

Integrating and coordinating care between the Women, Infants, and Children Program and pediatricians to improve patient-centered preventive care for healthy growth

Lisa Bailey-Davis,^{1,2,3} Samantha M.R. Kling,¹ William J. Cochran,⁴ Sandra Hassink,^{5,6} Lindsey Hess,² Jennifer Franceschelli Hosterman,^{1,7} Shawnee Lutcher,¹ Michele Marini,² Jacob Mowery,¹ Ian M. Paul,^{8,9} Jennifer S. Savage²

¹Geisinger Obesity Institute, Geisinger Health System, Danville, PA 17822, USA

²Nutritional Sciences, Center for Childhood Obesity Research, The Pennsylvania State University, University Park, PA 16803, USA

³Epidemiology and Health Services Research, Geisinger Health System, Danville, PA 17822, USA

⁴Department of Pediatric Gastroenterology, Geisinger Medical Center, Danville, PA 17822, USA

⁵Institute for Healthy Childhood Weight, American Academy of Pediatrics, Wilmington, DE 19810, USA

⁶Department of Pediatrics, Nemours/Alfred I. duPont Hospital for Children, Wilmington, DE 19803, USA

⁷Nutrition and Weight Management, Geisinger Medical Center, Danville, PA 17822, USA

⁸Pediatrics, Penn State College of Medicine, Hershey, PA 17033, USA

⁹Public Health Sciences, Penn State College of Medicine, Hershey, PA 17033, USA

Correspondence to: L Bailey-Davis, lbaileydavis@geisinger.edu

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Abstract

New care delivery models call for integrating health services to coordinate care and improve patient-centeredness. Such models have been embraced to coordinate care with evidence-based strategies to prevent obesity. Both the Special Supplemental Program for Women, Infants and Children (WIC) Program and pediatricians are considered credible sources of preventive guidance, and coordinating these independent siloes would benefit a vulnerable population. Using semistructured focus groups and interviews, we evaluated practices, messaging, and the prospect of integrating and coordinating care. Across Pennsylvania, WIC nutritionists ($n = 35$), pediatricians ($n = 15$), and parents ($N = 28$) of an infant or toddler participated in 2016. Three themes were identified: *health assessment data sharing* (e.g., iron, growth measures), *benefits and barriers to integrated health services*, and *coordinating care to reduce conflicting educational messages* (e.g., breastfeeding, juice, introduction of solids). Stakeholders supported sharing health assessment data and integrating health services as strategies to enhance the quality of care, but were concerned about security and confidentiality. Overall, integrated, coordinated care was perceived to be an acceptable strategy to facilitate consistent, preventive education and improve patient-centeredness.

Keywords

Health status disparities, Health Communication, Information systems, Primary health care

INTRODUCTION

Novel delivery models have been conceptualized with the promise of improved patient-centered care and health outcomes. The Chronic Care Model [1] advanced the concept of connectivity among community and clinical health services to improve patient-centered care. More recent models such as the Culture of Health Action Framework [2], developed by the Robert Wood Johnson Foundation, embrace this concept with the goal of health equity by making optimal health a public value shared equitably across a diverse country. One component of this Action Framework calls for strengthening integration of health services and systems (e.g., public health, clinical, and social services), particularly for the most vulnerable populations that rely upon

Implications

Practice: Integrated delivery models that electronically share patient-level data to coordinate care across sectors is an acceptable strategy among patients, providers, and public health professionals.

Policy: Health disparities among vulnerable populations may be reduced when clinical and public health services recognize their mutual roles in prevention, share data, and coordinate patient-centered care.

Research: Future research should be aimed at identifying the process for delivering integrated care and the impact of such care on preventive practices and health outcomes.

services to meet basic needs [3]. In this vein, we explore how the Special Supplemental Program for Women, Infants, and Children (WIC), administered by the United States Department of Agriculture since 1974 and a widely utilized public health service, could be integrated with clinical services to coordinate preventive care with evidence-based strategies and improve patient-centeredness for early childhood obesity prevention.

Despite initiatives to reduce childhood obesity, 1 in 10 infants and toddlers are affected, with rates higher for economically disadvantaged children, placing them at increased risk for later obesity [4, 5]. For successful, patient-centered obesity prevention, integration of providers (i.e., public, mental, and behavior health), community and social services, and health care delivery systems via data exchange and information sharing strategies is an under-explored strategy [6]. Achieving integration and coordination would break down siloes to improve health outcomes, offer a comprehensive

acknowledgement of the patient's context, and reduce duplication and inefficiencies. This concept has been primarily applied to clinical settings (e.g., general physicians, specialists, and insurance), but a broader view extends it to public health settings, such as WIC [7].

Mothers of infants enrolled in WIC receive nutrition education and obesity prevention care at similar time points in two distinct settings: public health and clinical healthcare. Both WIC nutritionists and pediatricians collect anthropometric and behavioral measures to evaluate nutritional status and growth and provide education during routine visits. WIC is required by law to complete assessments of height, weight, BMI percentile, hemoglobin, and dietary intake [8]. In comparison, pediatricians are recommended to deliver anticipatory guidance based on their physical (i.e., height, weight) and behavioral (i.e., dietary) assessments to promote healthy growth and prevent obesity [9, 10].

There are seemingly many opportunities for data sharing and coordinated care to support and educate parents on appropriate child growth, feeding practices and styles, and parenting; however, research suggests that educational messages conflict and the roles of various health professionals are not mutually understood [11–13]. Even though WIC has a regulatory responsibility to coordinate with other health services [8] and the American Academy of Pediatrics (AAP) has called for coordination of services between WIC and healthcare organizations [14, 15], there is limited evidence of coordination. Barriers to coordination of care include limited resources and a lack of understanding of the other entity [16] but stakeholders' views regarding the value of integrating and coordinating care are unknown.

The success of coordination of care depends on awareness and acknowledgement of roles, identification of supportive organizational climates for change, and appreciation for potential reciprocity of services to improve patient-centeredness and health outcomes. The goal of this research is to evaluate how WIC nutritionists, pediatricians, and parents perceive current practices, preventive, educational messaging across settings and their views on how integration and coordination could affect care. The impressive cross-sector reach between WIC and the pediatric clinical setting and potential of integrating and coordinating care is underscored. During this critical development period for obesity prevention, more than half of the U.S. infants and a third of children under 5 years of age participate in WIC, and nearly two-thirds of children receiving Medicaid receive annual well child visits [17, 18]. The study will provide insight to stakeholder perceptions regarding a new delivery model for a vulnerable population that may be applicable across the USA to benefit the health of young children.

METHODS

Participants

Participants were WIC nutritionists, pediatricians, and parent/guardians in the central Pennsylvania area. A convenience sample of WIC nutritionists were recruited during a regularly scheduled state agency meeting, representing 24 local WIC agencies, of which 100% agreed to participate ($N = 35$). A convenience sample of pediatricians ($N = 35$) were sent emails and study information; 43% consented to participate ($N = 15$). Electronic health records were used to identify eligible parents/guardians (hereinafter, "mothers") ($N = 347$) to be mailed an opt-out letter. Eligible criteria for mothers included (a) having a child aged birth to 24 months, (b) receiving care from a pediatrician in Geisinger Health System (GHS), and (c) participating in the Pennsylvania WIC program. After the opt-out period expired, trained research staff contacted mothers ($N = 251$) by phone to provide more details about the study, of which 28 mothers consented to participate. All participants were English speaking. Recruitment and data collection took approximately 4 months and occurred until data saturation was reached.

Moderator's guide

A mixed methods approach consisting of semi-structured focus groups (WIC nutritionists) and interviews (pediatricians and mothers) were used to elicit broad themes related to the study aims. This approach allowed participants to discuss their views without introducing potential bias and allowed the moderator/interviewer to ask clarifying and/or related questions based on responses. The questions used in the guides are listed in Table 1. The moderator's guide was informed by integrated [19] (e.g., WIC item 2, Pediatrician item 3, Mother item 4) and coordinated care principles [7] (e.g., WIC item 3, Pediatrician item 2, Mother item 2) and adult learning theory [20] (e.g., Pediatrician item 4, Mother item 3) to identify key concerns and conflict points to address in an intervention designed to optimize integration, coordination, and learning. The study team developed initial moderator guides that were peer-reviewed by the state WIC agency, the Institute for Healthy Childhood Weight (AAP), pediatricians, and a GHS patient advisory panel. Their collective feedback was used to refine the moderator guides before pilot testing with representatives from the three target audiences to assure that each guide would elicit the perspective of each group on core topics.

Procedures

Focus groups were conducted with WIC nutritionists following an annual professional meeting to optimize participation. All moderators and note takers were trained and had experience working with the target

Table 1 | Focus group guides for WIC nutritionists and interview guide for pediatricians and mothers**Focus Group Guide for WIC Nutritionist**

1. In your experience, what specific feeding/nutrition messages do you find difficult to talk about or that your clients tend to resist the most? Why?
2. How useful would it be to be able to see the feeding/nutrition/parenting messages that the PCP delivered to your client? Discuss why/why not.
3. Describe a time when your client told you that the nutrition/feeding information you gave them conflicted with what the primary care provider told them.
 - a) Is that something you tend to hear from your clients?
 - b) What did you do, if anything, to resolve the conflict in information?
4. What concerns do you have with PCPs and WIC nutritionists electronically sharing child data?
 - Prompts
 - o Impact on WIC staff/workflow
 - o Feasibility of providing/receiving data in a timely manner
 - o Breach of confidentiality
 - o Data security
5. What are some of the potential barriers to coordinating care between you and PCPs?
 - Prompts
 - o Limited time available to convey messages
 - o Different sources of information
 - o Different background training and inherent skills
 - o Limited (human/technology) resources
 - o Lack of parent interest

Interview Guide for Pediatricians

1. What kinds of nutrition/feeding messages do you deliver to mothers that might conflict with WIC guidance?
 - Prompt: Juice
2. Describe a time when the patient's mother told you that the nutrition or feeding information you gave them conflicted with what the WIC nutritionist had told them.
 - a) What, if any, steps did you take to resolve the conflict in information?
3. How useful would it be to you to see WIC feeding/nutrition/parenting data in the child's EHR? Use a scale of 1 (not at all useful)-10 (extremely useful) to quantify your response and describe your rating.
4. Describe how, if at all, you would find value in having the WIC feeding/nutrition/parenting data in the child's EHR?
 - Prompts
 - o Time saver; if already know topic discussed at WIC then can discuss something else
 - o The PCP could reinforce nutrition education/messaging with confidence
5. What type of information, if any, do you think would be useful to export from the child's EHR to the WIC clinic so that WIC knows what has been communicated in clinical care?
 - Prompt: Feeding/nutrition/parenting messages
 - o Type of infant formula recommended/amounts/frequency
 - o When to introduce solids/type of solid food (e.g., cereal, vegetables, etc.)
 - o Avoiding juice, television
 - o How to soothe a fussy baby
 - o How to establish a sleep routine
 - Prompt: Clinical evidence of nutrition risk
 - o CBC rather than Hemoglobin only
 - o Anthropometric measures
 - o Food allergies/intolerances
 - o Failure to Thrive; feeding disorder; metabolic diseases; reflux
6. How frequently should the child's data be shared between these two settings?
7. What concerns do you have about the feasibility of electronically sharing child data?
 - Prompts
 - o Impact on clinical workflow
 - o Feasibility of providing/receiving data in a timely manner
 - o Breach of confidentiality

Table 1 | *Continued***Interview Guide for Mothers**

1. Describe a time, if any, when the nutrition or feeding information you received from your primary care provider was different than the advice that you received from your WIC Nutritionist.
2. Describe a time, if any, when the parenting information you received from your primary care provider was different than the advice that you received from your WIC Nutritionist.
3. If you have received different information, did you tell either the WIC nutritionist or your child's primary care provider that they had given you information that differed from other information you had received?
 - a) Who did you tell?
 - b) What was their reaction?
4. What, if any, concerns would you have about your child's primary care provider and your WIC nutritionist sharing information about your child's health?
5. What, if anything, would you NOT want them to share with each other about your child?

CBC complete blood count; *EHR* electronic health record; *PCP* primary Care Provider; *WIC* Women, Infants, and Children Program.

audience. Moderators read the questions and asked participant(s) to discuss the responses and an assistant managed the audio recording and note taking. Seven focus groups with 4 to 7 participants were conducted and lasted between 60 and 90 min. Breakfast was available before and during the focus groups.

Interviews of mothers and pediatricians were conducted by telephone to optimize convenience for the participant by a moderator with experience conducting phone interviews. The moderator read questions from the guide and provided prompts to the participant to elicit further detail as needed. Interviews were recorded and lasted 15 min, on average. Mothers received a \$25 gift card for their participation. Verbal, implied consent was obtained from each participant at the beginning of the focus group or interview. The Institutional Review Board at GHS approved study procedures.

Analysis

For demographic variables, descriptive statistics were calculated using SAS version 9.4 (SAS Institute Inc., Cary, NC). Focus groups and phone interviews were transcribed verbatim. Transcripts were analyzed using thematic analysis, a process that involves six phases including familiarization with the data, generation of initial codes, searching for themes, reviewing themes, naming themes, and producing a final report [21]. First, six researchers independently read and open-coded a subset of the transcripts to generate initial codes. Next, the study team met to discuss the codes for consistent interpretation, compared codes to reduce redundancy, and sorted codes into tentative categories. Transcripts were then imported into NVivo 8.0 (QSR International PTY Ltd.) for three researchers to independently code the data. Through discussion, the study team resolved all coding discrepancies, reached consensus on the underlying meaning of the codes, merged categories to tentative themes, identified quotes relevant to each theme, and named themes to produce findings. Overall, qualitative data analysis was inductive and followed the constant comparative method [22].

RESULTS**Sample**

WIC nutritionists, pediatricians, and mothers participated. WIC nutritionists were primarily white (94.3%) and not Hispanic or Latino (97.1%), had at least a bachelor's degree, and 90.9% reported a family income greater than \$40,000. Pediatricians were primarily white (88%) and non-Hispanic or Latino. Per Census 2015 data, communities where mothers were recruited from were primarily white (94%) and non-Hispanic or Latino (96.5%).

As shown in Table 2, three major themes emerged that provided support and considerations for pursuing the integrated, coordinated care between WIC nutritionists and pediatricians: (a) Health Assessment Data Sharing: Iron and Growth; (b) Benefits and Barriers to Integrated Health Services; and (c) Coordinating Care to Reduce Conflicting Educational Messages: Breastfeeding, Juice, Introduction of Solids.

Health assessment data sharing: iron and growth measures

The first theme to emerge was the lack of sharing and communication of health data, specifically regarding two issues identified as subthemes: iron and growth measures. Hemoglobin values to assess iron status and anthropometric data to assess growth were not shared between WIC and pediatricians, a situation that created frustration and decreased workflow efficiencies (Table 2). Across WIC nutritionists, pediatricians, and mothers, there were reports that the results and standards for hemoglobin tests conducted by WIC were not directly shared with clinical settings, which led to additional assessments. Pediatricians raised concerns about the accuracy of the WIC finger stick method used to assess iron status, indicating that venous specimens are more reliable than capillary samplings. Regardless, pediatricians indicated that documented WIC hemoglobin results were rarely available and instead verbally reported by the mother. To resolve assessment conflicts, some pediatricians ordered an additional

Table 2 | Sample of independent quotes within each of the three identified themes or subthemes related to integrating and coordinating care between WIC nutritionists and pediatricians

Theme 1. Health Assessment Data Sharing

Iron

“What we see is low hemoglobin is not seen as low hemoglobin at the doctor’s office. It has to be a 9 or below 9 before they would do any intervention, when we start intervention at 10.9.”—WIC Nutritionist

“They [Parents] would always tell me that WIC checked their hemoglobin and it was normal and I would ask them the number and they wouldn’t know. And I’d have no way of knowing that because I can’t share data with WIC. And I have to repeat it and parents are not happy about it.”—Pediatrician

“So they’re getting, I feel, inaccurate information more than not, so if they were to share that information it’d be done we wouldn’t have to worry about ok he just had his blood drawn at the doctor’s office now we have to go to WIC two weeks later and they have to prick his finger for his iron.”—Mother

Growth

“They’ll [Mothers] say, ‘well my doctor’...we might be talking about the weights on the charts so then they might say, ‘well the doctor always has a different percent or different number’ than we have so then they would sometimes listen to the doctor instead of us. And sometimes I’ll get like a little offended, cause we might say they’re overweight but according to the doctor they’re okay.”—WIC Nutritionist

“...I don’t know what that is, you know if we just have, if we’re using the same growth curves or not or what is, what is the scale, but I notice that too. We have parents coming in saying they’re underweight but they’re not, you know. Or they’ll have a four-month-old and they’ll say well they weigh too much for their height, and I’m like well they’re four months.”—Pediatrician

“The doctor was telling me always make sure feed him when he’s hungry because just because he was big when he was born doesn’t mean there’s something wrong with his growth, and being 18 months now he’s doubled his weight, he’s pretty much tripled his length and he’s healthy as can be. To where the WIC office does suggest smaller portioning and everything and...that I’m not feeding him these jumbo plates of anything.”—Mother

Theme 2. Benefits and Barriers to Integrated Health Services

Benefits

“Sometimes you can explain the same thing the doctor said, but in a different way and the mom will just thank you, because you brought it to her level, and so it’s the same message, but explained in a different way.”—WIC Nutritionist

“If the WIC feels okay mom is doing a good job, I want to know the mom is doing a good job so I don’t have to again like you know like give her a positive reinforcement you’re doing a great job, but you know I can concentrate more on like something else.”—Pediatrician

“You know we can use that to kind of bolster you know the recommendations. Because I think if they hear it from enough places, different places, and it’s pretty much consistent then they’re gonna follow through.”—Pediatrician

“I don’t think that would bother me at all because then they could learn from each other and hopefully... they can get on a system that works and collaborates with both and then they’d be on the same page.”—Mother

Barriers

“And not to make the process and burden on the client too like if this appointments gonna take longer and we’re you know [be] sharing information you know we already hear from the clients that they feel they’re already at WIC too long so you know I wouldn’t want it to burden them”—WIC Nutritionist

“The thing is that you know, we want the information from the doctor if it’s helpful to us, but they don’t necessarily want our information I don’t think, I mean they hold all the information they need. They don’t really want anything from us, so what’s the likelihood that they would be waiting on our information you know?”—WIC Nutritionist

“I think from a workflow perspective, um if the WIC information was not in the pediatricians, like if it’s not in the same database... and I had to log in and review notes in a different system, um that would take more time.”—Pediatrician

“I think that the more people who are able to get into an electronic medical record the more concern there is for HIPAA violation”—Pediatrician

“Like, ok if [child], let’s just say, had to go get stitches or something, God forbid. And like I don’t think that’s information that they have to share with WIC.”—Mother

Theme 3. Coordinating Care to Reduce Conflicting Educational Messages

Breastfeeding Support

“the doctor, we have a good pediatrician, a really good pediatrician, but he tells mom’s breastfeeding is disgusting, and they do believe him, and they think what he says is true!”—WIC Nutritionist

“if the doctor’s telling them to um stop breastfeeding and we’re trying to encourage them... what they’re doing is correct you know um those are um sometimes difficult cause we’re conflicting with what maybe they’re hearing from the doctor”—WIC Nutritionist

“breastfeeding information can be very conflicting, we have one physician who wants all breastfeeding women to supplement with formula, um that same physician recommends that [babies] wean at six months”—WIC Nutritionist

Provision of Juice

“It makes it very difficult sometimes um they [Pediatricians] don’t like us giving any juice at all, and every change we’ve made they’ve come up with a reason why it wasn’t a good change and so they’re very difficult to deal with.”—WIC Nutritionist

“I think the fruit juice is provided by WIC, and I think a lot of people believe, families believe at least, a lot of my families believe that it’s a healthy thing. So that’s the big thing that I’m pretty anti-fruit juice”—Pediatrician

Table 2 | *Continued*

"I don't recommend juice for any of my patients, regardless of where they are on the growth curve. Um and I think some of the nutrition that WIC provides and the advice that they give often includes juice. Um even if it's a recommended like small volume that WIC offers. Um I, I disagree with that recommendation."—Pediatrician

Introduction to Solids

"Mom will not start solids before four months, so we're following up with that, and she'll say "well no we started that last month because he was, you know, taking too much formula and the doctor said it was fine."—WIC Nutritionist

"WIC is telling them to introduce solids is much earlier stage than what the American Academy of Pediatrics guidelines are. So, um, some of them are starting to get cereal and baby food at 3 ½ months or 4 months of age where the AAP is pushing more toward 6 months and they are telling me that this is what WIC has been giving us."—Pediatrician

"My doctor had told me to start giving him cereal at night, where WIC was pretty much, you know pretty stern against him having cereal until um he was 6 months. But I think he was about three months when the doctor said go ahead, you know, 'it's not going to hurt him, go ahead and give him a little bit at night so he'll sleep more.'"—Mother

AAP American Academy of Pediatrics; *WIC* Women, Infants, and Children Program.

laboratory test (Table 2), which frustrated mothers and pediatricians due to the burden on the child and workflow inefficiencies.

The second subtheme emerged regarding a lack of data sharing and resultant conflicts across WIC nutritionists, pediatricians, and mothers regarding assessment and communication of child growth (Table 2). Every stakeholder group reported that child weight measures were conflicting between the two settings. Parent confusion about child growth status may be attributed to different measurement techniques, and use of different child growth references/standards between WIC and clinical settings. In regards to growth, mothers reported that they trusted the pediatrician more than WIC and may disregard WIC nutritionists' assessment and preventive counseling.

Benefits and barriers to integrated health services

The second identified theme related to benefits and barriers of integrating health services between WIC nutritionists and pediatricians. Across stakeholder groups, integration was perceived to offer the benefit of being a means to resolve communication breakdowns and more easily identify and address gaps in parent knowledge to boost the impact of preventive care (Table 2). WIC nutritionists reported sharing health data would allow them to identify what the parent misinterpreted from the physician and explain the point from a different perspective (Table 2). Pediatricians reported that integrating services with WIC would have many benefits, including identification of WIC participants, having a record of WIC educational messages, and limiting the amount of hear-say information from the mother. Pediatricians perceived the opportunity to briefly boost the educational message already provided by WIC and/or discuss novel topics in detail. In turn, pediatricians reported being consistent with WIC might facilitate parental adoption of recommendations. Mothers also thought the integration of health services would reduce the burden of transporting health information, such as immunization records, between the two settings (Table 2). In addition,

mothers were hopeful that integration would lead to improvements in their child's care, since both providers would have more information to make more efficient and effective care decisions.

Despite the numerous benefits, barriers to integrating health services were identified within stakeholder groups. WIC nutritionists reported that integration would have to be an efficient, confidential process that would not increase the amount of time mothers spend in the clinics (Table 2). Similarly, pediatricians expressed concerns about data quality and privacy. Clinical notes may not be helpful to WIC and electronic record systems may not be interoperable, thus requiring additional documentation time or limiting the ability to share data confidentially. Mothers expressed that they would not want the pediatrician to share certain information, such as personal health conditions (e.g., circumcision problems) or accidents (e.g., stitches, burns) with WIC. However, mothers were comfortable with WIC sharing all their data with the pediatrician. Lastly, even though WIC nutritionists viewed shared health assessment data as valuable, they were unsure if the pediatrician would share this perspective. Counter to this concern, all but one pediatrician identified value in integrating with WIC to enhance preventive health services, particularly for children at nutrition risk.

Even though all stakeholders perceived that integrating health services between WIC and pediatricians would be of benefit to patient-centered preventive care, barriers were identified related to developing a way to securely and efficiently transfer the appropriate data. Concerns about transiency among the vulnerable population were noted by WIC and pediatricians as a potential limiting factor to the impact of integrated, coordinated care.

Coordinating care to reduce conflicting educational messages

The third theme identified was conflicting educational messages, which had three subthemes: breastfeeding support, provision of juice, and introduction to solids. These subthemes emerged as an issue of conflict within at least one stakeholder group

whereas the group perceived that integrated and coordinated care between WIC and pediatricians could reduce conflict.

The WIC nutritionists reported that pediatricians did not provide support or helpful information to breastfeeding mothers (Table 2). When mothers faced breastfeeding problems, the WIC nutritionists reported that pediatricians did not aid, and often encouraged cessation of breastfeeding and/or addition of formula. Pediatricians reported that WIC's provision of juice and messaging around juice conflicted with their advice of limiting or excluding juice from infant diets. This was a source of frustration among pediatricians as providing easier access to juice directly conflicts with their educational messaging. Every stakeholder group reported inconsistencies between the two settings regarding recommendations for when to introduce solids to infants. Pediatricians indicated that standard guidance is to advise mothers to wait until 6 months of age to introduce solid foods, but mothers told them that WIC instructed them to start solid foods earlier. Conversely, some pediatricians reported that flexibility with the 6-month guideline was appropriate for some infants and guidance should be tailored to individual infants; whereas, they perceived WIC was less flexible. Mothers noticed these mixed messages, which could lead them to feed their infants solid foods earlier than AAP recommendations.

WIC nutritionists, pediatricians, and mothers reported that educational messages provided at WIC appointments and well child visits conflict, which could impede the adoption of healthy behaviors. A consistent educational curriculum with integrated communication across settings could reduce conflict, improve patient-centeredness with tailored care, and improve the adoption of health promoting behaviors.

DISCUSSION

The WIC nutritionists, pediatricians, and mothers in this study were candid about the miscommunications and conflicts between WIC and healthcare settings, positive about the potential benefits of integrating and coordinating care between these settings, and insightful regarding the potential barriers to implementing this practice. From the discussions, three themes and subthemes were identified that provide evidence, support, and future direction for pursuing integrated, coordinated care between public health and clinical settings. The themes that emerged from the focus groups and interviews included (a) health assessment data sharing; (b) benefits and barriers to integrated care; and (c) coordinating care to reduce conflicting educational messages.

Potential solutions to integrate and coordinate care between WIC and pediatricians would be characterized by data exchange and information sharing built around care activities including

communication between involved parties; a governance structure with cross-sector representation to ensure an understanding of roles, scope of practice, assessment methods, and regulatory or reference standards; and a shared yet dynamic educational curriculum that could be modified to reflect patient-centered needs. Our results provide a foundation for integrating and coordinating care between WIC and pediatricians, which both provide essential care to vulnerable infants, toddlers, and children. Enhancing patient-centered preventive care may be highly beneficial for this population that experiences economic disparities, food insecurity, and a need for supplemental food and nutrition education to promote adequate but not excessive intake of nutrients and appropriate growth [17].

Several facets of the healthcare system have applied and shown care coordination can be successful in improving patient-centered care, quality of care, and health outcomes [6, 7, 23] while literature is sparse regarding integration. We found no literature examining outcomes of integration or coordinated care on early obesity prevention. Further, care coordination literature related to lifestyle behaviors has been limited to training and referral activities [6] and has not included broad-scale entities external to clinical settings, such as WIC, a critical gap given the prominence of community in the Chronic Care and Obesity Care Models [1, 24]. The Integration Framework for the Prevention and Treatment of Obesity [25] proposes identifying an integrator to serve the functions of leadership, engagement of cross-sector partners, facilitation of goals and metrics, awareness of community resources, etc. Coalitions or large integrated health care systems invested in population health management have and could play this role, which often requires long-term and sustained resources to realize desired health outcomes and reductions in economic risk or financial gains, if applicable [25]. In contrast, the Culture of Health Action Framework [3] indicates organizational work force staffing as a path to ensuring cross-sector collaboration.

Absent from each of these approaches to integration is the explicit description of care coordination detailing how data exchange, information sharing, and communication would occur at the point of care in public health and clinical settings. Implementation lessons in interoperability, security, and organizational divides regarding data ownership and use can be garnered from large-scale data information exchange projects [26, 27]. Interinstitutional agreements that describe collaborative processes with shared organic leadership could serve the function of an integrator without formal identification of leaders or new administrative staff. National policy that supports collaboration between public health and medicine as a driving force to initiate planning activities toward the vision of integrated and

coordinated care needs to be flexible, but research is needed to identify effective and efficient methods for data exchange and communication.

Integrating and sharing health data between WIC and pediatric clinical settings has potential to improve assessments, decision-making, and preventive education or counseling regarding child growth while reducing parent/guardian confusion and improving quality of care. Preparations for data sharing should include cross-sector training to promote awareness and acknowledgement of the scope of practice, assessment methods, and reference standards used in each setting. Specifically, WIC nutritionists and pediatricians expressed that not knowing the other's cutoff values for hemoglobin or the reference growth chart utilized contributed to their mutual loss of confidence regarding care in the other setting. This may be most problematic for children with obesity, since their parents often do not recognize their child as having an unhealthy weight status [28]. Use of different standards in the two settings may not be the whole problem, however, and inconsistencies may also be due to differences in assessment method, equipment, and the time lapse between measures. Future research should examine whether communication of both the standards and procedures used for laboratory and anthropometric data between WIC and pediatricians facilitates consistent assessments and decision-making and minimizes inefficiencies in workflow attributed to unnecessary testing.

Our findings align with the most cited benefit of care coordination: having all stakeholders on the same page. The first benefit of communication between WIC and pediatric clinical settings would be additional opportunities to provide parents more opportunities to ask questions and clarify educational messages. A communication system would also need to clearly indicate that a family is enrolled in WIC, an item that is not routinely captured in electronic health records; thus, providing an accessible resource that the pediatrician could utilize to facilitate lactation support or assistance with child feeding issues. Having a shared educational curriculum and a record of what messages a patient has received could reduce reliance on unverifiable, indirect information provided by the parent. Therefore, coordinating care would also reduce the perceived conflict between the two settings and decrease the burden on parents to transport information. This would make the visits more efficient and effective by allowing providers to spend more time on priority topics and reduce duplicate assessments and tests.

The cited barriers to integrating and coordinating care between WIC and pediatric clinical settings could be addressed with health information technology (HIT) solutions. Secure and confidential health information exchange, conforming to the rules of HIPAA, has been demonstrated, suggesting that this can be achieved between clinical and public health

services [7, 29]. Furthermore, HIT can assist providers in integrating standardized procedures and recommendations into their workflow while improving patient care [30] and health outcomes while remaining acceptable to patients [31]. With care coordination occurring in the healthcare setting, there are models in place to inform a system that would allow communication and data sharing between WIC nutritionists and pediatricians although flexible governance solutions should be mutually identified and practiced with continuous attention to internal factors (e.g., time) and external factors (e.g., economic costs) [26, 27].

One strength of the study is the inclusion of the stakeholders that would be directly engaged in the practice of integrating and coordinating care between public health and clinical settings. The study, however, has several limitations. The racial and ethnic diversity of mothers is unknown, limited to one health care system and one state, and mixed qualitative methodologies were utilized, all factors that limit the generalizability of the findings.

Strategies to integrate and coordinate care between WIC and pediatricians were viewed positively to improve patient-centeredness, decrease confusion, and reduce care inefficiencies. Since the integration and coordination of care between public health and clinical settings is uncommon, there are barriers that need to be considered and thoughtfully resolved. Developing a system for integrating and coordinating care and communication between these two settings could effectively and efficiently decrease conflict in messaging while increasing dose and frequency of reinforcement to impact parent and child health behaviors. Thus, future research is needed to examine the integration and coordination of care between public health and clinical settings on the care of children, stakeholders' perceptions, and health outcomes.

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Compliance with ethical standards

Conflict of Interest: The authors declare there is no conflict of interest.

Primary Data: These findings have not been previously published or reported and this manuscript is not being simultaneously submitted elsewhere. The authors have full control of all primary data and agree to allow the journal to review the data, if requested.

Ethical Approval: This project was approved by the Geisinger Institutional Review Board # 2012-0363; human rights were protected. Practitioners were actively engaged in the development, analysis, and reporting of this study.

Informed Consent: Participants provided informed consent.

References

1. Improving Chronic Illness Care. The Chronic Care Model. Available at http://www.improvingchroniccare.org/index.php?p=The_Chronic_Care_Model&s=2. Accessibility verified December 1, 2017.
2. Evidence for Action. What is a Culture of Health? Available at <http://www.evidenceforaction.org/what-culture-health>. Accessibility verified December 1, 2017.
3. Martin LT, Plough A, Carman KG, Leviton L, Bogdan O, Miller CE. Strengthening integration of health services and systems. *Health Aff (Millwood)*. 2016;35(11):1976–1981.
4. Ogden CL, Carroll MD, Lawman HG, et al. Trends in obesity prevalence among children and adolescents in the United States, 1988–1994 through 2013–2014. *JAMA*. 2016;315(21):2292–2299.
5. Mei Z, Grummer-Strawn LM, Scanlon KS. Does overweight in infancy persist through the preschool years? An analysis of CDC pediatric nutrition surveillance system data. *Soz Praventivmed*. 2003;48(3):161–167.
6. Porterfield DS, Hinnant LW, Kane H, Horne J, McAleer K, Roussel A. Linkages between clinical practices and community organizations for prevention: a literature review and environmental scan. *Am J Prev Med*. 2012;42 (6 Suppl 2):S163–S171.
7. McDonald K, Schultz E, Albin L, et al. *Care Coordination Measures Atlas Version 4*. Rockville, MD: Agency for Healthcare Research and Quality; 2014.
8. Food and Nutrition Service, USDA, 7 CFR 246.4 (a). State Plan. 2017. Available at <https://www.gpo.gov/fdsys/pkg/CFR-2011-title7-vol4/pdf/CFR-2011-title7-vol4-sec246-4.pdf>. Accessibility verified December 1, 2017.
9. Barlow SE; Expert Committee. Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: summary report. *Pediatrics*. 2007;120(Suppl 4):S164–S192.
10. Daniels SR, Hassink SG; Committee on Nutrition. The role of the pediatrician in primary prevention of obesity. *Pediatrics*. 2015;136(1):e275–e292.
11. Chamberlin LA, Sherman SN, Jain A, Powers SW, Whitaker RC. The challenge of preventing and treating obesity in low-income, preschool children: Perceptions of WIC health care professionals. *Arch Pediatr Adolesc Med*. 2002;156(7):662–668.
12. Olson BH, Horodyski MA, Brophy-Herb H, Iwanski KC. Health professionals' perspectives on the infant feeding practices of low income mothers. *Matern Child Health J*. 2010;14(1):75–85.
13. Savage JS, Neshteruk CD, Balantekin KN, Birch LL. Low-income women's feeding practices and perceptions of dietary guidance: A qualitative study. *Matern Child Health J*. 2016;20(12):2510–2517.
14. American Academy of Pediatrics. WIC program. *Pediatrics*. 2001;108(5):1216–1217.
15. Islam N, Nadkarni SK, Zahn D, Skillman M, Kwon SC, Trinh-Shevrin C. Integrating community health workers within Patient Protection and Affordable Care Act implementation. *J Public Health Manag Pract*. 2015;21(1):42–50.
16. Fox H, McManus M, Schmidt H. WIC reauthorization: Opportunities for improving the nutritional status of women, infants, and children. *NHFP Background Paper 2003:1–35*. Available at http://www.nhfp.org/library/background-papers/BP_WIC2_8-03.pdf. Accessibility verified December 1, 2017.
17. National Academies of Sciences, Engineering, and Medicine. *Review of WIC food packages: improving balance and choice: Final report*. Washington, DC: The National Academies Press; 2017.
18. Haire-Joshu D, Tabak R. Preventing obesity across generations: evidence for early life intervention. *Annu Rev Public Health*. 2016;37:253–271.
19. Institute of Medicine. *Primary care and public health: Exploring integration to improve population health*. Washington, DC: National Academies Press; 2012.
20. Lave JR, Frank RG, Taube C, Goldman H, Rupp A. The early effects of Medicare's prospective payment system on psychiatry. *Inquiry*. 1988;25(3):354–363.
21. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3(2):77–101.
22. Merriam S, Tisdell E. *Qualitative Research: A Guide to Design and Implementation*. 4th edn. San Francisco, CA: Jossey-Bass; 2016.
23. Stock S, Pitcavage JM, Simic D, et al. Chronic care model strategies in the United States and Germany deliver patient-centered, high-quality diabetes care. *Health Aff (Millwood)*. 2014;33(9):1540–1548.
24. Dietz W, Lee J, Wechsler H, Malepati S, Sherry B. Health plans' role in preventing overweight in children and adolescents. *Health Aff (Millwood)*. 2007;26(2):430–440.
25. Dietz WH, Solomon LS, Pronk N, et al. An integrated framework for the prevention and treatment of obesity and its related chronic diseases. *Health Aff (Millwood)*. 2015;34(9):1456–1463.
26. Unertl KM, Johnson KB, Gadd CS, Lorenzi NM. Bridging organizational divides in health care: an ecological view of health information exchange. *JMIR Med Inform*. 2013;1(1):e3.
27. Feldman SS, Schooley BL, Bhavsar GP. Health information exchange implementation: lessons learned and critical success factors from a case study. *JMIR Med Inform*. 2014;2(2):e19.
28. Briefel RR, Deming DM, Reidy KC. Parents' perceptions and adherence to children's diet and activity recommendations: the 2008 feeding infants and toddlers study. *Prev Chronic Dis*. 2015;12:E159.
29. Steichen O, Gregg W. Health information technology coordination to support patient-centered care coordination. *Yearb Med Inform*. 2015;10(1):34–37.
30. Thompson LA, Wegman M, Muller K, et al.; Health IMPACTS for Florida Network. Improving adolescent health risk assessment: a multi-method pilot study. *Matern Child Health J*. 2016;20(12):2483–2493.
31. Cochran GL, Lander L, Morien M, et al. Consumer opinions of health information exchange, e-Prescribing, and personal health records. *Perspect Health Inf Manag*. 2015:1–12 Available at <http://ezaccess.libraries.psu.edu/login?url=https://search.proquest.com/docview/1739315737?accountid=13158>. Accessibility verified December 1, 2017.