

From HRSA Grant to Medical Practice: Improving Care for Children and Adolescents in a Family Medicine Residency Clinic

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ABSTRACT

BACKGROUND: The patient-centered medical home (PCMH) is an ideal primary care model for patients across the lifespan. Family Medicine (FM) practice and training often address adults more than children/adolescents. Few studies describe the efficacy of education programs seeking to enhance PCMH-based care of children/adolescents.

METHODS: At the Brown FM Residency in Pawtucket, Rhode Island (RI), from 2015–2020, we aimed to enhance care of children/adolescents through a HRSA-funded program that enhanced PCMH-based care for children/adolescents and related resident education. Our mixed-methods evaluation assessed learner experiences. Vaccination data assessed patient impact.

RESULTS: 119/155 (77%) residents completed surveys over four years and learning and performance improved, especially in PCMH principles and behavioral health (BH) competencies. Vaccination rates improved. Qualitative interviews supported quantitative results.

CONCLUSIONS: Enhancing care for children/adolescents within a FM residency clinic requires a multi-pronged approach. This initiative improved children/adolescents' care and increased residents' learning and performance.

KEYWORDS: graduate medical education; curriculum development; patient-centered medical home; mixed-methods; children/adolescents

INTRODUCTION

The patient-centered medical home (PCMH), initially conceptualized by the American Academy of Pediatrics for care of children with complex medical illness, has been adopted by the broader primary care community.¹ Today, PCMH is seen as an ideal care model for all ages,^{2,3} incorporating integrated approaches, including behavioral health (BH).⁴ However, family medicine (FM) initiatives embracing PCMH are less likely to focus on children/adolescents than adults.^{5,6} In this paper we describe a five-year initiative funded by a HRSA Primary Care Training and Enhancement (PCTE) grant to enhance training of child/adolescent care within a FM residency in Rhode Island (RI); and share results from our mixed-methods evaluation.

METHODS

Program Description

The Brown FM residency is a primary care training program based in Pawtucket, Rhode Island (RI). Its main teaching site, a safety-net PCMH clinic, serves majority low-income, diverse and medically complex patients.⁷ Our 2015–2020 HRSA grant, "Transforming Family-Centered Care for Children and Adolescents in Underserved Communities in RI," aimed to enhance the care delivery for children/adolescents within our resident/faculty PCMH clinic through clinical innovations and resident education, and to increase trainee knowledge of child/adolescent determinants of health.

Specific aims of the grant included providing robust training and practice around PCMH principles, panel management, and population health; enhancing child/adolescent BH; establishing a medical-legal partnership (MLP);⁸ and providing nutrition education. (**Table 1**)

We sought to educate residents in PCMH concepts through a recurring yearly PCMH clinical rotation in all three years of residency; a third-year BH rotation; community engagement during pediatric outpatient months; and didactic education to increase self-efficacy in addressing health needs of child/adolescents.

We used mixed methods evaluation strategies to adapt our approach over the funding period. The research was approved by the Kent Hospital Institutional Review Board (Warwick, RI).

Study Design

We used mixed-methods to evaluate grant programming, incorporating Moore's Expanded Outcomes Framework for Assessing Learners.⁹ This framework is commonly used to evaluate medical education efforts and outlines seven levels of educational development, ranging from physician participation to community-wide health outcomes.¹⁰ We conducted annual quantitative surveys of all residents in Years 1–4 and annual qualitative interviews with graduating residents in Years 2–5.

Quantitative Data Collection and Analysis

We designed an electronic questionnaire in Qualtrics to evaluate outcomes for each of the grant's components which was administered to all residents at the end of each academic year in grant Years 1–4. Survey completion was voluntary,

Table 1. Overview of program initiatives and curricula

PCMH, Panel Management and Population Health	We designed and implemented the following curricula: <ul style="list-style-type: none"> • Geographic information system (GIS) training to understand community characteristics, taught during residents' first year. • Child/Adolescent panel management, taught during three first-year outpatient blocks, used electronic medical record (EMR) tools to examine individual panels to increase well-child checks and immunization rates. • Scholarly development training, to support population health research, was taught during didactic sessions and individual mentorship across all three years.
Behavioral Health	<ul style="list-style-type: none"> • Curriculum, protocols, and resources were developed to enhance child/adolescent BH care, increase access to services, and augment resident education including screening and management of autism, anxiety, depression and risk-taking behaviors. • For the first three years of the grant, an adult clinical psychologist and clinical social worker provided behavioral healthcare, clinical training, and didactics. In Year 4, a pediatric psychologist was added to the care/training team. • In Year 4, we implemented formal BH screening for patients aged 16-17 during well child visits.
Medical-Legal Partnership (MLP)	<ul style="list-style-type: none"> • We contracted with a regional MLP to enable a lawyer to train residents to address civil legal needs that may lead to health inequities and adverse health outcomes.⁸ These included the right to safe and fair housing; educational, employment, food, health, and disability benefits; and immigration and domestic violence legal needs.
Nutrition	<ul style="list-style-type: none"> • A team of residents and medical students taught weekly nutrition and health topics to 4th graders year-round at a local elementary school. Each resident participated for four weeks in their first and third years of training. • After performing a needs assessment of families with children at the clinic, we designed and implemented FM resident-led family nutrition classes in the community.
Community Adolescent Health Sessions	<ul style="list-style-type: none"> • FM residents paired with young adult facilitators ran health education and empowerment sessions with adolescents at a local community agency, focusing on a variety of topics including communication with clinicians, nutrition, substance use, peer pressure and health careers.
Child/Adolescent Health Didactics	<ul style="list-style-type: none"> • During monthly PCMH rotations, residents were taught about key concepts, research, and clinic design innovations for children/adolescents. Examples include ADHD sample care plans, immunization QI interventions, and policies relating to adolescent consent and confidentiality.

and a \$10 gift card was offered. Data were exported into Microsoft Excel, cleaned and exported to IBM SPSS for analysis. We tracked grant outcomes at four levels of Moore's Framework: participation, learning, performance, and patient health. Participation was evaluated through completion of scholarly development projects related to grant programming. Learning and performance were evaluated via self-reported assessment of confidence and competence related to grant activities. Descriptive statistics were used to summarize residents' responses by year and class. For secondary analysis, we used generalized estimating equations (GEE) to account for repeated resident surveys across years. Count variables were modeled with a Poisson distribution and binary variables with a binomial distribution. Patient-related outcomes were evaluated via an EMR data query to assess change in immunization rates and chi-squared test was used to assess significance between years.

Qualitative Data Collection and Analysis

For this qualitative, phenomenological component of the evaluation we explored residents' experiences with the grant curriculum. We developed a semi-structured qualitative interview guide based on literature and our previous HRSA-funded projects related to PCMH,¹¹ with a new focus on children/adolescents and families. In our final grant year, after all residents experienced the entire curriculum, we added questions to comprehensively evaluate all program initiatives.

We interviewed graduating residents interviewed each spring, and offered \$10 gift cards. Interviews were recorded and professionally transcribed. Our qualitative team (coauthors CG and REG) of experienced interviewers with no supervisory role in residents' clinical work conducted the interviews and analyzed the data. We used Immersion/Crystallization¹² techniques for analysis, reading each interview transcript while taking notes, identifying illustrative quotes, and sorting transcript segments into code categories. We documented patterns within and across transcripts from participants in the same class year. Authors discussed the identified patterns, which led to final data interpretation.

RESULTS

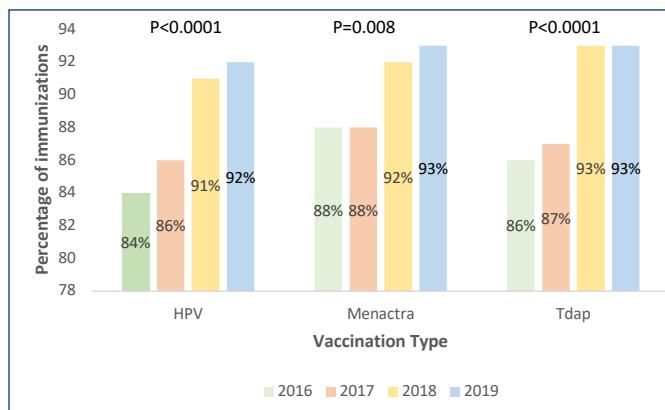
Seventy-seven percent (119/155) of residents completed surveys over a four-year period. (**Table 2**) There was a statistically significant increase in residents reporting being

Table 2. Survey respondents by class year

	2016	2017	2018	2019
PGY-1	10 (32%)	13 (37%)	7 (26%)	9 (35%)
PGY-2	9 (29%)	11 (31%)	11 (41%)	8 (31%)
PGY-3	11 (35%)	10 (29%)	9 (33%)	9 (35%)
Unknown Year*	1 (3%)	1 (3%)	0	0
TOTAL = 119	31	35	27	26

*Respondents chose not to disclose class year.

Figure 1. Change in clinic vaccination rates, 2016–2019
(Moore's Framework Level 6 – Patient Health Outcomes)



'prepared' or 'extremely prepared' to implement patient empanelment, (5/31 or 16.1% Y1; 14/26 or 53.8% Y4, $p<0.01$), and feeling extremely prepared to implement principles of PCMH (2/31 or 6.5% Y1; 6/26 or 23.1% Y4, $p=0.04$). Self-reported performance regarding screening for depression in school-aged children and for anxiety in adolescents increased significantly [11/31 or 35.9% Y1; 16/26 or 61.3% Y4, $p=0.004$; 16/31 or 52.2% Y1; 20/26 or 75.9% Y4, $p=0.007$, respectively]. Change in pediatric vaccination rates in the residency clinic, by year, are shown in Figure 1.

We conducted 48 qualitative interviews conducted with graduating third-year residents (13, 10, 13, 12 in 2017–2020, respectively). In all areas, we noted improvement in residents' perspectives regarding care of children/adolescents. (Appendix 1) For all topics, residents felt sufficiently exposed to different faculty perspectives and practice styles and tools to have obtained the necessary foundation to continue to build their skill after residency.

In the following sections, we present the quantitative and qualitative results for third-year residents by topic.

PCMH, Panel Management and Population Health

The mean confidence among third-year residents in measuring practice-wide clinical outcomes in child/adolescent care after graduation significantly increased between 2016–2019 (2 vs 2.89, $p=0.024$). Residents consistently showed a strong conceptual understanding of PCMH, using terms in interviews such as "multidisciplinary teamwork" and "patient-centered coordination of care." Over time, they were increasingly likely to identify specific roles within a multidisciplinary PCMH, including social workers, pharmacists, and psychologists. Residents were more likely to spontaneously identify strengths of the PCMH clinic and suggestions for improvement of PCMH for children/adolescents in later grant years. For example, they became aware of specific resources that had been implemented, including fluoride varnish, children's books to promote early literacy, and pediatric BH specialist. Residents expressed appreciation for

support staff for care of children within a PCMH, and the importance of adequate staffing, particularly for BH and nutritional needs.

During interviews, many residents expressed uncertainty about their ability to effectively apply the PCMH model to the real world. Some reflected on the inadequacy of reducing PCMH to required "checkbox" categories and risking PCMH devolving into a technical classification rather than a truly improved approach to practice. Over the years, expressions of skepticism toward PCMH increased, even as more residents referred positively to the residency clinic as a PCMH.

All residents valued having been taught to query their panels to determine which children were overdue for well-child checks or vaccines. All felt that more panel management and population health should be included in the curriculum, asserting these are essential to well-functioning practices. Some had identified and seen children who needed care through these efforts. Some anticipated they would do the analyses themselves post residency; others said embedding this task as a support staff role would be more efficient.

Behavioral Health

Between 2016 and 2019, third-year residents reported statistically significant increases in confidence related to child/adolescent mental health screening. For screening school-aged children for depression and anxiety, mean confidence increased (mean = 2 in Y1; mean = 2.78 in Y4, $p=0.003$ for both). For adolescent screening, mean confidence significantly increased for depression (2.45 to 3.11, $p=0.016$) and for anxiety (2.09 to 3, $p=0.004$).

As grant programming evolved, resident classes went from little awareness of the BH role within a PCMH to high awareness. In the 2017 interviews, only a few residents included BH in their PCMH definition. In 2019, all residents except one mentioned this. In later years, residents were more likely to praise the clinic's BH resources, whereas earlier they were more likely to express a need for more BH providers.

In 2020, residents expressed appreciation for the work and teaching of the BH providers, the development of a comprehensive community BH resource guide, and learning from the recently-hired pediatric psychologist. Several residents raised concerns about pediatric BH screening, expressing that identified needs exceeded clinic capacity and community resources. In contrast, others perceived resources for young children to be adequate.

Residents expressed more comfort with BH and developmental screening with young children than with adolescents. This was consistent with a significant increase in mean confidence among third-year residents in screening preschool aged children for developmental delays (2.45 to 3.11, $p=0.03$). Some felt that as they saw more young children, they became more comfortable in their knowledge about developmental milestones. Others explained they

were comfortable screening adolescents for depression because they asked parents to leave the room for other reasons during the visit, though they noted that teenagers are difficult to engage. Regarding screening for developmental delays and autism, several residents appreciated having the "correct pediatric assessment forms" in the clinic to ensure they asked the right questions.

Medical-Legal Partnership

Third-year residents' self-reported knowledge in making necessary referrals demonstrated a significant increase regarding certain, but not all, issues: employment problems (1.73 in 2016 to 2.56 in 2019, $p=0.001$), parental consent (2 in 2016 to 2.67 in 2019, $p=0.058$), issues related to immigration status (1.55 in 2016 to 2.11 in 2019, $p=0.039$), unmet educational needs (2.27 in 2016 to 2.33 in 2019, $p=0.803$), dislocation due to eviction or foreclosure (1.45 in 2016 to 2.22 in 2019, $p=0.0$), unhealthy housing conditions (1.91 in 2016 to 2.56 in 2019, $p=0.019$), disability insurance (1.82 in 2016 to 2.44 in 2019, $p=0.046$), denial or delay of public benefits (1.64 in 2016 to 2.11 in 2019, $p=0.113$) and intimate partner violence or child abuse (2.09 in 2016 to 3.11 in 2019, $p=0.0$).

Residents valued the MLP, especially when the attorney was meeting with patients directly (her role later changed to consulting with residents about patients). They accessed the lawyer during her weekly in-person session at clinic and through email. Residents found the lawyer's lectures to contain novel, pertinent information about topics such as housing mold and eviction, domestic abuse, maternity leave, immigration status terminology, unemployment during the COVID-19 pandemic due to child care issues, informed consent, and letter writing for work and disability applications.

Nutrition

Most residents chose 'somewhat confident' or higher for all questions related to counseling overweight children or adolescents related to physical activity. There was a statistically significant increase over the grant period in the proportion of residents who felt "confident" or "very confident" in MyPlate¹³ counseling (18/31 or 58.1% to 17/25 or 68.0%, $p=0.04$). Third-year residents when analyzed separately did not show significant increase in confidence discussing obesity or overweight with children/adolescents, nor did they have increased confidence in counseling parents or children/adolescents about physical activity or nutrition. This was consistent with qualitative findings. Residents said weight control was more difficult to talk about with children/adolescents than good nutrition in general. With younger children, some residents noted that children's family members were overweight which guided their strategies for speaking with parents. A few residents were anxious to avoid contributing to children's body image issues, and did not want to appear judgmental by teaching children that what their parents feed them is unhealthy. Some noted that healthy food

is expensive. Residents said teaching nutrition in a local elementary school was an excellent learning experience and a welcome change of pace from clinical commitments.

Patient Level-Adolescent Vaccination Rates

From 2016–2019, a statistically significant increase in vaccination rates occurred for HPV1 (568/673 to 654/712, or 84.4% to 91.9%, $p<0.0001$), Tdap (577/673 to 661/712, or 85.7% to 92.8%, $p<0.0001$) and Menactra (595/673 to 659/712, or 88.0% to 92.5%, $p<0.008$).

Residents' Scholarly Activity

Among three graduating classes (2018–2020), the majority (25/38, 66%) of scholarly projects focused on care of children/adolescents.

DISCUSSION

Enhancing care for children/adolescents within a FM residency PCMH clinic requires a multi-pronged approach to implementation and evaluation. Looking at the efficacy of grant implementation through the tiered outcomes lens of Moore's Framework^{9,10}, and utilizing mixed-methods, allowed us to evaluate a multi-faceted program with complex goals.

Moore's Framework guided our understanding of our grant's strongest areas of impact. Survey findings suggest that residents' learning and possibly performance improved, especially in regard to PCMH principles, BH, and self-reported screening frequency. Patient outcomes as measured by vaccination rates (Levels 6) also improved.

Qualitative interviews provided context for survey findings. For instance, as surveys showed residents' increasing confidence in implementing PCMH principles for children/adolescents, interviews elicited increasingly detailed understanding of PCMH as a concept; residents frequently referred to their lived experience in a PCMH practice. BH integration responses, too, showed increasing confidence and self-reported frequency of screening; as confirmed in interviews, residents perceived grant-funded BH staff as implementing didactic and clinical improvements for school-aged and younger children mid-way through the grant. Organizational challenges delayed implementation of clinical screening for adolescents' BH needs until the fourth year of the project, which was reflected in residents' lack of confidence as identified through qualitative/quantitative data in earlier years.

A major limitation of this study was that Grant Year 5 occurred during the beginning of the COVID-19 pandemic. RI had among the highest rates of infection, nationally. It was not an appropriate time to ask residents to complete a survey so we eliminated this evaluation component that year. Another limitation was only one measurement of patient health outcomes (vaccination data), and no community health data. We experienced challenges in EMR data

extraction, and therefore used self-reported rates of screening as measures of performance. Allocating funds to EMR data extraction should be incorporated in future initiatives.

As a result of this grant, we were able to fund staff (e.g., MLP, evaluation researchers, pediatric BH specialist) who otherwise would not have been hired by our healthcare system. Only some of these positions can be continued via other means (e.g., our Accountable Care Organization is funding MLP). Identifying strategies to sustain essential program staff employment after completion of the grant is critical.

Mixed-methods evaluation strategies can be readily integrated into residency initiatives. Making room in residents' schedules and providing incentives for completion of surveys and interviews are key mechanisms for successful data collection. Incorporating evaluation into education may be beneficial clinically as well. For example, the patient-level vaccination outcomes were obtained from a panel-management didactic. Our residency's next steps include continuation of education sessions across class years; expansion of PCMH services and education to other demographics; and leveraging our evaluation data for program enhancements and future grant applications.

CONCLUSION

Through a HRSA Primary Care Training and Enhancement grant, the Brown FM Residency was able to successfully improve care for children/adolescents within a PCMH, and increase residents' learning and performance in key program areas. A mixed-methods evaluation that incorporated Moore's Framework enabled us to understand the impact of our educational initiatives in detailed and descriptive ways. We believe this strategy can be harnessed by other primary care training programs in the state and beyond to effectively implement and evaluate enhancements in care delivery and resident education.

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Supplemental content

Appendix 2: Quantitative Survey

Brown University. Brown Family Medicine Residency.

Appendix 3: Qualitative Semi-Structured Interview Guide

From HRSA grant to medical practice: Improving pediatric care and resident education in a patient-centered family medicine clinic: Interview questions for residents. Brown Family Medicine

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Disclosures

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