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Optimizing interconception care: Rationale for the IMPLICIT model

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ABSTRACT

Despite traditional prenatal interventions, the incidence of low birth weight and prematurity in the United States have not significantly decreased. Interconception care for women between pregnancies has been proposed as a method of improving various perinatal outcomes. Although broadly advocated by national groups, interconception care (ICC) has not been widely implemented. We describe best practices for an ICC model based on screening mothers for tobacco use, depression, folic acid intake, and inter-pregnancy interval at well child visits. Because of the model's flexibility, sites can readily customize implementation by incorporating the questions directly into existing workflows and using local service providers already working in maternal-child health. This model has demonstrated promising results and ease of implementation thus far, and offers great potential for improved perinatal outcomes and promotion of health equity.

Background

Despite intensive traditional prenatal interventions, low birth weight and prematurity rates have not decreased in the United States.[1] Preterm birth (PTB) remains the number one cause of neonatal mortality and morbidity with negative effects on motor, cognition, behavior and academic outcomes that continue throughout childhood.[2,3] Low birth weight (LBW) in itself is further associated with adult comorbidities such as hypertension, hyperlipidemia, and diabetes mellitus type 2.[4]

Addressing pregnancy issues before a woman becomes pregnant represents a unique opportunity to modify risks for prematurity and low birth weight. However with worldwide estimates of 44% of all pregnancies being unplanned and with many women not receiving routine health maintenance, finding opportunities to address these risks can be challenging.[5,6] One opportunity to intervene occurs during well child visits (WCV) prior to a subsequent pregnancy and is called interconception care (ICC). Women attend their child's appointments greater than 90% of the time[7] and most mothers (nearly 95%) are willing to accept health advice and referral for services from their child's clinician during WCVs.[7,8] Children's' health clinicians already recognize that risk factors such as depression should be identified during routine WCVs.[9,10] Providing ICC by addressing the continuity of risk from one pregnancy to the next represents a unique opportunity to improve birth outcomes.

Barriers do exist to providing optimal ICC and overall preconception care (PCC). Clinicians identify lack of a common preconception plan, limited awareness of the benefits of preconception planning, poor coordination and organization of PCC as challenges to having a comprehensive approach to

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this care. Additionally, a lack of clarity on which medical providers should administer PCC or ICC, as well as limited office resources and uncertain insurance reimbursement further challenges effective implementation.

Many different targets exist for improving women's health and thus outcomes of future pregnancies. Some risk factors for adverse birth outcomes, such as uterine anomalies and short cervical length, have proven controversial as targets for routine prenatal or preconception screening.[11–14] Other risk factors, such as asymptomatic bacteriuria, sexually transmitted infections, and anemia are screened for and addressed with routine prenatal care by women's health clinicians (obstetricians, midwives, family physicians, advanced practice providers).[10,11,13,14]

Certain conditions can also increase prevalence of specific risk factors. For example, advanced maternal age (age 35 and older) and obesity increase the risk of pre-existing hypertension and diabetes. Conditions that developed in prior pregnancies such as preeclampsia, diabetes mellitus, and prior preterm birth can be identified but are not modifiable in and of themselves.[13–16] There are however, multiple risk factors that could be evaluated and mitigated as part of a preconception evaluation. These modifiable risk factors include elevated lead levels, non-immune status to varicella and rubella, control of hypertension, control of diabetes mellitus, substance use, length of time since last pregnancy and inadequate nutritional status and folic acid use.[13–20]

Various guidelines on PCC recommend that primary care clinicians and women's health clinicians screen for the above risks or conditions during preconception care.[13–20] Guidelines also advise maternity care providers to screen for and address these conditions during prenatal care in early pregnancy.[13–20] Large-scale research studies, however, have not been undertaken to demonstrate which of the many factors above are most modifiable during PCC or ICC. Even if impactable, published evidence has not demonstrated population-level improvements in birth outcomes when providers given attention to these factors.[18–21] Furthermore, many women or birthing persons do not utilize preconception visits offered by women's health or primary care clinicians, possibly due to issues of cost, convenience and access.[18–21]

The Interventions to Minimize Preterm and Low birth weight Infants using Continuous Improvement Techniques (IMPLICIT) model of ICC chose to assess four risk areas found to be prevalent in patient populations (based on the baseline study described below) and with strong universally supported evidence that risk modification would impact prenatal outcomes. Additionally, these risk factors were chosen as screening could be done by a pediatric provider (in a pediatrics or family medicine practice) verbally and without additional physical exam, imaging or laboratory diagnostics. These risk factors include smoking, interpregnancy interval, depression and multivitamin use. The ICC model further supports addressing these four risks together in a bundled approach similar to maternal safety bundles supported by national multidisciplinary organizations.

Evidence for risk factors chosen

Tobacco use in women has long been identified as a threat to pregnancy and newborn health. Women who smoke having a 1.3–2.5 times higher risk of preterm delivery, particularly prior to 32 weeks of gestation.[22] Multiple other negative outcomes are increased in pregnancies affected by tobacco use such as fetal growth restriction, low birth weight and sudden infant death syndrome. Additional morbidity comes from lifelong problems such as neurodevelopmental and behavioral problems, obesity, hypertension, type 2 diabetes, and asthma.[3,4]

Many studies have examined interpregnancy intervals and their effect on birth outcomes. Interpregnancy intervals less than 6 months increase the risk of delivery prior to 34 weeks three fold, although in highly-resourced settings this effect may not be as significant.[11,12] Additionally, assuring an interpregnancy interval of at least 12 months may further reduce a woman's risk for spontaneous preterm birth as well as decrease infant mortality.[12,22] Addressing family planning and contraceptive use with women helps assure healthy interpregnancy intervals.[23,24]

Preconception folic acid reduces neural tube defects by 50–80%; however, nationally, only 30% of non-pregnant women ages 18–45 years old take folic acid supplementation.[17] Additionally, women with anemia experience higher risks of low birth weight and preterm births (RR 1.3 and 1.63, respectively), suggesting a benefit of iron supplementation.[18] While other micronutrients may play an important role in pregnancy outcomes, insufficient evidence exists to formally recommend specific supplements.[18]

It has been shown that women who receive PCC on folic acid use report taking vitamins more often in the month before conception.

Depression affects up to 20% of all new mothers with higher rates in low income and adolescent mothers, however only 15% seek treatment.[25] Untreated depression during pregnancy increases preterm birth and low birth weight (OR 1.34 and 1.96, respectively) possibly through elevated cortisol levels and decreased uptake of prenatal care.[25] Postpartum complications from depression include child abuse and neglect, substance use and abuse, failure to implement injury prevention and safety guidelines for childcare, as well as overutilization of health care and emergency facilities.[26]

Feasibility

A 26-month study of maternal attendance and provider screening rates at family medicine practices implementing the IMPLICIT ICC model demonstrated the feasibility of using WCVs to screen for maternal behavioral risks.[8] Data from this pilot project demonstrated women received partial or complete ICC screening (based on the IMPLICIT model) from their child's health care provider at more than two thirds of all WCVs. Nearly 6000 unique mothers were screened across eleven sites while accompanying their children to WCVs. Approximately two thirds of the women had modifiable risk factors identified and most women obtained some type of intervention to modify behavioral risks while their child received well-child care.[8]

Approximately two-thirds of mothers in the study self-identified as members of a racial or ethnic minority (35.0% black, 32.7% white, 3.0% Asian, 28.3% other and 32.9% Hispanic). Nearly three quarters of mothers received public health insurance.[8] Three-quarters shared a medical home with their child,

and slightly more than one-half received prenatal care from their child's physician.[8] Although these preliminary results are promising regarding successful screening, further research is needed in a variety of populations, settings, and provider types to assess broader applicability.

Practical implementation of ICC

Although broadly advocated by national groups, ICC has not been widely implemented.[15,16] Inadequate knowledge among clinicians, lack of an established model, and multiple barriers to delivery have prevented large scale delivery of effective interventions.[13,14] In order to facilitate implementation of ICC as part of routine care, sites can incorporate screening tools into existing workflows.

Resources and services

Although practices with co-located maternity, children's and adult primary care may be able to access the maternal chart for screening and documentation or even schedule maternal visits, the IMPLICIT ICC model was developed for use in busy primary care practices or settings in which not all resources and care models are co-located or immediately available.

When implementing an ICC model, practices should undergo an assessment of resources in their practices and in their communities. Since services such as case management, behavioral health, substance abuse counselors, social workers, or pharmacists may potentially be available on-site, we advise practices to develop written workflows or protocols to streamline access to resources. Furthermore, some interventions can be delivered (such as provision of multivitamins) even when women identify an alternative clinician or practice as their source of primary care, offering an additional way to facilitate care for women who otherwise may not attend to their own health concerns.

Based on their particular population's needs, clinical practices might consider expanding the IMPLICIT ICC model to include additional risk factors for poor birth outcomes, such as domestic violence, food insecurity, obesity, or substance abuse. However, adding additional screening targets could limit the feasibility of screening and intervention in the context of the well-child visit.

Flow of ICC

Practices that serve populations with limited resources such as uninsured, undocumented, or immigrant communities may gain particular benefit from implementing IMPLICIT ICC as a way to reach women not seeking care.

In the full IMPLICIT model, practices obtain either self-reported or EHR-collected maternal demographics at a child's initial visit to the practice. Practices screen mothers for the 4 identified risk factors at well-child visits from the newborn period to 24 months of age. Mothers receive screening and advice regardless of whether they receive primary care from the child's provider or practice. Clinicians record maternal responses to screening for the risk factors directly in the child's health record, since this information pertains to the wellbeing of the child and family, making responses readily available at subsequent visits for review. We have included sample workflows and a sample screening questionnaire in Figs. 1 and 2.

When screening for tobacco use, clinicians or office staff ask mothers about smoking status (current, past, never) and document whether they offer interventions offer to encourage smoking cessation. Mothers depression screening utilizes a 2-step strategy: administration of the Patient Health Questionnaire (PHQ-2)[26–29] subsequently followed by the 9-question Patient Health Questionnaire (PHQ-9) for any mothers with a positive initial screen. Newer sites in the Network have chosen to utilize the Edinburgh Scale[30] instead, thus eliminating the need for the 2-phase screen. Any positive screen prompts an immediate safety assessment for postpartum psychosis and possible suicidality with documentation of appropriate triage in these situations. Clinicians further document whether an intervention was offered to women at significant risk for depression (PHQ-9 score of 10 or higher or positive Edinburgh).

Clinicians assess pregnancy status, intent, and current method of contraception along with counseling and interventions. Providers specifically note use of long-acting reversible contraception (LARC) methods and recommend these as the most effective methods for thus desiring contraception and not seeking permanent sterilization. For women not utilizing a "tier 1" contraceptive method (LARC, permanent sterilization), best practice includes brief counseling on birth spacing and either scheduling a separate visit for the mother or referring to the mother's primary or reproductive health care provider. Finally, providers assess maternal use of multivitamins (MVIs) with folic acid and document recommendations and interventions. These include recommending folic acid for all women of reproductive age (unless utilizing LARC or permanent sterilization) as well as prescribing or dispensing MVIs depending on the clinical setting.

Medical practices can implement a variety of to address maternal risk factors including promoting healthy behaviors, providing prescriptions, and referrals for additional services. Further examples of interventions are included in Fig. 3.

Coding and billing

In some states and regions health care providers can bill for maternal depression screening during WCVs if clinicians appropriately document this screening in the child's health record. Although payors offer minimal reimbursement for such screening, practices providing even 2–3 WCVs a week for infants and toddlers can quickly receive substantial reimbursements. The revenue offset the potential costs of office staff or clinical time needed for referrals for maternal health issues. For example, in a pilot study at the University of Rochester Medical Center (Rochester NY) insurers, including Medicaid plans, reimbursed $4.00–7.00 for maternal depression screening. Billing and coding data collected over a 12-month period at a family medicine practice providing 3–5 ICC screenings daily demonstrated a revenue of $10,000.00. The pilot achieved a somewhat higher than the expected $8750 – possibly because some insurers reimbursed at a higher-than-average level, and also because some clinicians

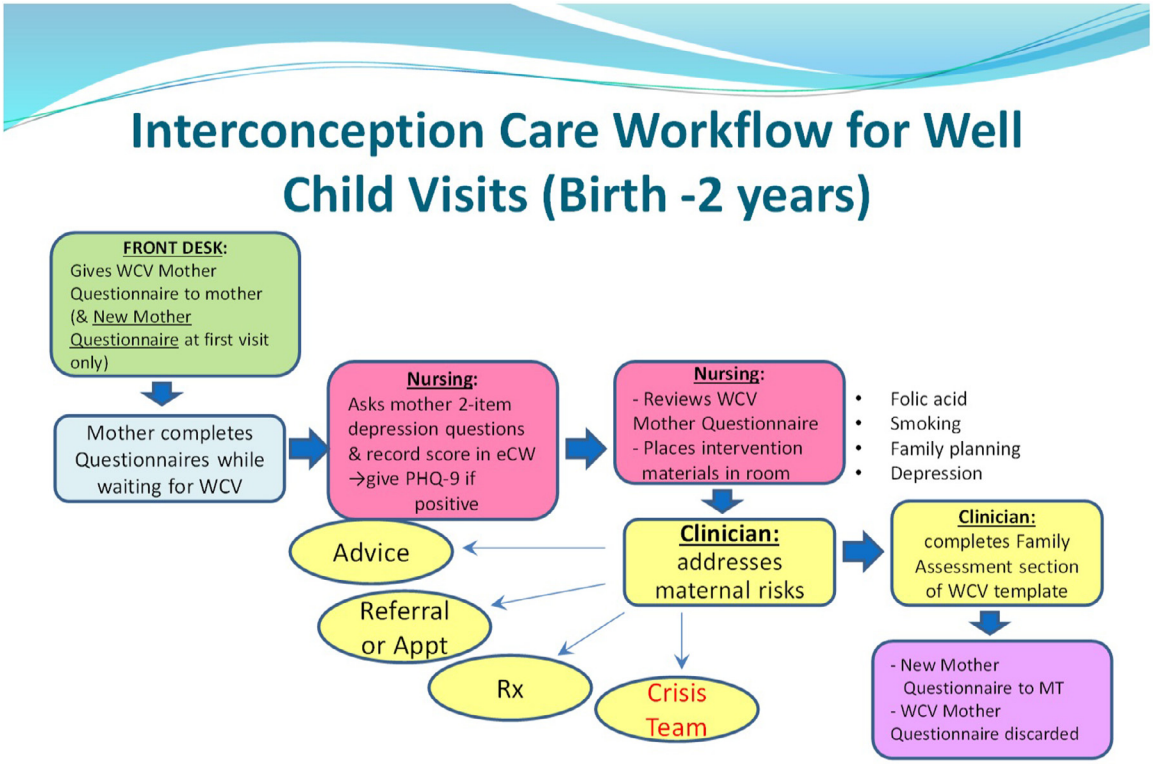


Fig. 1 – Interconception care algorithm.

were found (retrospectively) to have billed for parental smoking-cessation counseling and were reimbursed for this as well.[31] The resources to cover staff time for managing IMPLICIT Network data and providing referrals to non-collocated resources may be challenging to obtain, but we expect it to be far lower than the potential revenue.

We list sample codes clinicians can utilize to bill for these services in Table 1. Clinicians must take care to check with local billing experts and compliance officers since payors' interpretations and compensation for these codes, as well as documentation requirements, vary by state and region.

IMPLICIT network data sharing and outcomes

The IMPLICIT Network functions as a multi-site, multi-institutional continuous quality improvement (CQI) collaborative. The Network has developed ICC screening guidelines and "best practices" as described above for pediatric or family medicine clinical care sites. Several sites share de-identified aggregate data with the Network receive quarterly reports containing their rates of screening and intervention for the various risk factors.

Patient characteristics

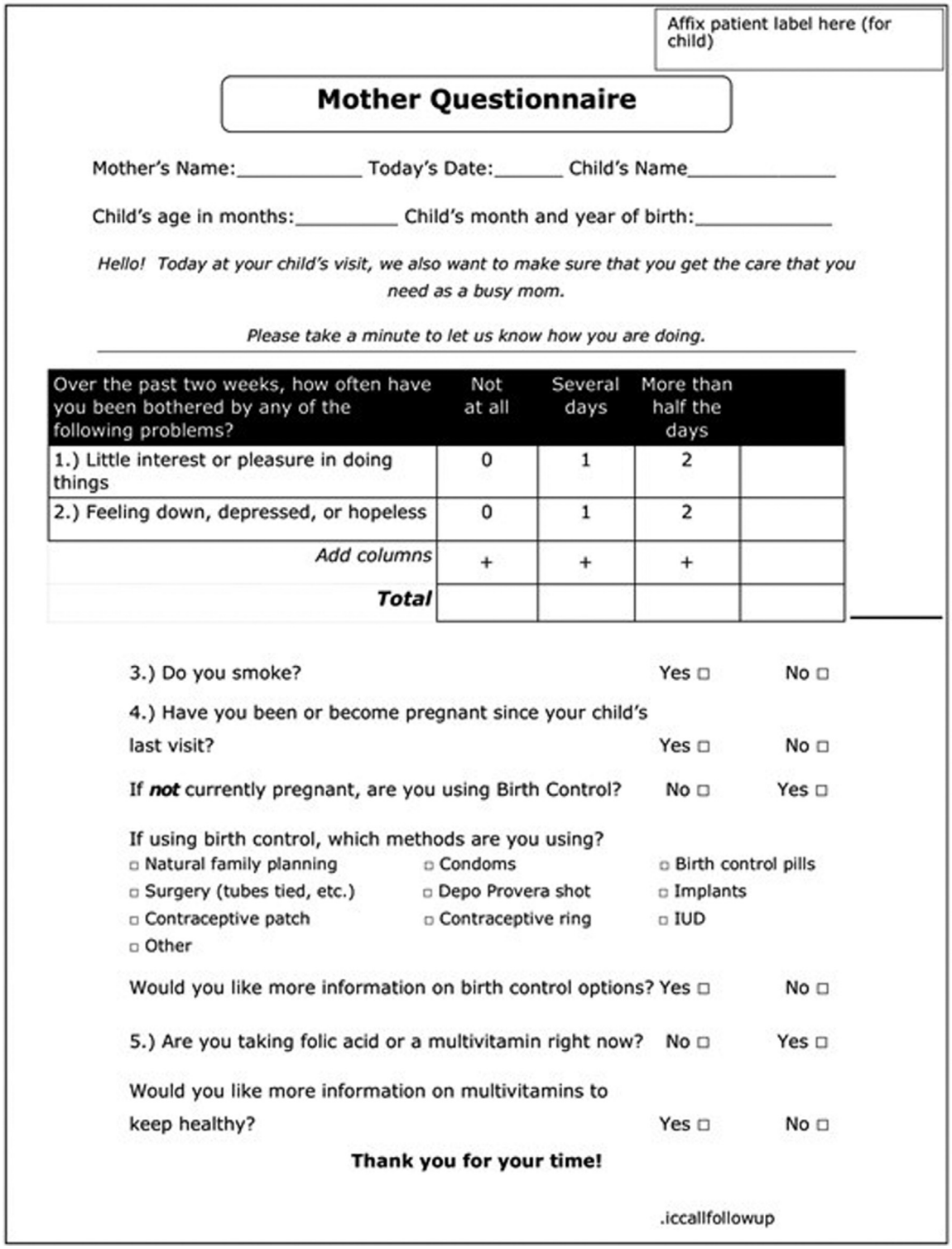
ICC data was collected at 73.5% of 63,019 well child visits with 17,938 mother–child dyads at 20 distinct outpatient sites (range 49.2–100%). The adjusted ICC screening rate across all sites was 78.8%, slightly better than the overall rate. Although demographic data was only provided for 50–60% of mother-child dyads, the patient population at ICC practices seems to reflect that of many pediatrics, medicine-pediatrics, and family medicine practices.

26.8% of respondents were white, 20.3% were black, 7.8% were other, and 3.3% were Asian, Pacific Islander, Native American, or unknown. 41.7% of respondents did not enter their race on surveys. Regarding ethnicity, 41.1% of respondents were non-Hispanic, 12.0% were Hispanic, and 8.2% were unknown. 38.8% of respondents did not enter their ethnicity.

Screening rates and risk factor prevalence

Data from the IMPLICT Network illustrates that screening within the ICC questionnaire were consistent across measures, indicating that surveys typically were completed when administered (Table 2). The presence of risk factors varied across practices and populations. On average, 13.6% of mothers screened were active cigarette smokers; 7.6% of mothers screened met criteria for depression; 30.1% of mothers screened were not using contraception; and 45% of mothers screened were not taking multivitamins. At least one risk factor was identified in 47.2% of visits. No risk factors were identified at 26.4% of visits. Data was missing from 26.4% of visits.

Prevalence rates for cigarette smoking, depression, and non-use of contraception remained relatively stable, accounting for contraception use starting at the 2-month well child visit rather than at the initial newborn visit. Multivitamin non-use by specific mother–child dyads was an exception; this increased steadily over the 24-month period of data collection, starting at 26.5% at newborn visits and peaking at 60.3% by the children's 24-month visits. Prevalence rates over



Affix patient label here (for child)

Mother Questionnaire

Mother's Name:_____ Today's Date:_____ Child's Name_____

Child's age in months:_____ Child's month and year of birth:_____

Hello! Today at your child's visit, we also want to make sure that you get the care that you need as a busy mom.

Please take a minute to let us know how you are doing.

Over the past two weeks, how often have you been bothered by any of the following problems?	Not at all	Several days	More than half the days	
1.) Little interest or pleasure in doing things	0	1	2	
2.) Feeling down, depressed, or hopeless	0	1	2	
Add columns	+	+	+	
Total				

3.) Do you smoke? Yes ☐ No ☐

4.) Have you been or become pregnant since your child's last visit? Yes ☐ No ☐

If ***not*** currently pregnant, are you using Birth Control? No ☐ Yes ☐

If using birth control, which methods are you using?

☐ Natural family planning ☐ Condoms ☐ Birth control pills
☐ Surgery (tubes tied, etc.) ☐ Depo Provera shot ☐ Implants
☐ Contraceptive patch ☐ Contraceptive ring ☐ IUD
☐ Other

Would you like more information on birth control options? Yes ☐ No ☐

5.) Are you taking folic acid or a multivitamin right now? No ☐ Yes ☐

Would you like more information on multivitamins to keep healthy? Yes ☐ No ☐

Thank you for your time!

.iccallfollowup

Fig. 2 – A sample maternal health questionnaire for use during well child visits.

time for all measures were similar regardless of patient race or ethnicity. Detailed prevalence data with breakdown by race and ethnicity was beyond the scope of this publication, but can be made available at the readers' request.

Stable prevalence rates for smoking (or any of the other risk factors) do not necessarily mean that no one quit smoking (or had their depression improved or started using contraception). It simply indicates that across all 20 sites on average, equal numbers of mothers resumed smoking, had worsening depression, or stopped using contraception as those who did stop smoking, had improvement in their depression, or started using contraception. Granular review of the data showed that

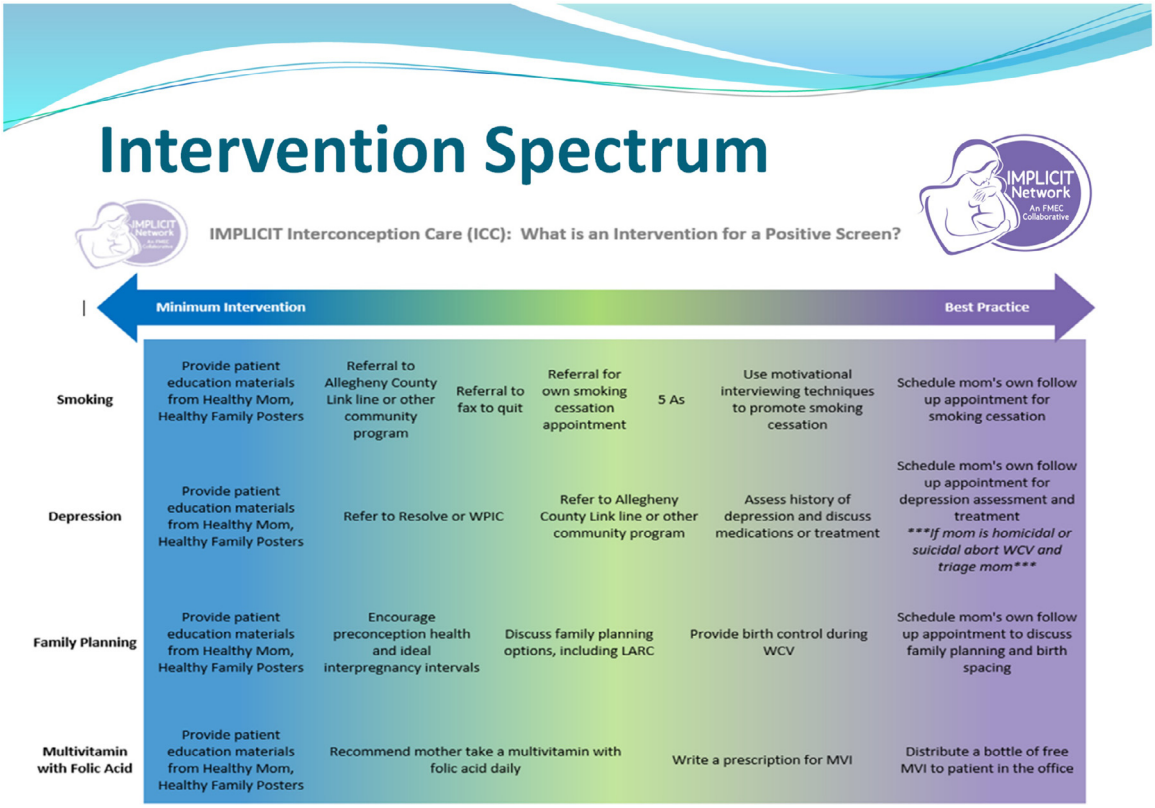


Fig. 3 – Spectrum of interventions for risk factors encountered during interconception care, ranging from minimal intervention to best practice.

Table 1 – Examples of CPT codes than be used during well child visits for maternal health screening.

CPT code	Name associated with code	Notes
96161	Health Risk Behavior Assessment	General code that in some regions might be used for smoking or depression screening
G8431 (HD modifier)	Positive maternal depression screen with follow up plan documented	
G8510 (HD modifier)	Negative maternal depression screen	
99213 or 99214 visit	Document increase in time or complexity of non-preventive pediatric visit due to maternal depression	

Table 2 – Rates of screening and prevalence for various risk factors by clinicians in the IMPLICIT network 2014–2019.

ICC Risk Factor	Screening rate	Prevalence
Multivitamin non-use	68.2%	45.0%
Contraception non-use	68.0%	30.1%
Active cigarette smoking	69.2%	13.6%
Depression	71.4%	9.9%

patients at some sites experienced improvements while others worsening rates.

Application and effectiveness of interventions

Across all visits where at least one risk factor was identified, clinicians offered at least one intervention at 75.5% of visits (Table 3).

Analysis on effectiveness of interventions on specific mother–child dyads were effective. Over 1/3 of mothers stopped cigarette smoking, almost 60% of mothers initiated contraception, and almost 60% of mothers with a positive depression screening score screened negative at reassessment.

Intervention rates, like risk factor prevalence for mother-child dyads, demonstrated relative stability for specific mother-child dyads. However, this endured only over the first 18 months. By the 24-month visit, decreases were seen in offered interventions for each of these measures. Interventions for multivitamin non-use decreased more steadily through the 24-month data collection period. When analyzed among all mother-child dyads at any particular time point regardless of child's age however, clinicians were consistent in offering interventions for all four risk factors.

The reductions in interventions at the 24-month visit were minor – 5–10% across measures. Clinicians at quality-

Table 3 – Intervention rates for positive screens by risk factor, along with effectiveness of the intervention, 2014–2019.

ICC Risk Factor	Intervention Provided	Intervention Not Provided	Intervention Documentation Missing	Effectiveness of Intervention
Multivitamin non-use	57.7%	32.2%	10.1%	44.2%
Contraception non-use	65.3%	19.9%	14.8%	58.3%
Active cigarette smoking	74.1%	19.1%	6.8%	34.1%
Depression	87.8%	6.8%	5.4%	59.7%

improvement meetings at the sites postulated that some of the drop-off may be attributed to the time gap between the 18 and 24-month well child visits, so slightly less sense of continuity with mothers and their health risks. Others speculated it may be due to the sometimes chaotic nature of the 24-month visit, with the child walking, talking and demanding attention – thus making it more challenging to discuss parental health than at earlier-age visits.

Providing ICC at WCVs is one of many strategies that providers can use to deliver the full breadth of comprehensive interconception care women should receive. The IMPLICIT Network has increased and integrated practices primarily staffed by pediatricians in addition to family physicians, and this interprofessional collaboration may help increase screening and improved ICC.

Future directions

Improving postpartum care or care in the "fourth trimester", the period of several months immediate postpartum, is an important goal of the IMPLICIT network and a natural partner with interconception care. IMPLICIT is currently examining other "fourth trimester" care guidelines and hoping to integrate those into the care provided. Typically the maternal care in this period includes one visit at six weeks postpartum where clinicians review the delivery, risk factors for future births, contraception, birth spacing, postpartum depression and assess recovery from childbirth. However 40% of women do not attend this postpartum visit for a variety of reasons including that 23% of employed women return to work within 10 days postpartum and additional 22% return between 10 days and 40 days.[32] Fifty percent of women who stopped smoking in pregnancy restart in the six months postpartum.[32] The American Congress of Obstetrician-Gynecologists (ACOG) has recently published recommendations on "fourth trimester" care including encouraging a first postpartum visit at three weeks postpartum with ongoing care continuing thereafter.[33] Future directions include the need for innovative techniques to sustain gains in screening and ICC.

From a policy standpoint, advocating for paid parental leave and for expanding reimbursement in the postpartum period to include comprehensive care are important pieces to improve health care for women and children and reduce disparities.[32] Expanding the interconception care model to include fourth trimester maternal care encourages earlier and more frequent postpartum contact for mother and newborn to address depression, medical complications, reducing risk factors for future pregnancies and discussing contraception.

Disparities in maternal mortality and infant mortality across different races and socioeconomic status in the US are startling with African American women 3–4 times more likely to die during childbirth.[33] IMPLICIT collects educational level and insurance as a marker for socioeconomic status and asks women to self-identify their race. Implicit bias can be challenging to identify and the IMPLICIT network intends to study the types of interventions provided across race and socioeconomic status to help identify any implicit biases present in order to plan for ways to counteract or educate regarding those biases.

By screening only mothers who bring their newborns to the outpatient office for WCV, mothers whose newborns require a longer stay in the hospital are not included in the ICC survey. Previous research has shown that mothers of infants hospitalized in the neonatal intensive care unit (NICU) lack knowledge about risks of preterm delivery and risks of cesarean delivery despite frequent exposure to perinatal specialists in the NICU.[34]

Some studies have addressed various interventions of ICC to address, for example, maternal depression in mothers of infants who remain hospitalized in the NICU.[35] One concern is that mothers of premature infants who are of lower socioeconomic status will have less ability to take part in these services due to reduced ability to visit their infant due to transportation costs or lack of ability to leave work. Looking to expand effective contraception use in mothers of premature infants hospitalized in the NICU can also be an important intervention. Interestingly, Leaverton et al. found that 75% of mothers of NICU infants were using or planning to use contraception; however 33% of those were planning on not using highly effective contraception.[36] Among breastfeeding mothers of NICU infants found maternal smoking rates of 22%.[37] ICC may also include ways to implement screening for mothers of infants who are hospitalized in the NICU.

Conclusion

The IMPLICIT Network model of ICC offers an innovative approach to addressing maternal health at well child visits. Sites can readily customize implementation by incorporating the questions directly into existing workflows and using local service providers already working in maternal-child health. This model has demonstrated promising results and offers potential for improved perinatal outcomes and promotion of health equity.

Declaration of Competing Interest

None.

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Summary

Interconception care optimizes the entire family's health and prevent future preterm and low birth weight infants. This article describes the creation and implementation of an efficient screening process around tobacco use, maternal depression, prenatal vitamin/folate use, and pregnancy spacing occurring during well child visits.

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