The Virtual Office Visit for Women With Gestational Diabetes Mellitus

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The ability to replicate a prenatal office visit in a more convenient location for the patient (home, office, etc.) has potential advantages, including reducing the need for transportation, childcare, and taking time off from work. After collecting data using anonymous surveys and qualitative interviews to evaluate acceptability (1), we conducted a proof-of-concept study of health care delivery combining patient-operated technologies with telephone encounters, which we called "virtual office visits."

Ten women with newly diagnosed gestational diabetes mellitus (GDM) were recruited. Inclusion criteria were ages between 18 and 45 years, a singleton pregnancy, gestational age less than 32 weeks upon entry into the study, and having a smartphone. At the study enrollment visit, each participant was given a set of devices consisting of a Bluetooth-enabled portable memory-based glucose meter (FORA GD40 or FORA MD), weight scale (FORA W310b or FORA TN'G Scale 550), and sphygmomanometer (FORA TN'G BP). Results were automatically uploaded via Bluetooth connection and transmitted via Internet for storage on a HTTPS-secured, Health Insurance Portability and Accountability Act of 1996 (HIPAA)-compliant server (FORA 24/7 HealthView, ForaCare, Moorpark, CA). Each patient was given a fetal heart rate Doppler device with a digital readout (Sonotrax Basic, EdanUSA, San Diego, CA) and was instructed to perform daily fetal kick counts (2). Patients were asked to check their blood glucose fasting and 1 hour after the first bite of each meal daily and to measure their weight, blood pressure, and fetal heart rate weekly.

Participants and office personnel were instructed that each office visit would alternate with a telephone (virtual) visit. Tests for significant differences were made using paired two-sided t tests, χ^2 tests, and correlation analysis.

Ten women newly diagnosed with GDM participated. Maternal age, ethnicity, parity, and prepregnancy BMI, as well as infant birth weight and percent large-for-gestational-age, were similar to those of a larger cohort of women with GDM previously reported from this institution (3). The mean (SD) gestational age at study enrollment was 30 (1.7) weeks and time from enrollment to delivery 9.7 (2.4) weeks. Gestational age at delivery was 39.8 (1.5) weeks. Mean fasting and 1-h postprandial glucose were within glycemic targets recommended by the American

Table 1—Results from 10 pilot study participants and compliance with requirements for self-monitoring

	Result	Percent of required measurements performed
Blood pressure, mmHg		163%
Systolic	116 (11)	
Diastolic	73 (7)	
Rate of weight gain, kg/week		
Mean duration of study	0.2 (0.4)	136%
3 months to study enrollment	0.4 (0.3)*	
Enrollment to delivery	0.2 (0.3)*	
Glucose, mmol/L		
Mean	5.9 (0.2)	
Fasting	5.3 (0.3)	78%‡
Postprandial	6.2 (0.3)	54%‡
Mean glucose first week of study, mmol/L	5.9 (1.0)†	
Mean glucose last week of study, mmol/L	5.8 (1.4)†	

Data are mean (SD) unless otherwise indicated. *$P = 0.24$; †$P = 0.34$; ‡$P = 0.002$.

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Diabetes Association (5.3 mmol/L and 7.8 mmol/L, respectively) (4). However, glucose was measured less frequently than recommended, with patients testing fasting glucose more often than postprandial glucose (respectively 78% vs. 67% of recommended frequency, $P = 0.01$). Frequency of self-measurement of weight and blood pressure exceeded the study requirements. There were no statistically significant differences between mean weekly weight gain after first trimester to study enrollment with that from study enrollment to delivery (Table 1). No significant correlation was found between the frequency of glucose checks and mean glucose concentrations ($r = -0.079$; $P = 0.83$).

The real-time upload of results through a smartphone app decreased the possibility of data loss and transcription error. The data presented in this small observational study provides evidence that a randomized controlled trial comparing alternate technology-mediated virtual visits with traditional all-office visits is both feasible and justified.

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