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Prenatal Education in the Digital Age

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Abstract: The millennial pregnant patient expects an innovative approach to prenatal care. Patients are reaching to peer support online communities or engaging in direct-to-consumer mobile applications during their pregnancy. Currently developed solutions show promise, however, the clinical impact and generalizability of these solutions remains unclear. Technology has the potential to decrease health care disparities, improve patient and provider satisfaction as well as clinical outcomes. In this article we discuss traditional models of prenatal education as well and suggest how obstetricians should consider utilizing technology as an approach to provide prenatal education to their patients.
Key words: prenatal education, mobile health, new media, consumer health education

Introduction

The traditional agenda of a prenatal visit includes biometric measurements, coordination of care such as ultrasounds and laboratory testing, as well as education and anticipatory guidance regarding pregnancy and childbirth. Measurements such as blood pressure, fundal height, and laboratory studies are standardized in guidelines. In contrast, the character and quality of prenatal education are largely hidden within the privacy of the exam room. Thus, while the American College of Obstetricians and Gynecologists states that "Patient education is an essential element of prenatal care"[1] the reality of patient education within the context of prenatal visits is unstudied and there are few standard recommendations for providers. As a consequence, the quality of prenatal education varies widely, and is limited by time, the provider's interest and knowledge base, their teaching skills and the patients' health literacy. Though technology has rapidly evolved, clinicians continue to rely on traditional methods of education. In addition, the modern pregnant patient's expectations have also evolved to include 24/7 access to information. Finally, the COVID-19 pandemic presents additional challenges to reduce the risk of transmission and support social distancing which would certainly be challenging in the traditional childbirth education class model. New, technology-driven approaches to prenatal education are needed.

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Low-Tech Models to Promote Prenatal Education

Recognizing that pregnancy, childbirth, and parenting preparation are broad

topics that cannot be fully discussed in a short outpatient visit, a variety of models of prenatal education have developed over the last few decades to provide more depth.

Most common are "childbirth education" or "prenatal" classes. These may be led by nurses or nonmedical professionals, in small or large groups, most commonly at a hospital.[2] Classes may be free, covered by insurance, or paid out-of-pocket.[3] General education regarding pregnancy physiology and childbirth has been promoted to reduce fear and anxiety, promote health, and form social networks. Curricula are not standardized, and evolve over time as cultural trends and priorities shift.[4] There are multiple small studies of specific educational interventions, but these have not translated into widely available or standardized curricula.

Reflecting the multiple potential goals of prenatal education, studied outcomes vary widely. Evidence shows that childbirth education classes can decrease presentation for false labor[5] and decrease anxiety or fear of childbirth.[6,7] Evidence of changes in obstetric outcomes, such as decreased rates of regional anesthesia or cesarean delivery, is more limited and no clear effect is apparent.[5,8,9] This research has significant limitations, including risk of bias in self-reported outcomes and selection bias. In many studies, women choosing to attend prenatal education were compared with those who did not. Patients who participate in health promotion activities such as prenatal education likely exhibit other healthy behaviors and access to resources that can improve their pregnancy outcomes.

Though evidence of direct benefits of health outcomes is weak, the ubiquity of these classes show that pregnant women value this education. Studies generally representative of women with young children in the United States show that 53% to 66% of women reported attending prenatal classes in at least 1 pregnancy, often their first.[3,10] It is concerning, however, that attendance varies widely by race and socioeconomic status. For example, Lu and colleagues found that White women were twice as likely as Black women to attend antenatal classes. College-educated women and those whose household income was > $35,000 were also twice as likely to participate in classes.[3] In a study of Midwestern pregnant women at clinics segregated by race and insurance status, women found prenatal classes to be helpful regardless of race. However, logistic regression showed that Black race, lower education level, public insurance, and living in a high crime neighborhood each independently decreased the rate of childbirth education attendance.[11]

Newer models of group prenatal care have helped to upend the paradigm separating prenatal medical care from prenatal education and psychosocial support. In a small-group setting, one provider can educate multiple patients, while having shorter individual contacts for measurements and care coordination.[12,13] In 2013, 22% of recently pregnant women reported having at least 1 group prenatal visit, with 13% saying this was their usual way of receiving care.[10] Centering pregnancy is a popular and standardized model. It is frequently promoted to decrease preterm birth rates, though a Cochrane review and a subsequent meta-analysis show similar preterm birth rates to traditional individual care.[14,15] Patient satisfaction is high, both when directly surveyed, and reflected in higher rates of attendance.[12,16] However, logistical and financial challenges for both patients and providers preclude this model becoming the only paradigm for prenatal care.[13]

As the COVID-19 pandemic began in early 2020, these traditional models with a focus on in-person group gatherings were thrown into disarray. Educators and clinicians were forced to pivot quickly.

Meanwhile, the emphasis on mobile health, telehealth and internet-based education and resources, which were already gaining popularity for the modern patient, was accelerated rapidly. It remains an open question whether these methods can increase knowledge and health behaviors, either by being more effective, or reaching populations previously poorly served by traditional education methods.

Technology in Prenatal Education

The millennial pregnant patient expects more than just in-person prenatal education classes. She expects information at her fingertips 24 hours a day, 7 days a week, on her own schedule. In an attempt to adapt to this mentality, prenatal education has migrated to the internet, and more specifically the smartphone. The smartphone over the last 10 years has emerged as the primary mode through which young women access information. Women of color and women with lower income and lower education levels rely more and more on their smartphone as their only source for internet information. Over 48% of Black or Hispanic women are smartphone dependent (meaning no other source of access to the internet), compared with 12% of women of White race.[17]

Perhaps the most obvious available technology to women living in the world of smartphones is the "Pregnancy App." There are hundreds of pregnancy apps available to both Apple and Android users. Nearly as many lay-press articles aim to guide women through which Apps to utilize during their pregnancy. The direct-to-consumer marketing of these Apps often leads to women downloading these virtual prenatal guides even before their first visit with their prenatal provider. Prices for these web applications range from free to around $20 for access to all aspects of the App.

Apps provide many benefits, with a snazzy interface and embedded information such as pictures, videos, and answers to frequently asked questions. However, their clinical impact and accuracy remains in question, particularly for apps that are marketed directly to consumers. Few studies exist on the medical accuracy of information derived from mobile Apps. One study comprehensively reviewed 2 popular direct-to-consumer pregnancy Apps. The authors found that comprehensive prenatal information was lacking. Specifically, neither app included any information on postpartum contraception.[18]

While many apps are marketed directly to patients, some have been designed for investment by obstetric practices to then provide to their patients. These benefit from the ability for providers to review and potentially customize the medical content. The Babyscripts app delivers educational content throughout pregnancy, featuring content based on American College of Obstetricians and Gynecologists and March of Dimes resources and reviewed by a committee of obstetrician-gynecologists. It also incorporates health monitoring through blood pressure and weight monitoring.[19] The Circle app was developed by a health system for use among its patients across multiple states and has since transitioned to a commercial product.[20] Its content was designed to span prenatal through pediatric care.

Limited data is available on patient-centered outcomes of these commercial apps. Similar to studies of traditional prenatal education, the published research is usually observation, and thus biased by patients who choose to participate in a health promotion activity. A postpartum survey of patients offered the Circle app showed that those who chose to use the app were more likely to also self-report some healthy behaviors, such as exercise during

pregnancy, increased breastfeeding duration, and knowledge about infant behavior. Correlation with medical records data also showed they were less likely to miss prenatal appointments.[20] Wyoming Medicaid collaborated with Wildflower Health on a similar App designed to monitor and guide patients through their pregnancy. Users of the app enrolled in Medicaid were more likely to have prenatal visit 6 months before delivery (eg, in the first trimester), and showed a trend toward decreasing rates of low birth weight.[21] A small trial of the Babyscripts app showed the ability to reduce in-person visits among patients receiving education through the app, with no different in patient or provider satisfaction. Clinical outcomes were not studied.[19] In contrast a recent randomized controlled trial on the impact of a breastfeeding App found no difference in rates of exclusive breastfeeding among women randomized to receive a free phone with uploaded App content compared with traditional delivery of breastfeeding education.[22]

Limitations inherent to App use (data usage, space, password resets, and software updates) may compound to create barriers to App use in socially disadvantaged women. In a study evaluating use of a novel and free pregnancy App in underserved women, over 75% of women initially enrolled were considered "non-users" by the end of the study.[23] Additional data suggests that Apps and websites may specifically be less ideal in the postpartum period compared with text messaging.[24]

If not a mobile application, what are the alternatives? Studies suggest women look to their peers for guidance through online support groups. Two of the most popular websites for online forums or birth clubs are WhatToExpect.com and BabyCenter.com. Often subdivided into "birth month clubs," these forums have grown to over 200 posts recorded for each birth month club. The most popular topics are maternal health and physical symptoms, or newborn care. Despite the hundreds of thousands of posts, there are likely even more women reading and not posting, indicating a powerful reach of the internet online peer community. Demographic data on these groups is not available and there is some concern that peer-sourced information may contain medically inaccurate and even dangerous medical recommendations.[25]

The final and perhaps most intuitive technology is short message services (SMS) otherwise known as text message. SMS have been found to be effective in increasing adherence to prescription medication and attend appointments.[26] Some benefits to SMS include receiving messages to a private inbox, anonymous nature, and reduction in stigma. These qualities have demonstrated promising results in the management of mental health disorders.[27] In obstetrics, texting has shown great promise in monitoring postpartum blood pressure. For women afflicted with pregnancy-related hypertension, over 90% of women complied with home blood pressure monitoring (compared with only 43% of patients complying with office blood pressure monitoring). Significantly this methodology appears to decrease health care racial disparities in this important clinical benchmark.[28]

Millennial women have access to unprecedented and innumerable websites and mobile applications in order to monitor their pregnancy and obtain prenatal education and health information. While these already developed and nearly infinite choices may appear sufficient, their accuracy and impact remains largely unknown and further optimization does appear important.

Choosing and Evaluating Future Technology for Prenatal Education

Clinicians wishing to invest in novel, technology-based prenatal education should

TABLE 1. Suggested Tool for Assessing the Qualities of a Tech Solution to Prenatal Education

	Patient Characteristic	Practice Characteristics	Example Questions to Work Through
Access	Computer vs. mobile Multilingual Flexible and on-demand	Provider portal Ease of customization	Does this require a large amount of "data" or memory from patients?
Engagement	Individualized content Gamification Multimedia	Capturing user participation Tracking to identify disparities	Do patients of all demographics engage in the technology?
Implementation	Medically accurate Minimal friction Trust in technology	Medically accurate Streamline existing work flows EMR integration	Can the technology reduce existing tasks for ancillary staff and thereby free up time to manage the technology or provide additional clinical care?
Data	Secure Compliant with patient privacy regulations	Clinically relevant Potential for research data	Will this help track rates of office visits and submission of biometric data?

EMR indicates electronic medical record.

consider several factors (Table 1). First, how will patients access the education? Be prepared for rapid evolution of technology and ready to pivot to new modes of communication.

It is useful to be able to monitor patient engagement with mobile health interventions. Comparing engagement across groups can help identify barriers to access. Small iterations in content and delivery can be quickly tested and compared with see which increase engagement in an equitable manner. An intervention that is interactive, rather than passive, may increase engagement. Examples include text messaging, online forums, or video classes. While interactive interventions require more staff input, automated text messaging, chatbots, or artificial intelligence can help scale these platforms.

To justify continued enthusiasm and funding, these methods should demonstrate improvement in outcomes. It may be too much to ask that a text message program could change birth or pregnancy outcomes, though improved clinical outcomes would be welcome. But patient satisfaction and psychosocial outcomes such as anxiety, fear, and knowledge can all be measured and are valuable. Disparities between groups of patients may be reduced if they all have access to the same information, in a way convenient to them and not dependent on the provider's time, memory, and enthusiasm for education. Obstetric providers may also be more satisfied to focus their efforts on higher-value clinical care and refer patients to a trusted technology resource for nonclinical questions.

Dissemination remains a key barrier in translating local initiatives to widespread use. Fortunately, technological innovations are by nature easier to scale than personnel-intensive traditional educational intervention. Integration into existing prenatal care will improve dissemination and improve provider satisfaction with these platforms, particularly integration within the electronic medical record. However, mobile health products will require staff time to monitor, update, and sometimes respond to patients. An ideal intervention will not require additional staff time, but be able to reduce the existing workload, perhaps through reducing phone calls, electronic messages or face-to-face time.

The study of technology and mobile health in prenatal education is likely to grow rapidly in the coming years, a process accelerated by the impact of the COVID-19 pandemic. A major limitation of studying traditional prenatal education classes is the difficulty in recruiting and randomizing patients to time-intensive and often costly interventions. In contrast, it is simpler to randomly assign different levels of access or features of an innovative technologic intervention, thus reducing the impact of selection bias on results. Technology will also allow these innovations to be disseminated widely and has the potential to decrease health care disparities which is if of critical importance given the large disparities in maternal morbidity and mortality. Pregnant patients are already using technology to learn about pregnancy and parenting, and obstetric providers should consider integrating this technology into their practice. If we do not adapt to the times we risk being left behind like a textbook on a bookshelf.

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