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Impact of Screening and Co-located Parent Coaching Within Pediatric Primary Care on Child Health Care Use: A Stepped Wedge Design

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Abstract

Childhood adversity and toxic stress have been associated with poor mental and physical health. This study examined if Parent Connext, a program that integrates adversity screening and parent coaching by co-located specialists within pediatric primary care, had an impact on health care utilization. This stepped wedge cluster randomized controlled trial evaluated Parent Connext across six pediatric primary care practices. All practices (clusters) were in the control period during year 1. Three practices were randomized to begin the Parent Connext intervention in year 2, and three practices were randomized to begin in year 3. Medical records of all patients under age 8 treated at these practices during these 3 years were queried retrospectively for participant-level primary outcomes (sick visits, emergency department visits, hospitalizations) and secondary outcomes (well-child and immunization adherence, referrals). The study sample included 27,419 patients followed for an average 1.39 ($SD = 0.66$) years in the control period and 1.07 ($SD = 0.60$) years in the intervention period. During the intervention period, patients had significantly fewer sick visits ($IRR = 0.91$, $p < 0.001$) which aligned with our hypothesis, decreased odds of well-child visit adherence ($OR = 0.88$, $p < 0.001$) which was unexpected, and increased odds of receiving a referral ($OR = 1.45$, $p < 0.001$). The odds of an emergency department visit, hospitalization, and 2-year immunization adherence did not differ between periods. Parent Connext resulted in a significant reduction in child sick visits, highlighting the potential benefit of two-generation approaches to pediatric care for child health.

Keywords Adverse childhood experiences · Social determinants of health · Positive parenting · Integrated care · Behavioral health

Introduction

Childhood adversities, such as abuse, neglect, domestic violence, separation from parents, and household mental illness or substance misuse, can have a toxic impact on health (Felitti et al., 1998). Children with greater exposure to adversity have increased odds of developmental delays, physical health conditions and injuries, behavioral problems, mental illness, and urgent/emergency medical visits in childhood and reduced odds of preventive care visits (Bethell et al., 2014; Bright et al., 2016; Duke & Borowsky, 2018; Flaherty et al., 2013; Gjelsvik et al., 2015; Marie-Mitchell & O'Connor, 2013; McKelvey et al., 2017). To prevent these health-related impacts, the American Academy of Pediatrics (AAP) is encouraging pediatricians to screen for risk factors for adversity, provide families with guidance on positive parenting and social-emotional development, and participate in innovative service-delivery

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adaptations to support at-risk children (Garner et al., 2012). These approaches are not standard practice yet.

The Safe Environment for Every Kid model, which incorporates screening for risk factors, motivational interviewing, and referral to community agencies into pediatric health care, is an example of one existing program that has resulted in improved adherence to medical care among low-income families (Dubowitz et al., 2009). A few other existing programs that have integrated family/child development professionals or parent coaches into infant primary care visits to provide developmental and behavioral screening, positive parenting guidance, and/or referral to community agencies have shown improved well-child visit and immunization adherence and reduced emergency department (ED) visits, although variable (Coker et al., 2016; Johnston et al., 2006; Sege et al., 2015).

This study examined if Parent Connext, a program that integrates adversity screening and parent coaching with pediatric primary care, had an impact on pediatric health care utilization. Parent Connext is a novel parent coaching program that was implemented within six pediatric primary care practices in this study. Parent Connext includes: (1) routine adversity screening and monitoring for parenting concerns by pediatricians during well-child visits and (2) parent coaching services provided to parents by co-located parenting specialists (Eismann et al., 2021a, b; Lott, 2020). This study evaluated the impact of this program on the health care utilization of children under age 8 years at these practices through a stepped wedge cluster randomized controlled trial design. This study design made it logistically and financially possible for all practices to receive the intervention. The intervention was provided at the practice- or cluster-level, and patient-level outcomes were assessed. It was hypothesized that the primary outcome of child diagnostic health care use (sick visits, ED visits, and hospitalizations) might decrease, that mental health and other referrals might increase, and that the secondary outcome of preventive health care adherence (well-child visit and immunization) might improve after implementing Parent Connext.

Methods

Study Design and Patient Population

We used a stepped wedge cluster randomized controlled trial design (Fig. 1), with each cluster being one pediatric primary care practice and six practices participating from one large multi-specialty group medical system in a large metropolitan area in the Midwestern United States. Retrospective chart review of all patients under age 8 who attended the six practices during the study period from January 1, 2017 to December 31, 2019 was performed at the conclusion of the study. The entire practice populations under age 8 were included in order to better understand practice-wide effects of the program, as the motivational interviewing training, screening, and monitoring by the pediatricians, and the presence of an on-site parenting specialist had the potential to change the way the pediatricians and practice staff interacted with families broadly, beyond those who completed the screen or participated in parent coaching. Patients under age 8 were studied because screening went up to age 6, and patients could be in the study period for up to 2 years afterward. Also, the majority of patients referred for parent coaching tend to be under age 8. The medical system's Institutional Review Board approved this study and waived informed consent.

Randomization

Randomization was performed at the cluster level by a research coordinator using random number generation to determine which year each practice would implement Parent Connext. During year 1 (2017), all six practices were in the control period. Three practices were randomized to step 1, beginning the intervention in year 2 (2018) and implemented from January 1, 2018 to December 31, 2019. The other three practices were randomized to step 2, beginning the intervention in year 3 (2019) and implemented from January 1, 2019 to December 31, 2019 (Fig. 1).

Intervention

During the control period, practices did not provide any intervention to families outside of standard clinical care. During the intervention period, practices implemented Parent Connext. This program has been explained in detail previously (Eismann et al., 2021a).

Routine Screening and Monitoring

Primary care providers (82%, 28/34) completed a 2-h motivational interviewing training, adapted for brief encounters. Practice staff gave caregivers the Parent Connext Parent Questionnaire (PCPQ), which screens for parenting stress and family psychosocial concerns (including harsh punishment, parental depression or substance use, financial insecurity, and domestic violence), at three well-child visits from birth to age 6. Providers reviewed the PCPQ for reported concerns based on a scoring system and monitored for these concerns at all other patient visits of any aged child. Providers used motivational interviewing to engage caregivers in supportive conversations and used their clinical judgment to decide whether or not to refer the caregivers to the co-located parenting specialist who provided complementary

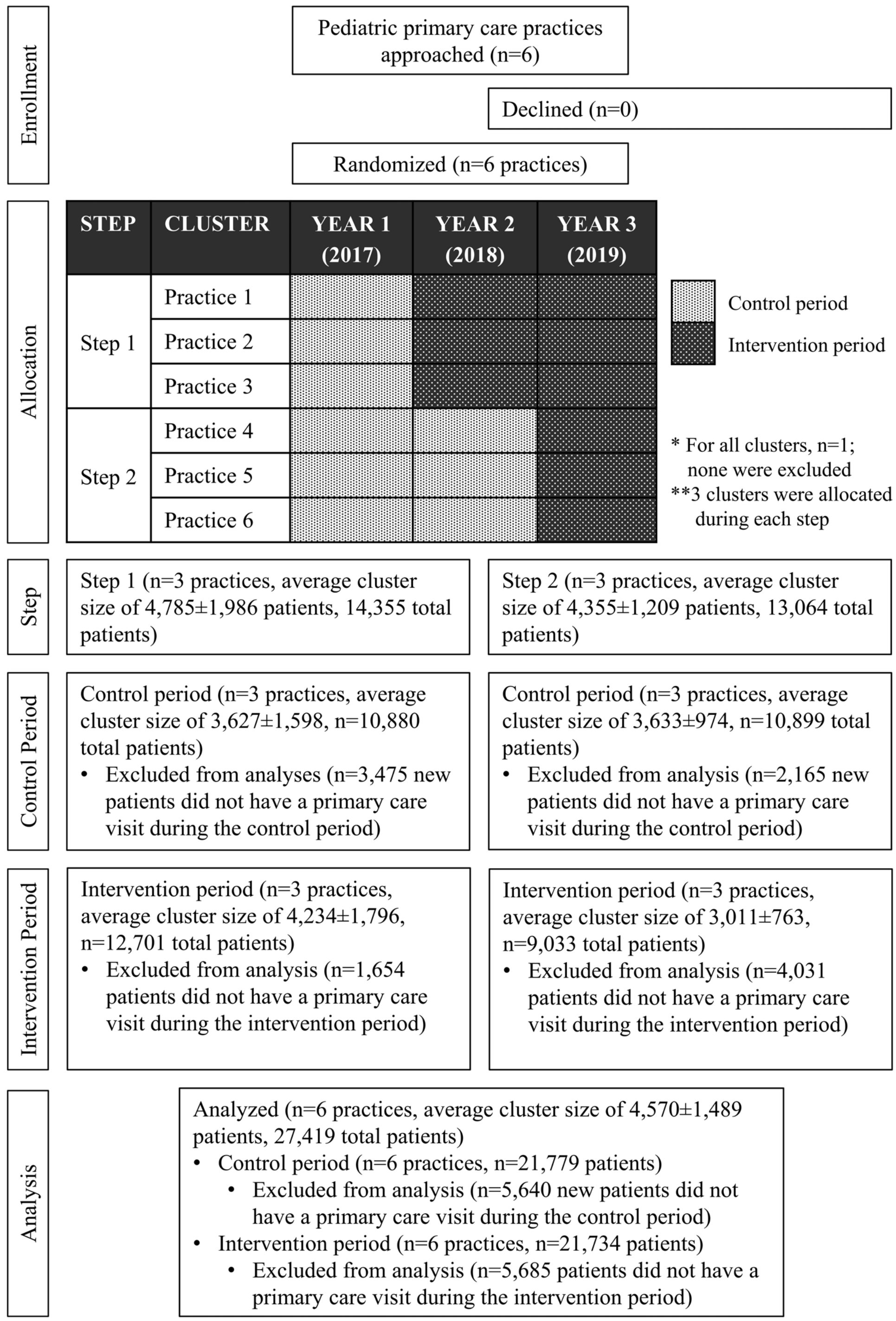

Fig. 1 CONSORT diagram of the stepped wedge cluster randomized controlled trial design

parent coaching. Although less common, caregivers could also self-refer.

Parent Coaching

The goal of parent coaching was to equip caregivers with solution-focused strategies for achieving parenting-related goals, strengthening positive parenting and family functioning, and promoting child social-emotional and behavioral health. Parenting specialists were employed by a community-based parenting organization and had graduate level education and greater than 5 years of experience working with parents and children. They were trained in the Natural Strength Parent Coaching model developed by their organization, which combines parent education with approaches from positive psychology (e.g., intentionality, strengths, mindfulness) and social cognitive theory (e.g., goal-setting, monitoring) that support self-efficacy. Training on the model included 8 h of in-person didactic teaching, 8 h of shadowing with consultation, 20 h of quality monitoring and coaching, and ongoing supervision and monthly team case consultation sessions. Fidelity and achievement of a proficiency status were evaluated through routine service monitoring and ongoing staff coaching. The parenting specialists typically met with caregivers without their children for approximately 60-min sessions weekly. The number and timing of sessions were individualized based on caregiver preferences and progress. The parent coaching process began with eliciting and understanding the caregiver's concerns, strengths, and supports as the foundation for change. The parenting specialists then provided education on child development, parenting guidance and resources, self-care guidance, resource navigation and referral, and crisis support as appropriate and worked collaboratively with caregivers to set goals and identify intentional daily actions to support progress. Subsequent sessions consisted of ongoing monitoring and additional guidance to support overcoming barriers to change. Parenting specialists shared information with the providers during collaborative monthly meetings and by entering brief notes on their coaching sessions in the child's electronic medical record using a linking software that restricted access to patients referred to them. This study was grant funded as an innovative health care integration grant, which allowed the parent coaching service to be provided at no cost to the practices or caregivers.

Measures

Electronic medical records of all active patients under 8 years of age who attended a visit at the study practices during the study period were queried for the patient-level outcome measures below. Events (visits, hospitalizations, or referrals) that occurred on or after patients turned 8 years of age were excluded. Events were considered to be in the control period until the practice started implementing Parent Connext, and the patient had their first visit after implementation (their first possible exposure to the program). After that date, all events were considered to be in the intervention period for that patient, even if they changed practices to one still in the control period (following the intention-to-treat principle). The only exception was referrals on that date which were classified as intervention period, as the intervention could have influenced them.

The duration of the control period was calculated for each patient as the time between January 1, 2017 (start of study; or a new patient's first visit at a study practice) and their first visit at a practice in the intervention period. If no visit occurred in the intervention period, then we used whichever of the following came first: their 8th birthday, December 31, 2017, if their first visit was at a step 1 practice, or December 31, 2018, if their first visit was at a step 2 practice. Patients were considered new patients if they were born during the study period or had not attended a study practice prior to the study start. The duration of the intervention period was calculated for each patient as the time between their first visit at a practice in the intervention period and either their 8th birthday or December 31, 2019 (end of study).

Demographics

Patient age, sex, race, ethnicity, and insurance type were collected. Race and ethnicity were collapsed into five categories: white/Caucasian, black/African American, Asian, Hispanic/Latino, and multiple/other. Insurance type was categorized as private, Medicaid, or other public insurance.

Diagnostic Health Care Utilization

Sick visits All non-routine pediatric office visits for study sample patients during the study period were pulled. For sick visits, only illness-related office visits were included, while consultations for concerns not related to illness, mobile visits, and office visits for labs, immunizations, and medication checks were excluded. Number of sick visits per period was derived for each patient.

ED Visits All ED visits for study sample patients during the study period were pulled, and the number of ED visits per period was derived for each patient.

Hospitalizations All inpatient hospitalizations of study sample patients during the study period were pulled, including hospitalizations at any outside health care facility which shares patient records with Cincinnati Children's through our electronic medical record. Number of hospitalizations per period was derived for each patient.

Referrals All referrals made by providers for patients in the study sample during the study period were pulled. Number of referrals per period was derived for each patient. The number of referrals to behavioral health agencies included those whose agency name included "behavioral health", "psychology", or "psychiatry."

Preventive Health Care Adherence

Well-Child Visit Adherence All well-child visits during the study period for each patient in the study sample were pulled. Well-child visit adherence up to age 8 was based on the AAP's recommended schedule for preventive pediatric health care visits before 8.0 years of age and whether or not each visit was completed within ± 1 month of its recommended age (Committee on Practice and Ambulatory

Medicine & Bright Futures Periodicity Schedule Workgroup, 2016). The newborn and 3–5 days after birth visits were excluded because their completion could not be impacted by the intervention. Other recommended well-child visits were excluded if their target date range ended before or started after the study period or if it ended before a new patient joined the study practice. A completed visit was recorded in the control period if it occurred before (or on) the date of a patient's first visit to a practice after the practice had started implementing Parent Connext because Parent Connext could not have influenced the occurrence of these visits. A completed visit was recorded in the intervention period if it occurred after their first visit to a practice following Parent Connext implementation (i.e., their first possible exposure to Parent Connext). A missed visit was recorded in the control period if the target date range ended before (or on) the date of their first visit to a practice after the practice had implemented Parent Connext and recorded in the intervention period if the target date range ended after their first visit to a practice following Parent Connext implementation. Missed well-child visits that had a target date range that extended beyond the study period were then excluded because it is unknown whether or not the patient attended that well-child visit outside of the study period.

Immunization Adherence The complete immunization record of each patient in the study sample was pulled. Immunization adherence up to age 2 was based on the AAP's recommended immunization schedule and whether or not each immunization was completed before the upper end of its recommended age range (Committee on Infectious Diseases, 2016). The first hepatitis B dose was excluded because it is typically administered at the birthing hospital. The influenza vaccine was also not assessed because it is intended to be completed annually instead of based on an age cutoff like the other immunizations, thus requiring a different methodology. Recommended immunizations were excluded, if their cutoff date for when they were to be completed fell outside of the study period or before a new patient joined the study practice. A completed immunization was recorded in the control period, if it occurred before (or on) the date of a patient's first visit at a practice after the practice had started implementing Parent Connext because Parent Connext could not have influenced the occurrence of these immunizations. A completed immunization was recorded in the intervention period, if it occurred after their first visit to a practice following Parent Connext implementation. A missed immunization was recorded in the control period, if the target date range ended before (or on) the date of their first visit at a practice after the practice had implemented Parent Connext and was recorded in the intervention period, if the target date range ended after their first visit to a practice following Parent Connext implementation.

Data Analysis

Descriptive statistics were used to characterize the study sample. Generalized linear mixed models were performed to evaluate the relationship between the intervention and the occurrence of the following measures: sick visits, ED visits, hospitalizations, referrals, and referrals to behavioral health agencies (considering the correlation between multiple observations within each patient). Odds ratios (*OR*) with 95% confidence intervals (*CI*) are reported. For well-child visit and immunization adherence, we modeled the odds of a visit/immunization being completed on-time (completed vs. missed). A negative binomial regression model evaluated the relationship between the intervention and frequency of sick visits. Incidence rate ratio (*IRR*) with 95% *CI* is reported. Period duration, patient age at period entry, sex, race/ethnicity, and insurance type were included as fixed effects, and cluster (practice) and patient were included as random effects in all models. The well-child visit and immunization models included recommended visit age and immunization cut-off age in place of patient age at period entry and did not include period duration because the number of recommended events was set based on patient age. All analyses were also performed on the subgroup of patients whose caregiver participated in parent coaching and included number of coaching sessions as an additional fixed effect. Analyses were performed using SAS version 9.4. Statistical significance was set at $p < 0.05$.

Results

Sample Characteristics

There were 27,419 patients in the study sample, including 21,779 patients with a control period, averaging 1.39 (standard deviation [*SD*] = 0.66) years in duration, and 21,734 patients with an intervention period, averaging 1.07 (*SD* = 0.60) years in duration. The average number of days in the intervention phase was 420 days for all patients. There were 7952 well-child visits during the study period when screens were intended to be given, and screens were completed at 4825 (61%) of these visits. Of the 1285 families who were referred to the parenting specialist, 580 (45%) participated in parent coaching (averaging 2.5 sessions). Tables 1 and 2 contain the demographic characteristics of the study sample by practice, step, and period. Table 3 shows the occurrence of health care utilization per period.

Diagnostic Health Care Utilization

Patients had significantly reduced odds of having a sick visit during the intervention period (*OR* = 0.50, adjusted decrease

Table 1 Characteristics of the six pediatric primary care practices that implemented Parent Connext and the study sample of patients under age 8 ($N=27,419$)

Characteristics	Total	Practices randomized to step 1				Practices randomized to step 2				Difference
		Combined	1	2	3	Combined	4	5	6	*t or* X^2 (*P*)
Study practices, *n*	6	3	1	1	1	3	1	1	1	
Physicians[a], *n*	30[b]	17[b]	3[b]	5	9	15[b]	6[b]	4	5	
NPs, *n*	4	3	0	1	2	1	0	0	1	
% Medicaid	14.4%	11.8%	19.9%	19.0%	6.8%	17.9%	11.2%	21.8%	19.9%	
Study patients, *n*	27,419	14,355	3343	3962	7050	13,064	5747	3575	3742	
Age at entry (yrs), *M* (SD)	2.8 (2.5)	2.8 (2.5)	2.7 (2.4)	2.9 (2.5)	2.7 (2.5)	2.8 (2.5)	2.8 (2.4)	2.6 (2.4)	2.8 (2.5)	¯0.22 (0.82)
Sex										(0.94)
Male, *n* (%)	14,044 (51.2%)	7356 (51.2%)	1754 (52.5%)	1981 (50.0%)	3621 (51.4%)	6688 (51.2%)	2977 (51.8%)	1827 (51.1%)	1884 (50.3%)	
Female, *n* (%)	13,375 (48.8%)	6999 (48.8%)	1589 (47.5%)	1981 (50.0%)	3429 (48.6%)	6376 (48.8%)	2770 (48.2%)	1748 (48.9%)	1858 (49.7%)	
Race/ethnicity[c]										1104.70 (< 0.001)*
White or Caucasian, *n* (%)	19,101 (77.8%)	10,975 (82.4%)	1992 (65.2%)	3200 (86.9%)	5783 (87.9%)	8126 (72.2%)	3525 (69.7%)	2253 (69.1%)	2348 (80.0%)	
Black or African American, *n* (%)	2570 (10.5%)	1400 (10.5%)	901 (29.5%)	339 (9.2%)	160 (2.4%)	1170 (10.4%)	208 (4.1%)	557 (17.1%)	405 (13.8%)	
Asian, *n* (%)	1161 (4.7%)	97 (0.7%)	57 (1.9%)	31 (0.8%)	9 (0.1%)	1064 (9.5%)	849 (16.8%)	205 (6.3%)	10 (0.3%)	
Hispanic or Latino, *n* (%)	372 (1.5%)	145 (1.1%)	56 (1.8%)	65 (1.8%)	24 (0.4%)	227 (2.0%)	129 (2.6%)	80 (2.5%)	18 (0.6%)	
Multiple or other, *n* (%)	1362 (5.5%)	696 (5.2%)	47 (1.5%)	47 (1.3%)	602 (9.2%)	666 (5.9%)	346 (6.8%)	166 (5.1%)	154 (5.2%)	
Insurance type[d]										94.98 (< 0.001)*
Private, *n* (%)	20,686 (81.0%)	11,162 (83.3%)	2308 (73.6%)	2718 (75.2%)	6136 (92.2%)	9524 (78.5%)	4433 (84.4%)	2355 (71.3%)	2736 (76.5%)	
Medicaid, *n* (%)	4540 (17.8%)	2106 (15.7%)	801 (25.6%)	839 (23.2%)	466 (7.0%)	2434 (20.1%)	745 (14.2%)	887 (26.8%)	802 (22.4%)	
Other public, *n* (%)	306 (1.2%)	134 (1.0%)	25 (0.8%)	55 (1.5%)	54 (0.8%)	172 (1.4%)	72 (1.4%)	63 (1.9%)	37 (1.0%)	

NP Nurse practitioner

[a]Additional physicians were employed after the start of the study period and were not included in this count

[b]Two of the same providers were employed at practices in both steps

[c]Race/ethnicity was missing for 2,853 (10%) patients, including 1,042 (7%) patients at practices in step 1 and 1,811 (14%) patients at practices in step 2

[d]Insurance type was missing for 1,887 (7%) patients, including 953 (6%) patients at practices in step 1 and 934 (7%) patients at practices in step 2

Table 2 Characteristics of the patient sample by control and intervention period ($N = 27,419$)

Characteristics	Control period ($n = 21,779$)	Intervention period ($n = 21,734$)
Age at entry (years), *M* (SD)	3.15 (2.41)	3.29 (2.53)
Birth to 1 year, *n* (%)	5785 (26.6%)	5825 (26.8%)
1 year, *n* (%)	2613 (12.0%)	2263 (10.4%)
2 years, *n* (%)	2550 (11.7%)	2284 (10.5%)
3 years, *n* (%)	2380 (10.9%)	2310 (10.6%)
4 years, *n* (%)	2438 (11.2%)	2278 (10.5%)
5 years, *n* (%)	2427 (11.1%)	2309 (10.6%)
6 years, *n* (%)	2149 (9.9%)	2325 (10.7%)
7 years, *n* (%)	1437 (6.6%)	2140 (9.8%)
Sex		
Male, *n* (%)	11,129 (51.1%)	11,141 (51.3%)
Female, *n* (%)	10,650 (48.9%)	10,593 (48.7%)
Race/ethnicity		
White or Caucasian, *n* (%)	15,623 (78.3%)	15,172 (78.4%)
Black or African American, *n* (%)	1940 (9.7%)	2032 (10.5%)
Asian, *n* (%)	907 (4.5%)	801 (4.1%)
Hispanic or Latino, *n* (%)	289 (1.4%)	290 (1.5%)
Multiple or other, *n* (%)	1198 (6.0%)	1062 (5.5%)
Insurance type		
Private, *n* (%)	16,789 (82.7%)	17,077 (81.2%)
Medicaid, *n* (%)	3,284 (16.2%)	3,697 (17.6%)
Other public, *n* (%)	225 (1.1%)	247 (1.2%)

of 9230 patients), and the frequency of sick visits was also significantly reduced (*IRR* = 0.91, adjusted decrease of 6052 sick visits) (Table 4). Odds of a patient having an ED visit or hospitalization did not significantly differ between control and intervention periods (Table 4). Patients had greater odds of receiving any referral from their pediatrician (*OR* = 1.45,

Table 3 Frequency of child health care utilization measures before and during the Parent Connext intervention

Variable	Control period ($n = 21,779$)		Intervention period ($n = 21,734$)		Difference
	n events total (range per patient)	*n (%) patients with an event*	*n events total (range per patient)*	*n (%) patients with an event*	*n (%) patients with an event adjusted*[a]
Primary care sick visits	71,201 (0–36)	18,461 (84.8%)	58,573 (0–41)	14,769 (68.0%)	–9,230 (–42.4%)
Emergency department visits	601 (0–6)	475 (2.2%)	487 (0–7)	401 (1.8%)	24 (0.1%)
Inpatient hospitalizations	246 (0–7)	190 (0.9%)	167 (0–7)	127 (0.6%)	–32 (–0.1%)
Primary care referrals	4541 (0–7)	3650 (16.8%)	5623 (0–9)	4333 (19.9%)	1,643 (7.5%)
Primary care referrals to behavioral health agencies	273 (0–3)	257 (1.2%)	340 (0–3)	324 (1.5%)	139 (0.6%)
Variable	**Control period**		**Intervention period**		**Difference**
	n events total (range per patient)	*n (%) completed*	*n events total (range per patient)*	*n (%) completed*	*n (%) completed adjusted*[a]
Well-child visit adherence before age 8	62,124 (1–10)	28,361 (45.7%)	43,460 (1–9)	20,820 (47.9%)	–3,403 (–5.5%)
Immunization adherence up to age 2	109,735 (1–24)	99,197 (90.4%)	61,346 (1–24)	55,618 (90.7%)	–2,975 (–2.7%)

[a]Adjusted based on the sample size of the control period and the odds ratios from models controlling for fixed effects of period duration, age at entry, sex, race/ethnicity, insurance type, and random effects for patient and cluster (Tables 4, 5, and 6 contain the *OR/RR*, 95% *CI*, and *P*-values)

Table 4 Statistical models with the Parent Connext intervention predicting odds of child diagnostic health care utilization and frequency of sick visits

Variables	*Level*	*OR/RR* [95% *CI*]	*P*
Generalized linear mixed models			
Primary care sick visit			
Study period (ref = control period)	**Intervention period**	0.50 [0.47, 0.52]	< 0.001
Period duration (in 30 days)		1.09 [1.08, 1.09]	< 0.001
Age at entry (in years)		0.88 [0.87, 0.89]	< 0.001
Sex (ref = male)	Female	0.94 [0.90, 1.00]	0.036
Race/ethnicity (ref = White or Caucasian)	Black or African American	0.65 [0.59, 0.71]	< 0.001
	Asian	0.62 [0.55, 0.70]	< 0.001
	Hispanic or Latino	0.94 [0.75, 1.17]	0.56
	Multiple or other	0.86 [0.76, 0.96]	0.010
Insurance type (ref = Private)	Medicaid	0.94 [0.87, 1.01]	0.092
	Other public	0.68 [0.54, 0.86]	0.002
Emergency department visit			
Study period (ref = Control period)	**Intervention period**	1.05 [0.91, 1.22]	0.47
Period duration (in 30 days)		1.06 [1.05, 1.07]	< 0.001
Age at entry (in years)		0.97 [0.94, 1.00]	0.072
Sex (ref = male)	Female	0.91 [0.78, 1.05]	0.192
Race/ethnicity (ref = White or Caucasian)	Black or African American	0.39 [0.28, 0.53]	< 0.001
	Asian	0.43 [0.25, 0.72]	0.001
	Hispanic or Latino	1.43 [0.86, 2.38]	0.17
	Multiple or other	0.69 [0.48, 0.99]	0.041
Insurance type (ref = private)	Medicaid	2.85 [2.42, 3.36]	< 0.001
	Other public	2.05 [1.13, 3.74]	0.019
Inpatient hospitalization			
Study period (ref = control period)	**Intervention period**	0.83 [0.65, 1.07]	0.15
Period duration (in 30 days)		1.05 [1.04, 1.07]	< 0.001
Age at entry (in years)		0.73 [0.69, 0.79]	< 0.001
Sex (ref = Male)	Female	0.83 [0.65, 1.07]	0.14
Race/ethnicity (ref = White or Caucasian)	Black or African American	1.32 [0.88, 1.98]	0.18
	Asian	0.50 [0.24, 1.08]	0.076
	Hispanic or Latino	0.99 [0.36, 2.68]	0.98
	Multiple or other	0.36 [0.16, 0.82]	0.015
Insurance type (ref = private)	Medicaid	0.04 [0.01, 0.15]	< 0.001
	Other public	0.58 [0.15, 2.34]	0.45
Negative binomial regression model			
Primary care sick visit frequency			
Study period (ref = control period)	**Intervention period**	0.91 [0.90, 0.93]	< 0.001
Period duration (in 30 days)		1.05 [1.05, 1.06]	< 0.001
Age at entry (in years)		0.88 [0.87, 0.88]	< 0.001
Sex (ref = male)	Female	0.97 [0.94, 0.99]	0.001
Race/ethnicity (ref = White or Caucasian)	Black or African American	0.72 [0.69, 0.75]	< 0.001
	Asian	0.79 [0.74, 0.83]	< 0.001
	Hispanic or Latino	0.89 [0.81, 0.97]	0.007
	Multiple or other	0.95 [0.91, 0.99]	0.018
Insurance type (ref = private)	Medicaid	0.99 [0.96, 1.02]	0.51
	Other public	0.96 [0.87, 1.06]	0.41

Table 5 Generalized linear mixed models with the Parent Connext intervention predicting odds of primary care referrals

Variable	*Level*	*OR* [95% *CI*]	*P*
Primary care referral			
Study period (ref = control period)	**Intervention period**	1.45 [1.38, 1.53]	< 0.001
Period duration (in 30 days)		1.04 [1.04, 1.04]	< 0.001
Age at entry (in years)		0.92 [0.91, 0.93]	< 0.001
Sex (ref = male)	Female	0.75 [0.71, 0.79]	< 0.001
Race/ethnicity (ref = White or Caucasian)	Black or African American	0.83 [0.76, 0.92]	< 0.001
	Asian	0.70 [0.61, 0.81]	< 0.001
	Hispanic or Latino	0.95 [0.76, 1.20]	0.69
	Multiple or other	0.98 [0.87, 1.10]	0.70
Insurance type (ref = private)	Medicaid	1.33 [1.24, 1.43]	< 0.001
	Other public	1.21 [0.94, 1.56]	0.13
Primary care referral to a behavioral health agency			
Study period (ref = control period)	**Intervention period**	1.54 [1.28, 1.85]	< 0.001
Period duration (in 30 days)		1.09 [1.07, 1.10]	< 0.001
Age at entry (in years)		1.53 [1.46, 1.59]	< 0.001
Sex (ref = male)	Female	0.63 [0.52, 0.76]	< 0.001
Race/ethnicity (ref = White or Caucasian)	Black or African American	0.64 [0.46, 0.90]	0.010
	Asian	0.15 [0.05, 0.46]	0.001
	Hispanic or Latino	0.66 [0.27, 1.61]	0.36
	Multiple or other	1.00 [0.68, 1.46]	> 0.99
Insurance type (ref = private)	Medicaid	1.99 [1.60, 2.48]	< 0.001
	Other public	2.39 [1.13, 4.36]	0.005

adjusted increase of 1643 patients) and had greater odds of receiving a behavioral health agency referral ($OR = 1.54$, adjusted increase of 139 patients) during the intervention period (Table 5).

Preventive Health Care Adherence

Recommended well-child visits had significantly reduced odds of being completed on-time during the intervention period ($OR = 0.88$, adjusted decrease of 3403 visits), whereas on-time immunization completion up to age 2 did not significantly differ between control and intervention periods (Table 6).

Subgroup of Parent Coaching Participants

Of the 580 patients whose caregivers participated in parent coaching during the study period, results were similar to the full study sample, with the exception of finding no difference between control and intervention periods in the frequency of sick visits ($IRR = 1.00$, 95% *CI* [0.89, 1.12], $p = 0.98$) or odds of on-time well-child visit completion ($OR = 0.99$, 95% *CI* [0.82, 1.19], $p = 0.89$). During the intervention period, patients had significantly reduced odds of having a sick visit ($OR = 0.48$, 95% *CI* [0.32, 0.74], $p = 0.001$) and greater odds of receiving a referral from their pediatrician ($OR = 1.47$, 95% *CI* [1.12, 1.94], $p = 0.006$) and a referral to a behavioral health agency ($OR = 1.93$, 95% *CI* [1.13, 3.31], $p = 0.017$). Odds of an ED visit, hospitalization, or immunization adherence did not differ between control and intervention periods ($p > 0.05$).

Discussion

This study evaluated the health care utilization of children under age 8 before and after the Parent Connext program was implemented within six pediatric primary care practices that were randomized to which year they received the program. Patients had half the odds of a sick visit and significantly fewer sick visits overall after practices implemented Parent Connext. The odds of having an ED visit, a hospitalization, and 2-year immunization adherence did not significantly differ after implementing Parent Connext, but well-child visit adherence was found to be reduced among the total patient sample but not among parent coaching participants.

These findings differ from other integrative pediatric primary care programs. The Parent-focused Redesign for Encounters, Newborns to Toddlers (PARENT), which integrates parent coaches into well-child visits up to age 2 to provide anticipatory guidance, developmental and psychosocial screening, and referral for low-income families, did not result in a change in sick visits or well-child visit adherence but did result in fewer infants having ≥ 2 ED visits during

Table 6 Generalized linear mixed models with the Parent Connext intervention predicting odds of child preventive health care adherence

Variable	*Level*	*OR* [95% *CI*]	*P*
Well-child visit completion before age 8[a]			
Study period (ref = Control period)	**Intervention period**	0.88 [0.86, 0.91]	< 0.001
Well-child visit age (in years)		0.81 [0.80, 0.81]	< 0.001
Sex (ref = male)	Female	0.95 [0.92, 0.99]	0.014
Race/ethnicity (ref = White or Caucasian)	Black or African American	0.67 [0.62, 0.71]	< 0.001
	Asian	0.92 [0.84, 1.01]	0.072
	Hispanic or Latino	0.69 [0.61, 0.78]	< 0.001
	Multiple or other	1.04 [0.95, 1.13]	0.42
Insurance type (ref = private)	Medicaid	0.71 [0.67, 0.75]	< 0.001
	Other public	0.76 [0.64, 0.89]	0.001
Immunization completion up to age 2[a]			
Study period (ref = control period)	**Intervention period**	0.97 [0.86, 1.10]	0.69
Immunization cutoff age (in years)		0.13 [0.11, 0.15]	< 0.001
Sex (ref = male)	Female	0.98 [0.82, 1.17]	0.99
Race/ethnicity (ref = White or Caucasian)	Black or African American	0.66 [0.51, 0.86]	0.002
	Asian	0.39 [0.28, 0.54]	< 0.001
	Hispanic or Latino	0.56 [0.36, 0.86]	0.008
	Multiple or other	1.20 [0.74, 1.93]	0.46
Insurance type (ref = private)	Medicaid	0.51 [0.41, 0.63]	< 0.001
	Other public	0.65 [0.34, 1.25]	0.20

[a]Coded as missed = 0, completed = 1

1-year follow-up (Coker et al., 2016). The Developmental Understanding and Legal Collaboration for Everyone (DULCE) program, which integrates family specialists into infant well-child visits to initiate medical-legal consults and perform home visits, resulted in better 12-month well-child visit adherence, better 6-month immunization adherence, and fewer infants having an ED visit by 6 months but not 12 months of age (Sege et al., 2015). The Healthy Steps for Young Children program, which integrates specialists into team-based infant well-child visits to provide developmental screening and anticipatory guidance and perform home visits and parenting classes, also resulted in better 15-month well-child visit adherence and 2-year immunization adherence (Johnston et al., 2006). It is possible that our differential findings could be related to child age or population served. The DULCE and PARENT programs served parents with infants who were mostly publicly insured (83%, 95%, respectively), and about half had at least one or two ED visits, respectively (Coker et al., 2016; Sege et al., 2015). The Parent Connext program served parents with any age child who were mostly privately insured (81%), and < 3% had an ED visit per period. ED visits were likely underestimated in this study as the data were limited to visits that occurred within the practices' medical system and not at other local hospitals.

The reduction in sick visits after implementing Parent Connext may have been due to fewer children experiencing disease or injury. It is possible that sick visits may have been reduced by medical concerns being identified and treated earlier, possibly due to improved provider-parent communication or more time to focus on medical concerns as a result of better addressing parenting and family psychosocial concerns (Eismann et al., 2019). In a prior study, providers reported feeling more knowledgeable and confident in their ability to address these concerns after implementing Parent Connext (Eismann et al., 2021a). Caregivers may have also felt more confident discussing child-related concerns sooner or addressing them without a visit. Pediatricians may have then referred patients to specialty care sooner. Patients did have greater odds of receiving a referral after practices implemented Parent Connext which may have reduced sick visits. Similarly, there was an increase in behavioral health referrals likely resulting from the increased focus of providers on screening and monitoring for behavioral health concerns, which also may have reduced sick visits for mental health concerns. However, although more patients had referrals, the decrease in patients with sick visits was considerably greater. This may suggest that an increase in referral practice did not fully explain the reduction in sick visits. Future research is needed to better understand what factors mediate the reduction in sick visits.

Unexpectedly, missed well-child visits also increased after implementing Parent Connext. Missing well-child visits is concerning because it could result in delays in immunization, diagnosis, treatment, and referral and increased ED visits and hospitalizations (Brousseau et al., 2004; Tom et al., 2013). Our study found no difference in 2-year immunization adherence, ED visits, or hospitalizations. It is possible that the reduction in well-child visit adherence and sick visits could indicate caregiver disengagement with the practice. Caregiver disengagement might occur if they found the screening questions to be overly invasive or if they did not receive a compassionate or helpful response from the providers. The reduction in well-child visit adherence, however, was not found among caregivers who participated in parent coaching. A previous study on Parent Connext found parent coaching participants to be highly satisfied with the program (Eismann et al., 2021b). Parents who have participated in other screening and parenting interventions in pediatric primary care have also been more satisfied with their child's doctor, finding them to be more competent, caring, and family-centered (Coker et al., 2016; Feigelman et al., 2011; Johnston et al., 2004). Further research is needed on caregiver acceptability of the screening and referral aspects of this program to determine if some caregivers become disengaged with the practice or if providers stray from using motivational interviewing.

At an estimated expense of $169 per pediatric office visit (Machlin & Mitchell, 2018), the estimated decrease of 6052 sick visits following the implementation of Parent Connext would result in a cost-savings of $1,022,788 to payors over 1.4 years for a patient population of 21,779 patients. If this finding persists in follow-up studies, insurance companies could benefit from investing in preventive programs like Parent Connext. The lack of funding mechanisms is a major barrier to the sustainability of innovative and integrative programs within health care (Stancin & Perrin, 2014). Due to insurance restrictions, services not provided by a licensed professional or not associated with a medical diagnosis are not able to be reimbursed. These restrictions can limit the accessibility of these services to only those families who can afford it. Alternative payment models such as bundled payments and shared savings with insurance companies could support the integration of beneficial preventive care services within health care (Blount et al., 2007).

This study had several strengths, including the randomized study design, implementation in a real-world setting, the large patient sample, and the novel approach of integrating parent coaching within pediatric primary care. This study also had several limitations. The number of steps and clusters randomized was small, and practices randomized to each step differed in demographic composition. Analyses therefore controlled for demographics, and selection bias was prevented by evaluating practice-wide effects. Some patients, however, may not have been exposed to any part of the intervention, reducing the likelihood of significant findings. Also, relatively few families participated in parent coaching. Multiple factors may have limited caregiver participation, such as the screen not being given to the caregiver by the practice when intended, providers addressing concerns on their own, or caregivers not feeling their concern warranted coaching services or not being available to return for a separate visit with the parenting specialist. Provider motivational interviewing training was also limited to a single 2-h training, which may not be sufficient to change regular practice, and 18% of the providers did not complete the training. Fidelity of motivational interviewing was not evaluated. In terms of outcome measures, it is possible they could have been influenced by secular trends or practice-related factors other than Parent Connext or system changes in electronic data documentation over time. Patient movement in, out, and between practices had to be accounted for in analyses. Two pediatricians treated patients at two practices that implemented at different times, reducing the likelihood of significant findings. The generalizability of these findings to practices with more publicly insured patients is unknown. Additional research is needed to replicate these findings with a more rigorous study design, more generalizable patient populations, and equal lengths of follow-up by period or group.

Conclusions

Pediatric primary care is a promising setting for providing positive parenting interventions given its wide acceptance and frequent use early in life. In this study, the Parent Connext program was integrated into pediatric primary care, prompting screening and conversations between pediatricians and caregivers about parental stressors and co-located parent coaching support for caregivers. There are clear advantages to children, caregivers, and medical providers when the medical home includes easily accessible community providers. Positive parenting also helps to build social-emotional health and reduce stress within a child's home. This program resulted in significantly reduced sick visits among patients under age 8, a finding that needs to be confirmed by future studies, and suggests a potential benefit of implementing two-generational approaches within pediatric care aimed at strengthening positive parenting and family functioning.

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Declarations

Ethics Approval This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Institutional Review Boards of Cincinnati Children's Hospital Medical Center and TriHealth.

Consent to Participate This retrospective chart review study was conducted using data obtained for clinical purposes. We consulted extensively with the IRBs listed above who granted a waiver of informed consent.

Conflict of Interest Financial interests: Jill Huynh receives a salary from Beech Acres Parenting Center. All the other authors have no relevant financial interests to disclose. Non-financial interests: Robert Shapiro is on the board of directors of Beech Acres Parenting Center and receives no compensation as member of the board of directors. All the other authors declare they have no relevant non-financial interests to disclose.

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