADA and ACOG recently revised guidelines to urge the OGTT be administered as early as 4–6 weeks post-delivery (ADA 2017). However, our findings suggest that the widening of the window will do little to address the actual barriers—both personal and systems-based—to adequate follow up and prevention after GDM. More significant is the recent ACOG committee opinion which re-defines the postpartum visit to include glucose testing and squarely places responsibility for connection to primary care for women after birth in the hands of obstetric providers (ACOG 2018).

Transitions in health care represent fruitful opportunities to connect past medical histories with future health and wellness. In the case of GDM, evidence of effective interventions to improve postpartum screening and follow up (e.g. text and postal reminders) have been limited to the highly surveilled and well-supported immediate postpartum period (Clark et al. 2009; Van Ryswyk et al. 2015b), and have had uneven results. Evaluations of system-based strategies that address the period after women are discharged from pregnancy/postpartum care are extremely limited and sorely needed (Yee et al. 2017).

Electronic 'patches' to the communication gaps and enhanced provider training to clarify roles, as suggested by providers in our study and by other commentators (Oza-Frank et al. 2014; Carson et al. 2013), will likely lead to incremental improvements in post-GDM screening and follow-up. The best hope of preventing T2DM among women after GDM, lies in a fundamental shift in our model of care for women in reproductive years—one that promotes a re-balancing of focus on the health of women and on continuity over time. A patient-centered medical home (PCMH) devoted to women, fashioned after original medical homes for children with special needs (Homer et al. 2008) and ACA-supported medical homes within primary care, is long overdue. PCMH's, built on the principles of prevention, collaboration, coordination, and patient engagement, have the potential to address the 'stormy' care transitions between prenatal, postpartum, and primary care (National Committee for Quality Assurance 2013). As noted by Friedberg et al. (2014), such models are likely to be most effective in improving quality, utilization and costs, if focused on individuals with known risk for chronic illness, such as women after a GDM-affected pregnancy. A cross-specialty, woman-centered PCMH would allow MCH professionals-both clinical and public health- to collaborate across specialties, heeding the call of Collins et al. (2009), and building the scaffolding for a life course approach to women's health care.

Study Limitations

Our study has several limitations. We include patients and providers from only two practice settings, one urban safety net hospital clinic and a related community health center, and focus on reporting themes drawn from their experiences. While other institutional settings with different follow up practices may give rise to different findings, GDM follow up has been found to be universally low, across types of settings. Based on prior research and speculation in the literature about barriers and facilitators to GDM follow-up care, we believe our findings may reflect those encountered in other healthcare settings. In addition, our study did not include a large number of PCPs or probes of women about their transition to primary care. Further research should focus more deeply on the period of time following the traditional postpartum visit.

Conclusion

Our combined analysis of patient and provider narratives reveal how their respective challenges in managing a GDM affected pregnancy from diagnosis through postpartum care and the transition to primary care, coalesce to impede ongoing monitoring and self-care to prevent the onset of T2DM. Women's profound anxiety about diabetes and providers' wish to emphasize reassurance over risk, influence the likelihood of postpartum screening and follow up after a GDM pregnancy, but it is the systems-level void between

maternity and primary care that most impedes the path to life course prevention for women known to be at high risk of T2DM. A life course approach to a women's medical home has the potential to knit together the torn patchwork quilt that Clancy and Massion (1992) described in their landmark analysis of gaps in women's health care.

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Compliance with Ethical Standards

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References

American Congress of Obstetricians and Gynecologists. (2013). ACOG practice bulletin. Gestational diabetes. *Obstetrics and Gynecology, 122*, 406–416.

American Congress of Obstetricians and Gynecologists. (2018). *ACOG committee opinion number 736*. Presidential Task Force on Redefining the Postpartum Visit.

American Diabetes Association. (2004). Gestational diabetes mellitus. *Diabetes Care, 27*, S88–S90.

American Diabetes Association. (2017). Standards of medical care in diabetes: Management of diabetes in pregnancy. *Diabetes Care, 40*, S114–S119.

Bennett, W., Ennen, C., Carrese, J., Hill-Briggs, F., Levine, D., Nicholson, W., et al. (2011). Barriers to and facilitators of postpartum follow-up care in women with recent gestational diabetes mellitus: A qualitative study. *Journal of Women's Health, 20*, 239–245.

Bennett, W. L., Chang, H. Y., Levine, D. M., Wang, L., Neale, D., Werner, E. F., et al. (2014). Utilization of primary and obstetric care after medically complicated pregnancies: An analysis of medical claims data. *Journal of General Internal Medicine, 29*, 636–645.

Carson, M. P., Frank, M. I., & Keely, E. (2013). Postpartum testing rates among women with a history of gestational diabetes: Systematic review. *Primary Diabetes Care, 7*, 177–186.

Clancy, C. M., & Massion, C. T. (1992). American women's health care: A patchwork quilt with gaps. *Journal of the American Medical Association, 268*, 1918–1920.

Clark, H. D., Graham, I. D., Karovitch, A., & Keely, E. J. (2009). Do postal reminders increase postpartum screening of diabetes mellitus in women with gestational diabetes mellitus? A randomized control trial. *American Journal of Obstetrics and Gynecology, 200*, 634 e1–634 e7.

Collins, J. L., Lehnherr, J., Posner, S. F., & Toomey, K. E. (2009). Ties that bind: Maternal and child health and chronic disease prevention at the Centers for Disease Control and Prevention. *Preventing Chronic Disease, 6*, 1–6.

Dabelea, D., Hanson, R. L., Lindsay, R. S., Pettitt, D. J., Imperatore, G., Gabir, M. M., et al. (2000). Intrauterine exposure to diabetes conveys risks for type 2 diabetes and obesity: A study of discordant sibships. *Diabetes, 49*(12), 2208–2211.

Dabelea, D., Snell-Bergeon, J. K., Hartsfield, C. L., Bischoff, K. J., Hamman, R. F., & McDuffie, R. S. (2005). Increasing prevalence of gestational diabetes mellitus (GDM) over time and by birth cohort. *Diabetes Care, 28*, 579–584.

Friedberg, M. W., Schneider, E. C., Rosenthal, M. B., Volpo, K. G., & Werner, R. M. (2014). Association between participation in a multi-payer medical home intervention and changes in quality, utilization, and costs of care. *Journal of the American Medical Association, 311*, 815–825.

Glaser, B., & Strauss, A. (1967). *The discovery of grounded theory: Strategies for qualitative research*. New York: Aldine DeGruyter.

Homer, C. J., Klatka, K., Romm, D., Kuhlthau, K., Bloom, S., Newacheck, P., et al. (2008). A review of the evidence for the medical home for children with special health care needs. *Pediatrics, 122*, e922–e937.

Ickovics, J. R., Kershaw, T. S., Westdahl, C., Magriples, U., Massey, Z., Reynolds, H., et al. (2007). Group prenatal care and perinatal outcomes. *Obstetrics and Gynecology, 110*, 330–339.

Kim, C., Berger, D. K., & Chamany, S. (2007). Recurrence of gestational diabetes: A systematic review. *Diabetes Care, 30*, 1314–1319.

Kim, C., Newton, K. M., & Knopp, R. H. (2002). Gestational diabetes and the incidence of type 2 diabetes. *Diabetes Care, 25*, 1862–1868.

Lu, M. C., Kotelchuck, M., Hogan, V., Jones, L., Wright, K., & Halfon, N. (2010). Closing the black-white gap in birth outcomes: A life-course approach. *Journal of Racial and Ethnic Health Disparities, 20*, 61–76.

Martinez, N. G., Charlotte, C. M., & Yee, L. (2017). Optimizing postpartum care for the patient with gestational diabetes mellitus. *American Journal of Obstetrics & Gynecology*. https://doi.org/10.1016/j.ajog.2017.04.033.

McCloskey, L., Bernstein, J., Winter, M., Iverson, R., & Lee-Parritz, A. (2014). Follow-up of gestational diabetes mellitus in an urban safety net hospital: Missed opportunities to launch preventive care for women. *Journal of Women's Health, 23*, 327–334.

National Committee for Quality Assurance. (2013). *Patient-centered medical homes* [fact sheet]. Retrieved from https://www.ncqa.org/Portals/0/Newsroom/2013/pcmh%202011%20fact%20sheet.pdf.

Oza-Frank, R., Ko, J. Y., Wagner, A., Rodgers, L., Bouchard, J. M., & Conrey, E. J. (2014). Improving care for women with a history of gestational diabetes: A provider perspective. *Maternal and Child Health Journal, 18*, 1683–1690.

Paez, K. A., Eggleston, E. M., Griffey, S. J., Farrar, B., Smith, J., Thompson, J., et al. (2014). Understanding why some women with a history of gestational diabetes do not get tested for diabetes. *Women's Health International, 24*, e373–e379.

Pies, C., & Kotelchuck, M. (2013). Bringing the MCH life course perspective to life. *Maternal and Child Health Journal, 18*, 335–338.

Ratner, R. E., Christophi, C. A., Metzger, B. E., Dabelea, D., Bennett, P. H., Pi-Sunyer, X., et al. (2008). Prevention of diabetes in women with a history of gestational diabetes: Effects of metformin and lifestyle interventions. *Journal of Clinical Endocrinology and Metabolism, 93*, 4774–4779.

Rice, P. L., & Ezzy, D. (1999). *Qualitative research methods: A health focus*. Oxford: Oxford University Press.

Shah, B. R., Lipscombe, L. L., Feig, D. S., & Lowe, J. M. (2011). Missed opportunities for type 2 diabetes testing following gestational diabetes: A population-based cohort study. *British Journal of Obstetrics and Gynecology, 118*, 1484–1490.

Shai, I., Jiang, R., Manson, J. E., Stampfer, M. J., Willett, W. C., Colditz, G. S., et al. (2006). Ethnicity, obesity and risk of type 2 diabetes in women: A 20 year follow-up study. *Diabetes Care, 29*, 1585–1590.

Steub, A., Ecker, J., Bates, D., Zera, C., Bentley-Lewis, R., & Seely, E. (2010). Barriers to follow-up for women with a history of

gestational diabetes. *American Journal of Perinatology, 27*, 705–710.

Thorne, S. (2008). *Interpretive description*. Walnut Creek: Left Coat Press.

Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): A 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care, 19*, 349–357.

Van Ryswyk, E. M., Middleton, P., Shute, E., Hague, W. M., & Crowther, C. A. (2015a). Women's views and knowledge regarding healthcare seeking for gestational diabetes in the postpartum period: A systematic review of qualitative/survey studies. *Diabetes Research and Clinical Practice, 110*, 109–122.

Van Ryswyk, E. M., Middleton, P. F., Hague, W. M., & Crowther, C. A. (2014). Clinicians' views and knowledge regarding healthcare provision in the postpartum period for women with recent gestational diabetes: A systematic review of qualitative/survey studies. *Diabetes Research and Clinical Practice, 106*, 401–411.

Van Ryswyk, E. M., Middleton, P. F., Hague, W. M., & Crowther, C. A. (2015b). Postpartum SMS reminders to women who have experienced gestational diabetes to test for type 2 diabetes: The DIAMIND randomized trial. *Diabetic Medicine, 32*(10), 1368–1376.

Walker, L. O., Murphey, C. L., & Nichols, F. (2015). The broken thread of health promotion and disease prevention for women during the postpartum period. *Journal of Perinatal Education, 24*, 81–92.

Yee, L., Martinez, N. G., Nguyen, A. T., Hajjar, N., Chen, M., & Simon, M. (2017). Using a patient navigator to improve postpartum care in an urban women's health clinic. *Obstetrics & Gynecology, 129*, 925–933.

Zapka, J. G., Puleo, E., Taplin, S. H., Goins, K. V., Yood, M. U., Mouchawar, J. et al. (2004). Processes of care in cervical and breast cancer screening and follow-up: The importance of communication. *Preventive Medicine, 39*, 81–90.