The Pregnancy Medical Home: History, Evolution and Comparison of Three States' Pilot Programs

By

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Abstract

The enhanced prenatal care model, Pregnancy Medical Home (PMH) is an adaptation of the Patient Centered Medical Home, intended to improve patient experience, population health, and cost through coordinating care to high-risk pregnant women. Pregnancy Medical Home as it is known in North Carolina has been implemented in other states under different names. It is a model of enhanced prenatal care adapted according to the principles of the Patient Centered Medical Home (PCMH) that have been applied to primary care settings. With the passage of the Patient Protection and Affordable Care Act in 2010, opportunities have arisen to pilot PMH programs in several states, including North Carolina. This paper will describe the application of the PMH in the context of the current obstetrical care landscape in the United States. A detailed discussion of the Pregnancy Medical Home (PMH) of North Carolina will be provided and compared with two other PMH pilot programs in Texas and Wisconsin.
Acknowledgements

I would like to thank Doris Robinson, Clinical Coordinator of the Community Care of the Lower Cape Fear, and second reader, for introducing me to the value of care coordination for the most vulnerable in our healthcare system. She is generous with her nursing knowledge, creative with her insight, and has been enormously encouraging during my time with Community Care of North Carolina.

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Chapter 1. Introduction

Obstetric Indicators and Challenges

Despite global trends which show improvements in obstetrical outcomes, the U.S. has experienced a doubling of maternal mortality rates between 2000 and 2014 (MacDorman, Declercq, Cabral & Morton, 2016). Although there has been a decrease in infant mortality during the same time period, stark racial disparities persist. The infant mortality rate for non-Hispanic blacks remains double that of non-Hispanic whites. Comparisons with other industrialized countries indicate that the U.S. infant mortality rate, defined as death within the first year of life, is 71% higher and neonatal mortality (first 28 days of life), is 83% higher than European countries (Gonzales and Sawyer, 2017). Given the wide availability and utilization of intensive medical care for neonates in the U.S., persistent poor comparative outcomes among other industrialized nations indicates a need for the U.S. to strengthen healthcare policy change towards prevention of preterm birth, accidental death and sudden infant death, particularly aimed at socioeconomically disadvantaged populations (Chen, Oster & Williams, 2015). Home visiting programs that pair nurses with families and infants for well child visits and early parenting guidance are among proposals (Chen et al., 2015). Programs like this have been tested and implemented inconsistently in the U.S. but are widespread in Europe. Review of U.S. elevated prenatal care models, often known as Pregnancy Medical Homes (PMH), reveals a heavily concentrated focus on the prenatal period and a relative neglect of the postpartum and newborn period.

Additional challenges to improving U.S. obstetric outcomes include opioid use in pregnancy. This burgeoning perinatal health care crisis in the U.S. will only intensify the
population health challenges of poor maternal infant health outcomes, specifically low birth weight and preterm birth. In one recent metropolitan hospital study based in Rhode Island, maternal opioid dependency was associated with an increase in low birth weight and preterm birth rates twice that of all newborns (Coyle, 2017).

Despite significantly higher spending on healthcare costs, the U.S. ranks at the bottom comparing key health indicators in other industrialized countries (Kane, 2017). Because the quality of maternal healthcare impacts population health for generations, there is clearly a need for a shift in U.S. public health policy, allocation of funding, and interventions focused on improving health outcomes and amplifying imperatives to reduce racial disparities. Patient centered medical homes (PCMH), long applied to primary care settings, have recently been piloted within obstetric care systems in some states, primarily among Medicaid recipients. This model is designed to identify those at high risk for poor outcomes and address specific medical, social, and economic needs through the coordination of an interdisciplinary healthcare team. The ultimate goal of this model is high quality and safe care delivered in such a manner that the maternal infant health indicators improve, patient experience is positive and healthcare funds are allocated efficiently.

**Purpose of Pregnancy Medical Home Review and Comparisons**

This paper will review the history, evolution, and evaluation of the patient centered medical home model and its application to obstetric care models in the context of the current state of maternity care in the U.S. This healthcare delivery model to at-risk obstetric populations has been piloted in North Carolina, Texas, and Wisconsin, among other states. These specific states have been chosen for comparison because recently published evaluations of the pregnancy medical homes are available for Texas and
Wisconsin. North Carolina, one of the first and a leader in pregnancy medical home program models, is described in detail. This author had the opportunity to work with the Pregnancy Medical Home in North Carolina, April through July, 2017. Surveys and interviews of care managers were conducted as a transition was made in the program from mainly telephonic patient contact to the directive for predominantly face to face contacts during a pregnancy, statistically determined by Community Care of North Carolina (CCNC) staff to positively impact outcomes. This paper seeks to describe the North Carolina model in detail, briefly describe similar models in two other states and examine outcome evaluations for each state.
Chapter 2. The Patient Centered Medical Home

History and Evolution of the Patient Centered Medical Home

The phrase “medical home” was first used in 1967 by pediatricians to refer to a location where multi-source medical records for their chronically ill patients could be stored and accessed. As described by the American Academy of Pediatrics (AAP), the phrase evolved from the description of a physical space to a concept of partnership with families to provide primary health care that is accessible, child/family-centered, coordinated, comprehensive, continuous, compassionate, and culturally effective, not simply a physical space (Arend, Tsang-Quinn, Levine & Thomas, 2012). In 1978 at The World Health Organization’s (WHO) International Conference on Primary Healthcare, WHO issued a statement which presciently described elements of the patient centered medical home. The organization promoted primary healthcare as best equipped to accommodate the community in an environment in which established health care workers, health-education, and patient “self-reliance” are highly valued and health system efforts are geared towards health promotion and disease prevention in addition to curative medicine and rehabilitation (WHO, 1978).

The Institute of Medicine (IOM) first referred to the ‘medical home’ as a concept in 1990, emphasizing the patient centeredness aspect (Arend 2012). Subsequently, the American Academy of Family Physicians adopted this concept in tailoring medical care to the patient in the context of their environment and envisioned a “personal medical home for each patient” (Kahn, 2004). According to Klein, Laugse and Liu (2013, p. 5), the medical home within primary care health delivery, essentially refers to “teams of providers from a diverse array of professional backgrounds, utilizing health information technology
to manage a defined panel of patients for both acute and chronic conditions in a proactive, patient-centered manner”. Indeed, when patients with chronic conditions are cared for within their primary ‘medical home’ outcomes are improved (Klein et al.).

The modern PCMH assimilated key elements of the chronic care model introduced by Dr. Ed Wagner of the McColl Institute for Healthcare Innovation. These components are reflected in the Pregnancy Medical Home Program in North Carolina, including team-based healthcare in support of patient self-management, reliance on evidence-based medicine and importantly, use of information technology in support of these functions (Wagner and Von Korff, 1996). The patient centered medical home is best described as “a combination of the core attributes of primary care: access, continuity, comprehensiveness and coordination of care - with new approaches to healthcare delivery including office practice innovations and reimbursement reform” (Arend et al., 2012, p. 433).

The most commonly held concept of the PCMH, which has also been explicitly assimilated into the North Carolina and Wisconsin pregnancy medical home, is the “Triple Aim” goals of quality care (including patient experience), improved population health, and decreased costs (Rakover, 2016).

**PCMH and The Patient Protection and Affordable Care Act**

The passage of the Patient Protection and Affordable Care Act (ACA) in 2010 provided a significant opportunity to address the United States’ primary care system improvement at the population level. Among many other initiatives, the ACA elevated the concept of disease prevention and improved management of chronic illness by incentivizing primary care providers and increasing reimbursement to health care systems, which adopted the medical home model. The PCMH is described within the ACA as having
“a whole person orientation; coordinated and integrated care; safe and high-quality care through evidence informed medicine, appropriate use of health information technology, and continuous quality improvements; expanded access to care; and payment that recognizes added value from additional components of patient-centered care”.

Additionally it promotes the implementation of ..."interdisciplinary, inter-professional care plans that integrate clinical and community preventative and health promotion services for patients” (The Patient Protection and Affordable Care Act, 2010, p. 436).

As result of the ACA and the ensuing search for high quality, cost effective delivery systems, the Center for Medicare and Medicaid Innovation (CMMI) was formed. The CMMI tests models of healthcare delivery and prioritizes funding for health care delivery systems which manage chronic disease in the primary care setting in alignment with the Triple Aim (Davis, Abrams & Stremikis, 2011).

**ACA Efforts to Address Maternal Infant Population Health**

In addition to chronic and adult primary care, The Strong Start for Mothers and Newborns Centers for Medicare & Medicaid Services (CMS) Initiative, rooted in CMMI, received ACA funding in 2012, in an effort to reduce preterm births and improve maternal infant population outcomes. Two strategies identified to achieve these goals are to decrease the number of elective inductions prior to 39 weeks and to utilize enhanced maternity care models, such as pregnancy medical homes (Centers for Medicaid and Medicare Services, 2017). Partnerships with the March of Dimes and the American College of Obstetricians and Gynecologists (ACOG) began assisting CMS in raising awareness, promoting best practices within hospitals, and requiring accountability through data collection and reporting in order to reduce elective inductions (CMS, 2017). Elective
induction without a medical indication prior to 39 weeks is associated with preterm birth and greater neonatal morbidity and mortality (American College of Obstetricians and Gynecologists, 2013). Sequelae of preterm birth result in significantly increased costs distributed among the U.S. healthcare and education systems and social services (American College of Nurse Midwives, 2012).

The “enhanced prenatal care” strategy of CMMI includes group prenatal care, birth center-based case management, including effective and creative programs utilizing peer counselors, along with the promotion of the pregnancy care home models. These specific strategies address psychosocial health determinants and provide a wider variety of health services within a coordinated, team based “home” (CMS, 2017).

Embracing the PCMH within the ACA for general primary and maternity care signaled a retreat on a national level from our US healthcare system’s historic focus on a ‘reactive’ acute care model in pursuit of a more proactive, anticipatory model of care (Arend et al., 2012).

**Standardization and Recognition**

The elements of integrated information technology, patient-centered engagement, and team approach sets apart the PCMH from other healthcare systems. Assimilation of these elements has qualified these healthcare systems to apply for recognition by the National Committee on Quality Assurance (NCQA) since 2008. Although other accrediting bodies have established criteria for PCMH recognition, NCQA has led in setting industry standards for medical homes (Arend et al., 2012). The NCQA accreditation standard began as an effort by unions, major employers, and national health plans in collaboration with healthcare provider groups with formation of the “Patient Centered Primary Care
Collaborative” (PCPCC). The PCPCC is currently an information and evaluation resource for the PCMH. PCPCC was formed mainly in response to frustration with widespread poor patient experience and inefficiency of the traditional healthcare system. This collaborative effort helped standardize principles of PCMHs to achieve validation for provider reimbursement as "Joint Principles of the Patient Centered Medical Home" (Arend et al., 2103). By way of contrast, the National Committee for Quality Assurance website does not list accreditation or certification of pregnancy medical homes. There are critical elements of PMH promoted by medical home and clinical obstetric experts but national standardization does not yet exist (National Committee for Quality Assurance, nd).

**PCMH Leadership**

The Joint Principles of the Patient Centered Medical Home, compiled by the principal U.S. primary care physicians’ professional organizations was published in 2007. The establishment of the Joint Principles was intended not only to define the PCMH for these primary care organizations in the context of chronic and primary care delivery but to “reform reimbursement structure to support medical home functions” (Arend et al. 2012, p. 435). The Joint Principles list ‘physician led’ and ‘personal physician’ as two specific principles out of seven (Table 1) (see page 17). The elevation of these principles by physician groups as a requirement for medical homes is significant in our U.S. health care system because the number of primary care nurse practitioners and physician assistants outnumber primary care physicians 3 to 1 in the most remote rural areas (Agency for Health Care Research and Quality, 2014). Although the concept of “physician-led” healthcare teams is not specifically defined in the ACA or required for accreditation by NCQA (Table 1), it is promoted legislatively by primary care physicians’ professional state
and national organizations as the “Joint Principles” for PCMHs. This language has been included in proposed legislation defining the PCMH in states such as California, a state where the legislature opposed proposed “physician-led” medical homes as “overly prescriptive”. The California Department of Health Services opposed exclusively “physician-led” teams proposed by the state California Academy of Family Medicine because it might restrict medical homes directed by nurse practitioners and other clinics or health plans (Dau and Austin, 2012), thus, impacting the “patient centered access” standard of the PCMH.

Relevant to this review, North Carolina’s Medical Home Program for primary care has recognized nurse practitioner and physician assistant-led practices as medical homes (American Nurses Association, 2010) but as recently as December 2016, a pregnancy medical home presentation promoted “physician led” and “personal physician” language at the Institute for Healthcare Improvement meeting. Restrictions on nursing practice are known to limit access to care and can negatively impact population health.

According to the Institute of Medicine, the presence of nurse practitioners (NPs) in rural areas increases access to primary care and patient satisfaction (Health Affairs, 2012). There is also evidence that when nurses coordinate and manage care, it results in lower rates of hospitalization and re-hospitalization among certain populations (Robert Wood Johnson Foundation, 2010). The American Academy of Nurse Practitioners (AANP) opposes the American Academy of Family Physicians proposition that the PCMH must be physician-led. The AANP, though in support of patient-centered and team-based health care, reiterates that the primary accrediting body for PCMH, the NCQA and the Joint Commission do not require physician leadership for granting accreditation (American
Academy of Nurse Practitioners, 2012). Within the context of maternity care quality and access, certified nurse midwives (CNMs), analogous to nurse practitioners, also provide safe, high quality obstetric care as evidenced by multiple studies and currently lead care teams in rural areas.

Decades of research prove that among women with similar risk factors, CNM care results in fewer cesarean deliveries and induced labor (American College of Nurse Midwives, 2012). These are both medical procedures which pregnancy medical homes have sought to reduce for reasons of cost and patient care quality. Further restrictive language in healthcare industry and academic publications may influence legislative language. Limiting enhanced prenatal care model leadership to include only physicians could negatively impact those most in need of risk identification and care coordination. “Physician-led” legislative requirements may compromise access to obstetric care in rural areas and will likely exacerbate an existing shortage of providers willing to care for the rural underserved.

**Outcome Studies of the PCMH**

In 2014, The Patient Centered Primary Care Collaborative (PCPCC) published an analysis and summary of 20 studies examining the impact of the PCMH model on outcome measures such as cost, utilization, population health indicators, use of preventative services, access to care and patient satisfaction. This summary reported significant improvement in every measure, with greatest advantages in cost and utilization categories. Specifically, there was a 61% decrease in both the “cost of care” and “use of unnecessary or avoidable services” (Nielsen, Olayiwola, Grundy and Grumbach, 2014, p.6). The one
remaining gap for future research is clinician satisfaction within the PCMH model (Nielsen et al., 2014).

A study published in 2014 examined the impact of patient centered primary care combined with “systematic care management” on healthcare utilization and cost during the first five years after the initiation of the Community Care of North Carolina program, from 2007 through 2011. The PCMH of CCNC demonstrated significant cost savings through decreased emergency room utilization and hospital admissions. There was a demonstrated increase in non-acute primary care encounters, particularly in individuals with multiple chronic diseases, leading the authors to conclude that this coordinated primary care program is a model for lasting health care quality improvement (Fillmore, DuBard, Ritter & Jackson, 2014)
**Table 1.** Joint Principles of the PCMH created by primary care physician organizations compared to National Committee for Quality Assurance standards for PCMH recognition.

<table>
<thead>
<tr>
<th>Joint Principles of the Patient Centered Medical Home</th>
<th>Summary of NCQA PCMH 2014 Standards for Patient Centered Medical Homes</th>
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<tbody>
<tr>
<td>Personal Physician</td>
<td>Patient Centered Access</td>
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<tr>
<td>Physician-directed medical practice</td>
<td>Team-Based Care</td>
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<tr>
<td>Whole-person orientation</td>
<td>Population Health Management</td>
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<td>Care is coordinated and/or integrated</td>
<td>Care Management and Support</td>
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<td>Quality and Safety</td>
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<td>Enhanced access</td>
<td>Performance Measurement and Quality Improvement</td>
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<td>Payment</td>
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National Committee for Quality Assurance, 2014
Chapter 3. Application of the PCMH Model to Obstetric Care

The Current State of Obstetric Care in the U.S.

According to The American College of Obstetricians and Gynecologists (ACOG), 49% of U.S. counties have no OB/GYN physicians (Schwartz, 2017). More than one million U.S. babies are born to women who do not receive adequate prenatal care every year. These babies are more likely to be considered low birth weight, born prematurely, and are much more likely to be disabled or die. The cost difference in medical care for a low birth weight baby compared to newborns without medical complications is almost $45,000 (Schwartz, 2017).

According to a recent analysis of 306 rural hospitals in 9 states with large rural populations, over 7% of rural hospitals in the analysis closed maternity wards between 2010 and 2014 (Hung, Kozhimannil, Casey, Moscovice, 2016). Currently, half of all women living in rural areas live more than 30 minutes drive away from hospitals that offer maternity care (Schwartz, 2017). ACOG and The American College of Nurse-Midwives (ACNM) issued a collaborative statement in August 2017 at the National Institute for Health Care Management meeting to sound the alarm regarding the existing maternity care access crisis. These indicators that portend an even more severe future provider shortage should inspire solutions, not only in graduate medical education and midwifery education but innovative interdisciplinary health care policies to expand and improve models of care that address social and economic health determinants.

The Pregnancy Medical Home

According to an expert panel presentation, “Population Health and Maternity Medical Homes” at the Institute for Healthcare Improvement (IHI) conference in December
2016, there is no standard definition of ‘maternity medical home’ but it may be understood as a model that “adopts the principles of the patient-centered medical home” promoted by state maternity health care leaders (Redfern, Berrien, Johnstun & Rakover, 2016). Community Care of North Carolina explains “pregnancy medical homes are designed to improve maternal and infant health through coordinated, evidence-based maternity care management for women at risk for poor birth outcomes” (Community Care of North Carolina, 2013).

In researching three states that have piloted enhanced prenatal care models, the common goals reflect the five core principles for a pregnancy medical home: patient-centeredness, comprehensive care, care coordination, accessible services, and a systematic approach to quality and safety (Association for Healthcare Research and Quality 2011). A study of enhanced prenatal care in 2001 preceding formal models of the pregnancy medical home studied African American, Medicaid eligible women identified as high risk at a public health center in Alabama. The goal was to reduce preterm birth and low birth weight. Enhanced prenatal care consisted of longer appointment times (40 minutes compared to a typical 15 minute appointment) with a nurse provider, limited wait times, culturally sensitive education materials and décor, on site child care provision, and extended clinic hours. Additional group education sessions followed appointments in a peer-supported environment and included information on nutrition, weight gain, smoking cessation, lifestyle decision-making skills, and stress reduction. Though study results indicate increased patient satisfaction and self-perceived mastery of life decisions, reduction of rates of preterm birth and low birth weight were not observed (Klerman, Ramey, Goldenberg, Marbury, Hou & Cliver, 2001).
According to the IHI, the establishment of pregnancy medical homes provides a natural environment to address more complex social risks: behavioral health, substance abuse, resources for care access, and social isolation (Rakover, 2016). Innovative programs such as Centering Pregnancy (group prenatal care) and substance abuse treatment programs exclusively for perinatal patients have potential to integrate care in a way that provides a satisfying patient experience while addressing population wide health outcomes.

**North Carolina Pregnancy Medical Home**

In North Carolina, the Pregnancy Medical Home (PMH) program began as a partnership between the Department of Medicaid Services (DMS), the North Carolina Department of Public Health, and the care management organization CCNC based in Raleigh. The program was implemented in 2011 and is regarded as a leader among PMH models (Rakover, 2017). The primary objective of CCNC’s PMH model was to decrease the rate of preterm birth and low birth weight (defined as under 2500 grams) in North Carolina, and in accordance with the Triple Aim, increase patient satisfaction, improve population health outcomes, and decrease Medicaid costs (Tucker, Berrien, Menard, Herring, Daniels, Rowley, Halpern, 2015). At the inception of the PMH, approximately 12% of North Carolina births were preterm, slightly higher than the national average of 11.4% (National Center for Health Statistics (NCHS)). Racial and economic disparities are clearly a factor in North Carolina, considering that the preterm birth rate among non-Hispanic black women is 13.3%, which is 51% higher than among all other women (March of Dimes, 2016). Most of these births are to Medicaid recipients (North Carolina Center for Health Statistics, 2015). Medicaid and Emergency Medicaid recipients comprise just over 50% of
North Carolina births (Redfern et al., 2016). Unlike several other pilot PMH programs reviewed, this program was implemented statewide, including all 100 counties.

As a measure of its broad acceptance statewide, approximately 90% of health care systems and offices that offer obstetric services participate in the CCNC mutual partnership agreement (Berrien, Ollendorff, Menard, 2015). This allows them to apply the CCNC PMH model to their practices and access financial and clinical guidance as well as performance data incentives. The state model is comprised of 14 networks led by a nurse/physician team. The nurse coordinator provides full time “support, education, and technical assistance” (Rakover, 2016). Physician champions are identified as respected 'local opinion leaders' among OB/GYNs, family medicine physicians, and maternal fetal medicine specialists. They provide feedback and encourage best practices among their colleagues including counseling regarding practices most associated with preterm delivery: elective inductions prior to 39 weeks gestation, and cesarean delivery (Berrien et al. 2015).

Participating practices within the NC PMH agree to complete universal risk screens, perform no elective deliveries prior to 39 weeks, provide weekly injections of progesterone for specific patients at risk for preterm birth, maintain a cesarean section rate of 16% for vertex singleton term births, and partner with an assigned pregnancy care manager. In exchange, the practices or health departments receive financial incentives for completion of risk screens, postpartum visits scheduled by 60 days postpartum and increased reimbursement for vaginal deliveries (NC DMA, n.d.). Evidence-based clinical pathway documents, clinical "coaching" by physician champions, and summary data of comparative practice performance are also benefits for participation in the PMH program. Additionally,
practices get intensive care management by a registered nurse or social worker (OBCMs) for the medical, behavioral, and social needs of their patients (Redfern et al., 2016).

**Specific Elements of the North Carolina Pregnancy Medical Home**

*Universal risk screen*

Key to the identification of NC women at risk for preterm birth is the ‘universal risk screen’ (Berrien et al. 2015). The risk screen is a paper questionnaire that is completed by the patient and the registered nurse or provider at the first obstetric visit and must be signed by a licensed healthcare professional. A 2015 study by CCNC resulted in a “predictive model” for preterm birth and includes (at highest risk) those with multifetal gestation, a previous preterm birth, cervical insufficiency, diabetes, renal disease, and hypertension. Additional risk factors include Hispanic or black race, smoking in pregnancy, underweight, nulliparity, asthma, history of low birth weight, second trimester loss, or fetal death (Tucker et al., 2015). According to care management leadership at CCNC (2017), “impactable” risk factors also include domestic violence, current or recent substance abuse and social instability. These risk factors are all identified on the ‘risk screen’ and are quantified by a statistical model developed by CCNC staff. This calculation identifies, through a numeric score, those women who are mostly likely to experience improved outcomes through intensive pregnancy care management, defined by CCNC as eight face-to-face contacts in a pregnancy. Known as the Maternal Infant Impactability Score (MIIS), the number sets the priority level for each patient and guides the level of the care managers’ engagement, allowing for OBCM’s professional judgment, and provider’s requests to override a low score and initiate care management. The Case Management Information System (CMIS) is the health information technology system that quantifies patient
impactability scores and updates them daily. CMIS also provides information about patients including contacts with pregnancy care managers, care encounters, records of emergency department and labor and delivery evaluations, and prescribed medications. The CMIS is also a critical tool to track outcome data.

Providers who note “impactable factors” during the visit are requested to make contact with the care manager as soon as possible to facilitate initiation of best practice to address the risks. For example, the initiation of 17-P, proven to decrease the risk of preterm labor (American College of Nurse Midwives, 2012), is a time sensitive intervention for which early communication between OBCMs and prenatal clinicians is imperative.

First trimester entry into prenatal care

The elements of “focus on first trimester entry into care” and “enhanced access to care” are carried out through utilization of an effective health information technology system and diligent follow through. The case managers/coordinators identify women who present with acute symptoms, which may signal a high-risk pregnancy, at local emergency departments. This identification system called Admissions, Discharges and Transfers (ADT) is a component to the NC PMH that allows for professional care managers to contact women directly, encourage them to access prenatal care within a Pregnancy Medical Home (if possible), and assist in addressing personal barriers to accessing care. Additionally, CCNC strongly encourages health departments to allow presenting patients to access initial prenatal appointment as soon as possible (same day is encouraged), and complete the risk screen at initial presentation.
Care coordination

As defined by the Agency for Healthcare and Research Quality (AHRQ), care coordination is defined as "...the deliberate organization of patient care activities between two or more participants (including the patient) involved in a patient's care to facilitate the appropriate delivery of health care services. Organizing care involves the marshaling of personnel and other resources needed to carry out all required patient care activities and is often managed by the exchange of information among participants responsible for different aspects of care." (AHRQ, 2014, Chapt. 2). The NC PMH care coordination team consists of a registered nurse or social worker and a clinical coordinator for each of the 14 North Carolina Regional Networks. The care coordination team is augmented by behavioral health, social services, and other specialized health care services.

Initiation of contact between the OBCM and the patient occurs through referrals from providers, self-referrals, appointments made at the maternal fetal medicine specialty office or, as noted above, the ADT system. The network nurse coordinators access CMIS which provides daily updated patient information. According to the Pregnancy Care Management Standardized Plan (2012) produced by the NC Department of Public Health and CCNC, functions of the care manager include "initial and ongoing assessment, facilitation of communication and coordination among care team members, education for both the patient and clinical team members to inform care decisions, patient empowerment to affect outcomes and encourage quality and stewardship of resources." According to CCNC, most important is the function of care plan development, in conjunction with the patient, her family, and care providers intended to meet her individual needs through mutually agreed upon goals. Additionally, flexibility regarding changing patient needs,
assistance to facilitate changes in care, as well as continuous patient advocacy are all responsibilities of the OBCM and the supervising care coordinator (Pregnancy Management Standardized Plan, 2012).

**Standardized care pathways**

Shared documents known as ‘standardized care pathways” are developed by CCNC clinical leadership and convey the most recent and evidence-based recommendations for clinical obstetric care to network providers. In North Carolina, the pathways focus on care that impacts preterm labor and birth, such as hypertension management, progesterone treatment for preterm birth prevention and elimination of the practice of labor induction prior to 39 weeks gestation in the absence of a medical indication (Berrien et al., 2015). For example, progesterone therapy is widely recognized as a cost-effective treatment to prevent preterm birth and should be available to every woman who might benefit (ACNM, 2012). Provider agreement to initiate progesterone (17-P) for patients who meet a specific high-risk criteria is required to participate in the NC PMH program. Berrien et al. (2015) noted that some providers objected to CCNC Clinical Pathways as “cookbook” medicine and did not allow for flexibility in unique clinical patient scenarios. CCNC leadership is clear that care pathways are not “protocols” but named “pathways” precisely to be used as guides and not prescriptive instructions for patient management.

**Enhanced access**

Regular, respectful, and meaningful communication established between the patient and a pregnancy care manager encourages women to attend prenatal visits with the prospect of meetings with the care manager who becomes a trusted partner to the women in the course of the pregnancy. Pregnancy care managers regularly follow up with patients
regarding missed appointments and attend specialty clinic appointments with patients to better understand the plan of care and make personal contact with the patient. Additionally, contracting with the NC PMH requires that providers are available to see both scheduled and walk-in patients at least 30 hours per week and must provide information to patients regarding care access after hours (Redfern et al., 2016).

**Patient centered care**

Patient centered care within PCMH primary care model is defined as shared decision making as is practical between the patients and the medical providers, nursing staff, and care manager (Rakover, 2017). Cultural, social and economic considerations are taken in to account and include the woman's family. The “Motivational Interview”, a technique initially used in addiction counseling, is promoted by CCNC PMH leadership as a best practice in encouraging behavior change and personal health decision making. It is defined as a “directive, client-centered counseling style for eliciting behavior change by helping clients explore and resolve ambivalence” (Hettema, Steele & Miller, 2005). ACOG promotes this counseling technique in a published Committee Opinion and cites evidence of positive behavior change in pregnancy and patient satisfaction. Notably, motivational interviewing may improve patient/care manager interactions by requiring intensive listening on the part of the care manager and improving self-efficacy and confidence of the patient (ACOG, 2009).

**Outcome indicators of the North Carolina Pregnancy Medical Home**

Outcome indicators are defined as “a specific, observable, and measureable characteristic or change that will represent achievement of the outcome or the specific statistic(s) (e.g., number and percent attaining outcome) the program will calculate to
summarize its level of achievement” (United Way, 1996, p.59). Outcome indicators including the statewide cesarean section rate and elective induction rate have both declined. These two outcome indicators do impact the preterm birth rate, which has declined 6.7% since the NC PMH program began in 2011 (Berrien, 2015). Importantly, the use of long acting reversible contraception has increased since the inception of the program in 2011 (CCNC Press Release, 2015). Unplanned and closely spaced pregnancies (less than 18 months from delivery to conception) are identified as a pregnancy outcome risk on the NC Pregnancy Medical Home risk screen because they are significantly more likely to result in poorer outcomes, including preterm birth. According to H. Lawrence, “unintended pregnancy may have significant implications for a woman's health, sometimes worsening a preexisting health condition such as diabetes, hypertension, or coronary artery disease. Planned pregnancies improve the health of children as well, as adequate birth-spacing lowers the risk of low birth weight, preterm birth, and small-for-gestational age” (Lawrence, 2011, p.10).

According to CCNC Maternal Health Programs Director, Kate Berrien, induction of labor prior to 39 weeks in North Carolina is the lowest in the south and among the southeastern states (CCNC Press Release, 2015). Importantly, rates of low birth weight have decreased in North Carolina since the inception of the PMH from 11.06% to 10.53% (CCNC Press Release, 2015).

**Comparisons of Obstetric Medical Home Programs**

**Harris County Texas pregnancy medical home pilot program**

The Texas state legislature, in effort to decrease premature birth and low birth weight propelled the development of the pilot Pregnancy Medical Home program in Harris
County to run from 2014-2016 (Texas Health and Human Services, 2017). Unlike the state-wide program in North Carolina, the Harris County pilot PMH program was conducted within a single large county at two separate locations. Eighteen percent of all Texas births occur in Harris County and the cesarean delivery rate is notably high at 34%. The preterm birth rate is also comparatively high at 12.2% compared to the overall Texas rate of 11.8%. Low birth weight in Harris County is 8.5% compared to Texas rate of 8.2% (Texas Health and Human Services, 2015). Evaluators indicate that mothers who were cared for in the Medical Home of Harris County were less likely to have cesarean deliveries and less likely to have newborns admitted to the neonatal intensive care unit. The PMH patients were also less likely to use the emergency department, spend more time in prenatal care, and more likely to attend their postpartum visit. Though these indicators are related to improved outcomes and efficient resource use, there was no notable reduction in preterm birth or low birth rates. Texas Health and Human Services recommended continuation of this PMH model but did not recommend its expansion (Texas Health and Human Services, 2017).

Similar to the NC PMH, the Texas pregnancy medical home included identification of sociodemographic medical/pregnancy risks, such as hypertension and chronic disease, behavioral and environmental, such as smoking and drug abuse. Environmental pollution and second hand cigarette smoke are also identified in a formal risk screen upon entry to care (Texas Health and Human Services, 2017). These environmental risks are not included in either the NC or WI risk screens; however, maternal environmental tobacco smoke and environmental pollution are associated with low birth weight (March of Dimes, May, 2016).
The Harris County Program emphasizes early entry in to prenatal care and 17-P treatment. Two locations provide extensive services including prenatal care, behavioral health, nutrition counseling, optometry, a lab, and dental services. Additionally, Centering Pregnancy, group prenatal care associated with decreased rates of preterm birth, are offered. In addition, comprehensive gestational diabetes care is offered on site. Enhanced access is offered to patients through extended weekday evening hours and weekend clinics. Staffing consisted mainly of OB/GYNs, CNMs, nurse practitioners, and social workers (Texas Health and Human Services, 2017).

It is clearly difficult to compare a statewide PMH model to a single county pilot model consisting of two physical locations. In contrast, the North Carolina pregnancy medical home program could not dictate expanded hours or require on-site behavioral health services because of its dependence on a variety of private obstetric practices and county health departments with inconsistent funding for such services. The Harris County pregnancy medical home summary did not specify specific patient engagement techniques or define clinical pathways. Key common factors such as early initiation of prenatal care, emphasis on 17-P, enhanced care access, and continuity did impact outcomes and health care costs but did not significantly move the mark in the key indicator of birthweight.

**Wisconsin obstetric medical home**

Initiated in 2011 as a pilot program in six southeastern counties, the Wisconsin OB Medical Home was a continuation of the state’s effort “to improve birth outcomes and reduce birth disparities in Southeastern Wisconsin” (Wisconsin Department of Health Services, 2014). It was initially limited to six counties and expanded to include two more in
2014. As with other programs, the Triple Aim goals of improved care quality, improved patient experience, and decreased costs guide the Wisconsin model.

The emphasis of the Wisconsin OB Medical Home is coordination of care and psychosocial issues such as domestic violence and unstable living conditions. This OB MH model also prioritizes the woman’s participation in developing her care plan (Wisconsin Health and Human Services).

Financial clinic incentives depend on enrollment of OB Medical Home patients by 16 weeks gestation and continuation of care until the postpartum visit. Clinics receive an additional payment if the pregnancy outcome results in a birth after 37 weeks gestation, the newborn has a birth weight of 5.5 pounds or higher and lives past 28 days. The Wisconsin OB Medical Home recognizes racial disparities in birth outcomes and makes specific efforts to address these in inclusion criteria (Wisconsin Health and Human Services).

Similar to North Carolina, criteria for clinics to become a Wisconsin OB Medical Home consist of provision of care to recipients of BadgerCare (health care for low income Wisconsin residents) or Medicaid. The Wisconsin model requires staff comprised of an OB provider to serve as the clinical leader (does not specify a physician), care coordinator, registered nurses and medical assistants, and other medical/behavioral specialists. The OB clinic must agree to provide comprehensive care beyond medical specialty services to include behavioral health and social services such as housing services and domestic violence interventions. This plan must be individualized and must use of health information technology to track patient care and gather program data (Wisconsin Health and Human Services).
The intention to address racial and social disparities is evident in the patient selection criteria and is the most specific risk identification among the three comparison states. Patients enrolled must meet one of the following criteria:

- African American
- Homeless
- History of chronic illness or behavioral health diagnosis that will negatively impact the pregnancy
- History of poor pregnancy outcome (Wisconsin Health and Human Services)

Evaluation of the Wisconsin-OB Medical Home program revealed no impact on the significant birth outcome indicators of birth weight and gestational age. There was a small, statistically significant increase in behavioral health utilization and a statistically insignificant increase in timely postpartum care (Friedsam, 2016). Analysis of several program inconsistencies reveals gaps in systems to quantify care coordination activities, inconsistencies linking patients to community resources, and unclear expectations and coordination of individual clinic staff. There was no recommendation to expand or limit the program aside from future organizational quality improvement (Friedsam). Analysis of the Wisconsin OB Medical Home indicates that it might benefit from the model of coordination applied by the North Carolina PMH. Local leaders, known as network coordinators, ensure overall fidelity to the PMH model, monitor the CMIS database to ensure follow up for enrolled patients, and provide consistent professional guidance through regular meetings with Pregnancy Care Managers.
Chapter 4. Conclusion and Recommendations

Though pregnancy is not considered a chronic illness, it is a health condition that can impact the future health of both the woman and the fetus and impose significant impact on population health. Compelling U.S. racial disparities in pregnancy outcomes are no doubt among the motivations to adapt maternity care to the patient centered medical home model. Though piloted enhanced pregnancy medical home models have demonstrated improvement in outcome indicators such as decreased cesarean deliveries, reduced induction of labor and increased pregnancy spacing, disappointing reductions in preterm birth and low birth weight remain. More time to apply pregnancy medical home models may be needed to observe improvement in these indicators. The pregnancy medical home models may also suffer from the lack of consistent recognition standards available for primary care medical homes.

Pilot programs for enhanced prenatal care in the U.S. also focus only one postpartum interaction as an indicator for quality after the birth. Clinically sound prenatal care is no doubt critical to excellent outcomes, yet, there is a significant and precipitous decrease in focus on the maternal infant dyad after discharge from the hospital or birth center. Infant mortality is defined as death within the first year of life, yet very little care and follow up is standard following the birth within pregnancy medical home models reviewed. Attention by care managers during this period could improve social and behavioral health determinants for subsequent pregnancies. Prenatal programs which include long term postpartum home visits may be assimilated into pregnancy medical homes. The Nurse Family Partnership, with decades of research that prove excellent outcomes should be elevated as a cost effective, population health promotion model.
Pilot programs initiated by individual state legislatures adapted to local populations have likely contributed to the lack of standardization. Comparative pregnancy medical home models have demonstrated positive outcomes and have been reviewed and referenced by smaller pilot programs, yet, the specific objectives of decreasing preterm birth and low birth rate remains largely unmet. Social determinants of health, though addressed, are not as strongly emphasized with providers as physiologic-based clinical pathways (Berrien et al., 2015). Interviews and electronic surveys that this author conducted for the CCNC PMH between June and July 2017 indicate that care coordinators, who focus on access to care and address patients’ social and economic gaps, experience significant barriers integrating into OB/GYN clinics as equal team members. Survey comments reflect care managers’ impression of not being fully accepted in the prenatal care team and their role not being well understood by practice clinicians and management. Lack of acceptance of those who address social and behavioral determinants of health may reflect providers’ slow transition from acute care, “curative” model of care to patient centered care that addresses all factors that contribute to health or illness.

Lastly, language used by pregnancy medical home leadership promoting "physician-led" pregnancy medical homes as a requirement, (which national healthcare quality organizations do not endorse), should be avoided. It may contribute to decreased access to care, particularly for women in the most remote rural areas where nurse practitioners outnumber physicians. Policy makers, grant writers, and law makers who research pregnancy medical home’s opinion leaders’ publications to inform health care legislation may erroneously equate “physician-led” medical homes with quality.
The application of PCMH principles to maternal infant population health, pregnancy medical homes, is relatively new yet promising. As public health leaders move forward with continued refinement of implementation and evaluation of this model of care, the following considerations should be at the forefront of policy development; national standardization of pregnancy medical homes, elevation of the importance of social determinants of health with increased focus on the postpartum period, and public policy geared towards evidence-based quality and access despite legislative efforts to require leadership of medical homes by specific practitioners.
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