Differences in Healthcare Utilization in Children with Developmental Disabilities Following Value-Based Care Coordination Policies

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SUMMARY

Goal: To address healthcare spending growth, coordinate care, and improve primary care utilization, a majority of states in the United States have adopted value-based care coordination programs. The objective of this study was to identify changes in national healthcare utilization for children with developmental disabilities (DDs), a high-cost and high-need population, following the broad adoption of value-based care coordination policies.

Methods: This retrospective study included 9,109 children with DDs and used data from 2002–2018 Medical Expenditure Panel Survey. We applied an interrupted time series design approach to compare pre- and post-Affordable Care Act (ACA) care coordination policies concerning healthcare utilization outcomes, including outpatient visits, home provider days, emergency department (ED) visits, inpatient discharge, and inpatient nights of stay.

Principal Findings: We found statistically significant increases in low-cost care post-ACA, including outpatient visits (5% higher, p < .001) and home provider days (11% higher, p < .001). The study findings also showed a statistically significant increase in inpatient nights of stay post-ACA (4% higher, p = .001). There were no changes in the number of ED and inpatient visits. Overall, broad implementation of care coordination programs was associated with increased utilization of low-cost care without increases in the number of high-cost ED and inpatient visits for children with DDs. Our study also found changes in population composition among children with DDs post-ACA, including increases in Hispanic (16.9% post-ACA vs. 13.4% pre-ACA, p = .006) and non-Hispanic multiracial children (9.1% post-ACA vs. 5.5% pre-ACA, p = .001), a decrease in non-Hispanic Whites (60.2% post-ACA vs. 68.6% pre-ACA, p = .001), more public-only insurance (44.3% post-ACA vs. 35.7% pre-ACA,

For more information, contact Dr. Huang at lhuang2@kumc.edu. The authors declare no conflicts of interest. © 2024 Foundation of the American College of Healthcare Executives DOI: 10.1097/JHM-D-23-00031 p = .001), fewer children with DDs from middle-income families (27.4% post-ACA vs. 32.8% pre-ACA, p < .001), and more children with DDs from poor families (28.2% post-ACA vs. 25.1% pre-ACA, p = .043).

Practical Applications: These findings highlight the importance of continued support for broad care coordination programs for U.S. children with DDs and potentially others with complex chronic conditions. Policymakers and healthcare leaders might consider improving care transitions from inpatient to community or home settings by overcoming barriers such as payment models and the lack of home care nurses who can manage complex chronic conditions. Healthcare leaders also need to understand and consider the changing population composition when implementing care coordination-related policies. This study provides data regarding trends in hospital and home care utilization and evidence of the effectiveness of care coordination policies before the COVID-19 interruption. These findings apply to current healthcare management because COVID-19 has incentivized home care, which may have a strong potential to minimize high-cost care for people with complex chronic conditions. More research is warranted to continue monitoring care coordination changes over a longer period.

INTRODUCTION

The healthcare delivery system in the United States has undergone historic changes since passage of the 2010 Affordable Care Act (ACA), including improved integration of care, betterdesigned services, and new measurement tools designed to improve care coordination. By the end of 2018, 48 U.S. states or districts adopted various levels of value-based care coordination programs to reduce fragmented care and downstream costs (Change Healthcare, 2019; Substance Abuse and Mental Health Services Administration, 2019). While many of these value-based care programs targeted vulnerable populations, such as children with developmental disabilities (DDs) and mental health conditions, challenges remain. Children with DDs who lack access to value-based programs, such as patient-centered medical homes

(PCMHs) are especially at risk for receipt of suboptimal care coordination as a result of increasingly complex chronic conditions and specific care needs. Indeed, children with DDs receive less preventive care, have higher unmet needs, and utilize both hospital emergency department (ED) and inpatient visits more often—frequently leading to higher healthcare spending than that for children without DDs (Lindgren et al., 2021).

Care coordination studies comparing the effects of pre- and post-ACA on healthcare utilization have been limited for children with DDs, but some evidence has shown improvements, with post-ACA increases in PCMH-certified primary care linked to better of outpatient care quality. For example, Lin et al. (2018) found that children with special healthcare needs who had a PCMH experienced better healthcare quality and were more likely to access

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preventive services with unchanged expenditures. Previous studies have been limited by the lack of evaluation of overall value-based care coordination policies at the national level; use of early-stage data sources post-ACA (e.g., before 2016); use of local/ regional data; inclusion of only certain types of insurance (e.g., Medicaid only); lack of consideration of the impact of care coordination on multiple areas of healthcare utilization; and a focus on expenditures only (Cohen et al., 2023; Yamaki et al., 2018).

Healthcare leaders and others need to fully understand changes across types of care utilization among children with DDs. Research findings on high-cost healthcare such as ED and inpatient visits have been mixed, depending on the pediatric population/chronic conditions studied. For example, research using Nationwide Emergency Department data and population estimates from the American Community Survey has found higher rates of ED visits post-ACA (rising by 1.1% before 2014 vs. 9.8% post-ACA) (Lee & Monuteaux, 2019). Similar research has found increases in ED use, with pediatric ED visits for all mental health disorders rising 60% from 2007 to 2016 (Lo et al., 2020). According to a study by Kim and colleagues (2020), pediatric patients with intellectual DDs had higher healthcare spending and utilization than children without intellectual DDs in all categories (e.g., outpatient, inpatient, and home) except ED use. Alternatively, Connell and colleagues (2020) found that ACA implementation was associated with a decline in psychiatric length of stay over time for children, but 30-day readmissions increased significantly post-ACA.

Taken together, previous studies suggest improvements in quality but do

not report consistent findings regarding overall utilization of high-cost care. While post-ACA reforms suggest utilization improvements, shifts from high-cost to lowcost care for high-need, high-cost children with DDs have yet to be fully determined at the national level (*Health Affairs* Research Brief, 2022). As value-based care approaches become more prevalent and mature, it is important to update the literature regarding post-ACA efforts to improve the health of vulnerable populations.

The objective of this study was to elucidate changes in healthcare utilization following the implementation of care coordination programs. Specifically, we examined differences in healthcare utilization (e.g., outpatient, inpatient, ED, and home provider care) pre- and post-ACA for children with DDs. We hypothesized that utilization of low-cost care would increase (e.g., increasing numbers of outpatient visits and days of home provider care) and utilization of high-cost care would decrease (e.g., decreasing numbers of ED and inpatient visits, inpatient nights of stay), net of sociodemographic factors, following implementation of the ACA. However, those improvements may be limited for children with DDs because of ongoing complex medical needs.

METHODS

We conducted a retrospective study using the 2002–2018 Medical Expenditure Panel Survey (MEPS). The survey which is a publicly available and nationally representative sample of the U.S.civilian noninstitutionalized population (Agency for Healthcare Research and Quality, 2023). MEPS is the only source of national data measuring Americans' use of medical care, use of health insurance, and spending, and encompasses households, medical providers, health insurance, and nursing homes (Agency for Healthcare Research and Quality, 2023). The overall weighted response rate for the survey was 44.2% to 64.7% between 2002 and 2018 (Agency for Healthcare Research and Quality, 2023). Our study was exempt from institutional review board review because of its publicly available de-identified data. Multiple-year combinations, weighting, and data analysis were based on the MEPS guide to multipleyear estimates.

The yearly MEPS data were used for this healthcare utilization study (Kim et al., 2020). The pre-ACA (years 2002-2009) and post-ACA (years 2011-2018) data were derived from both the household-consolidated summary data and medical condition files. The householdconsolidated data files provided estimates of respondents' health statuses, selected comorbid conditions, demographic and socioeconomic characteristics, healthcare utilization, satisfaction with healthcare, and healthcare expenditures. The medical condition files included data from the International Classification of Diseases, Ninth Revision (ICD-9) and 10th Revision (ICD-10) that are used to classify the DD population. From 2002 to 2018, 166,086 child-level MEPS interviews were completed nationally.

As shown in Figure 1, children between 0 (<1 day–11.9 months) and 17 years of age were included. The pre-ACA policy years were 2002 to 2009 and the post-ACA policy years were 2011 to 2018. Data from 2010 were excluded from the study because it was a phase-in period. The final analytical cohort included 9,109 unweighted cases of children with DDs (Figure 1). The DD population was defined using MEPS medical conditions, including parents' reported DD diagnoses of their children (i.e., autism spectrum disorder, attention-deficit/hyperactivity disorder, cerebral palsy, moderate to profound hearing loss, developmental delay, intellectual disability, learning disability, Down syndrome, epilepsy or seizure disorder, deafness, blindness, speech or other language disorder, and Tourette syndrome) (Kim et al., 2020; Zablotsky et al., 2019); Zablotsky & Black, 2020). Household-reported medical conditions were coded into ICD-9 from 1996 to 2015 and into ICD-10 from 2016 to 2018 (Agency for Healthcare Research and Quality, 2023).

This study applied a quasi-experimental interrupted time series (ITS) segmented Poisson regression model because of its ability to evaluate natural experiments such as policy changes (Penfold & Zhang, 2013). ITS allowed us to use population-level data and control for secular trends by comparing the trend in the outcome after the care coordination intervention (2011-2018) with the secular trends in the outcome before the care coordination intervention period (2002-2009) (Bernal et al., 2017; Penfold & Zhang, 2013). We compared two groups of people: children with DDs after the implementation of the policy changes under study (i.e., cases) and a similar group of children with DDs before implementation of the policies (i.e., controls). The ITS segmented regression can be represented as follows:

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FIGURE 1

Medical Expenditure Panel Survey (MEPS) Flowchart for Children With Developmental Disabilities (DDs) Pre-ACA-Policy (2002–2009) Versus Post-ACA-Policy (2011–2018)



$$\begin{aligned} Y_t &= \beta_0 + \beta_{\text{time}} * T + \beta_{\text{policy}} * X_t + \beta_{\text{diff}} \\ &* (T - T_0) * X_t + e, \end{aligned}$$

where Y_t are the respective outcome healthcare utilization variables at time t. β_0 is the intercept at time 0. β_{time} is the slope of the outcome without the intervention, thereby representing the secular trend. β_{policy} quantifies the change following the intervention. β_{diff} quantifies the differences between the above two slopes. X_t is a dummy variable indicating the preintervention period (coded 0) or the postintervention period (coded 1). T is the time elapsed since the start of the study (2002) with the unit (1 year) representing the frequency with which observations are made yearly. T_0 is the time at the beginning of the intervention, and *e* represents the random error term.

Before the ITS analyses, we examined the linear trend for each outcome according to DD status between 2002 and 2018. For children with DDs, the results showed upward linear trends for outpatient visits, home provider days, ED visits, and inpatient nights of stay. However, downward linear trends were shown for inpatient discharge.

We then compared selected baseline sociodemographic characteristics to assess the population differences using frequency, mean, and chi-square tests. The estimation procedures were weight-adjusted for the complex survey design of the MEPS (Agency for Healthcare Research and Quality, 2023). Finally, we conducted five multivariable Poisson segmented ITS regression analyses for each of the five discrete healthcare utilization outcome variables to assess differences in healthcare utilization before and after the

implementation of care coordination policies, net of sociodemographic characteristics for children with DDs. Statistical software (Stata 15, StataCorp) was used to conduct the analyses, and $p \leq .05$ was the accepted level of statistical significance. Results are presented as incidence rate ratios (IRRs), which are the estimated post-ACA incidence rate divided by the pre-ACA incidence rate for each predictor. IRRs allowed us to compare the incidence rate between the two groups. An IRR equal to 1 indicated that the incidence rate was equal in the post-ACA group and the pre-ACA group. An IRR of <1 indicated that the incidence rate was lower in the post-ACA group than in the pre-ACA group. An IRR of >1 indicated that the incidence rate was higher in the post-ACA group than in the pre-ACA group.

Our exposure of interest was time relative to care coordination policies associated with the ACA, which was enacted in 2010. The intervention was care coordination policies associated with the ACA. For our primary analysis, three independent variables were used for the ITS model: a discrete measure indicating time (1-16, representing 2002-2018, except 2010); a binary measure indicating exposure (no exposure for 2002-2009 = 0, exposure for 2011-2018 = 1; and a discrete variable indicator for post-ACA policy years (pre-ACA policy = 0, post-ACA policy = 1-8) (Choi et al., 2017). We excluded 2010 as a phase-in period in our primary analysis.

Healthcare utilization variables included five outcome variables operationalized as high-cost and low-cost care. Consistent with other research, we included ED visits, inpatient visits, and inpatient nights of stay to represent high-cost care, while outpatient visits and home provider days represented low-cost care (Khullar & Chokshi, 2018). ED or inpatient visits included the number of visits made during the person's reference period to a hospital ED or to a hospital for an inpatient stay. Inpatient nights of stay referred to the number of nights of inpatient hospitalization during the person's reference period. Outpatient visits were defined as the number of visits made during the person's reference period to a hospital outpatient department (e.g., pediatrician, eye doctor, well visit, and laboratory) for health and medical services that do not require hospitalization overnight. The number of home provider days included both formal (i.e., paid) and informal (i.e., unpaid) home provider days. Formal or paid providers included home health agencies and other independent paid providers. Informal or unpaid providers included family members and friends who resided outside of the sampled person's household (Agency for Healthcare Research and Quality, 2023). Each of these variables was included as a discrete count variable representing the actual number of visits or days of healthcare utilization.

Utilization may have been impacted by other factors, such as age, sex, race/ethnicity, poverty, insurance status, geographic area of residence, and comorbidities (National Academies of Sciences Engineering and Medicine, 2018a). Covariates included the following sociodemographic factors: age (i.e., 0 to <3, 3 to <6, 6 to <12, and 12 to <18 years), sex (i.e., male, female), race/ ethnicity (i.e., Hispanic, non-Hispanic White, non-Hispanic Black, multiracial/ other, non-Hispanic), insurance status (i.e., any private, public only, and uninsured),

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poverty level (i.e., poor or <124% of the federal poverty level [FPL], low income or 125%–199% FPL, middle income or 200%– 299% FPL, high income or >400% FPL), and region (i.e., Northwest, Midwest, Northeast, South, West). Asthma is one of the most common chronic conditions among children in the United States and may influence healthcare utilization; therefore, we included it as a categorical variable (i.e., no, yes, unknown).

RESULTS

Table 1 presents the demographic characteristics of children with DDs pre-ACA versus post-ACA. DDs were more prevalent post-ACA policy compared with pre-ACA policy (7.9% vs. 5.0%, *p* < .001). Race/ethnicity, insurance status, and poverty status were significantly different between pre-ACA policy cases and post-ACA policy cases. Specifically, there were more Hispanic and non-Hispanic multiracial individuals post-ACA, while the proportion of non-Hispanic Whites with DDs declined post-ACA. Table 1 also shows that there were more children with public-only insurance post-ACA, fewer uninsured children, more children from poor families, and fewer children from middle-income families. Other variables such as age, sex, and region did not exhibit statistically significant differences following policy changes.

Tables 2 and 3 show statistically significant differences in utilization of lowcost care between pre- and post-ACA periods. Specifically, the results indicated increased outpatient visits and increased home provider days post-ACA. There were no statistically significant differences in high-cost care related to ED visits, inpatient visits, including discharges (p = .762), or inpatient nights of stay.

Tables 2 and 3 also present the longitudinal effects of implementing care coordination on healthcare utilization for children with DDs. The post-ACA policy trend (β_{diff}) quantifies the differences between the pre-ACA policy and post-ACA policy slopes. Table 2 and Figure 2 show statistically significant increases in low-cost utilization among children with DDs post-ACA policy compared with pre-ACA policy, including outpatient visits (5% higher IRR in slope difference post-ACA policy, or IRR β_{diff} = 1.05, *p* < .001) and home provider days (11% higher IRR in slope difference post-ACA policy, or IRR $\beta_{\rm diff} = 1.11, \, p < .001$).

Regarding high-cost care, the study findings (Table 3 and Figure 2) show a statistically significant increase in the slope of the number of nights of inpatient stays for children with DDs post-ACA policy (4% higher IRR in slope difference post-ACA policy, or IRR $\beta_{\text{diff}} = 1.04, p = .001$), while there were no statistically significant differences in ED visits (slope difference pre- and postpolicy, or IRR $\beta_{\text{diff}} = 1.03, p = .547$) or inpatient visits (slope difference preand post-policy, or IRR $\beta_{\text{diff}} = 1.01, p = .264$).

Sensitivity tests were used to address various phase-in periods. The results remained the same for home provider days and number of visits (i.e., outpatient, ED, and inpatient). In the model addressing the number of nights of inpatient stays, the results were statistically nonsignificant when a later and longer phase-in period was evaluated (i.e., 2008–2012/2009–2013 vs. 2010).

TABLE 1

		Weighted				
Demographic	Unweighted	Pre-ACA				
Characteristics	DD Count	Policy (%)	Post-ACA Policy (%)	p^{a}		
N	9,109	5.0 7.9		<.001**		
Age, years						
0 to ≤3	293	3.0	3.3	.585		
3 to ≤6	761	6.9 8.2		.106		
6 to ≤12	4,150	45.2	42.6	.145		
12 to ≤18	3,905	44.9	45.8	.603		
Sex						
Male	6,266	70.1	68.9	.492		
Female	2,843	29.9	31.1	.492		
Race/ethnicity						
Hispanic	2,370	13.4	16.9	.006		
White, non-	4,113	68.6	60.2	<.001**		
Hispanic						
Black, non-Hispanic	1,908	12.5	13.7	.283		
Multiracial/other,	718	5.5	9.1	.001		
non-Hispanic						
Insurance status						
Any private	3,713	60.6	53.9	.001		
Public only	5,160	35.7	44.3	<.001**		
Uninsured	236	3.7	1.8	.003		
Region						
Midwest	1,522	23.0	25.4	.271		
Northeast	2,130	18.9	17.7	.540		
South	3,682	40.7	38.6	.367		
West	1,775	17.4	18.2	.632		
Poverty status						
Poor	3,784	25.1	28.2	.043*		
Low income	1,667	15.3	16.9	.128		
Middle income	2,132	32.8	27.4	<.001**		
High income	1,526	26.8	27.5	.665		
Asthma ^b						
Yes	1,879	17.6	18.9	.319		
No	7,221	82.2	81.1	.414		

Demographic Characteristics of Children With Developmental Disabilities, Pre-ACA Policy (2002–2009) Versus Post-ACA Policy (2011–2018)

Note. ACA = Affordable Care Act; DDs = developmental disabilities.

^aThe *p*-value was calculated using an adjusted Wald test.

^bBecause there were only nine cases of unknown as thma status, results could not be generated. *p < .05, **p < .001.

TABLE 2

Descriptive and Interrupted Time Series Design Results of Low-Cost Healthcare Utilization Among Children With Developmental Disabilities, Pre-ACA Policy (2002–2009) Versus Post-ACA Policy (2011–2018)

Low-Cost Healthcare Utilization	Outpatient Visits	р	Home Provider Days	р
	M (95% CI)		M (95% CI)	
Pre-ACA	12.85 (11.91–13.78)	<.001**	2.62 (1.71-3.52)	.035*
Post-ACA	16.01 (14.71–17.31)		4.12 (3.08-5.15)	
	Incidence Rate		Incidence Rate	
	Ratios ^a		Ratios ^a	
Secular trend slope	0.99 (0.99-0.99)	<.001**	1.06 (1.06-1.07)	<.001**
Change after ACA policy slope	0.92 (0.91-0.93)	<.001**	0.57 (0.55-0.59)	<.001**
Difference between pre-ACA and post-ACA policy slope $(\beta_{diff})^{b}$	1.05 (1.05–1.05)	<.001**	1.11 (1.1–1.11)	<.001**

Note. ACA = Affordable Care Act.

^aAn incidence rate ratio (IRR) allows a comparison of the incidence rate between two groups. The IRR is calculated as the incidence rate in the post-ACA group/the incidence rate in the pre-ACA group. An IRR equal to 1 means the incidence rate is equal in the post-ACA and pre-ACA groups. An IRR of <1 means the incidence rate is lower in the post-ACA group than in the pre-ACA group. An IRR of >1 means the incidence rate is higher in the post-ACA group than in the pre-ACA group. The results were adjusted by covariates.

 ${}^b\beta$ diff post-ACA quantifies the differences between the pre-ACA and post-ACA slopes. *p < .05, *p < .001.

DISCUSSION

Our study provided evidence on overall healthcare utilization among children with DDs following enactment of the ACA in 2010. Overall, we found that DDs were more prevalent post-ACA policy changes. In addition, demographic characteristics, including race/ethnicity, insurance status, and poverty status differed between pre-ACA and post-ACA periods, suggesting increased opportunities for diagnoses among lower-socioeconomic status groups. The post-ACA population changes among children with DDs were similar to general population changes, including an increase in the Hispanic population,

a reduction in middle-income families, higher poverty levels, and more use of public insurance (Flores, 2017; Horowitz et al., 2020). Our results also pointed to healthcare utilization changes related to low-cost care, including increases in both outpatient visits and home provider days without an increase in high-cost ED and inpatient visits. However, the study findings showed an increase in the number of nights of inpatient hospital stays.

Our study findings confirmed that post-ACA, utilization of low-cost care has increased among children with DDs without apparent increases in some high-cost care (i.e., number of ED

TABLE 3

Descriptive and Interrupted Time Series Design Results of High-Cost Healthcare Utilization Among Children With Developmental Disabilities, Pre-ACA Policy (2002–2009) Versus Post-ACA Policy (2011–2018)

High-Cost Healthcare Utilization	Emergency Department Visits		Inpatient Visits		Inpatient Nights of Stay	
	M (95% CI)	Р	M (95% CI)	Р	M (95% CI)	р
Pre-ACA	0.196 (0.17-0.22)	.562	0.06 (0.04-0.07)	.762	0.38 (0.2-0.57)	.945
Post-ACA	0.207 (0.18-0.23)		0.05 (0.04-0.06)		0.39 (0.22-0.57)	
	Incidence Rate Ratiosª		Incidence Rate Ratiosª		Incidence Rate Ratios ^a	
Secular trend slope	0.98 (0.98-0.99)	.029*	0.99 (0.97-1)	.528	0.99 (0.99-1)	<.001***
Change after ACA policy slope	0.93 (0.88-0.98)	.019*	0.87 (0.78-0.98)	.262	0.86 (0.82–0.9)	<.001****
Difference between pre- ACA policy and post-ACA policy slope $(\beta_{diff})^{b}$	1.03 (1.02–1.04)	.547	1.01 (0.99–1.04)	.264	1.04 (1.03–1.05)	.001

Note. ACA = Affordable Care Act.

^aAn incidence rate ratio (IRR) allows a comparison of the incidence rate between two groups. The IRR is calculated as the incidence rate in the post-ACA group/the incidence rate in the pre-ACA group. An IRR equal to 1 means the incidence rate is equal in the post-ACA and pre-ACA groups. An IRR of <1 means the incidence rate is lower in the post-ACA group than in the pre-ACA group. An IRR of >1 means the incidence rate is higher in the post-ACA group than in the pre-ACA group. The results were adjusted by covariates.

 ${}^{b}\beta$ diff post-ACA quantifies the differences between the pre-ACA and post-ACA slopes. *p < .05, ***p < .001.

and inpatient visits). These changes may be due, in part, to incentivizing value-based care coordination programs (e.g., PCMHs, accountable care organizations, Medicaid medical homes, and/or community-level services) to lower costs by reducing high-cost hospital use and improving low-cost outpatient visits and home follow-up care (Berkowitz et al., 2018; Kim et al., 2020; Liu et al., 2022). For example, ACA-related healthcare delivery and care coordination efforts have included both payment-model and deliverymodel reforms, such as incentivizing care coordination (e.g., accountable care organizations), performing care coordination (e.g., PCMHs), encouraging

an environment of coordination (e.g., workforce development, mental/behavioral health support, community support, health information technology), addressing social determinants of health, and improving care quality. For example, Leslie and colleagues (2017) found that ACA-expanded Medicaid home- and community-based services resulted in decreased unmet needs and ED visits for children with DDs (e.g., autism). Overall, care coordination has aimed to keep patients in outpatient and communitybased care, while providing high-quality care in the best interests of patients (National Academies of Sciences Engineering and Medicine, 2018b). DDs were more prevalent post-ACA, but

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FIGURE 2

Interrupted Time Series (ITS) Design Approach on Healthcare Utilization Among Children With Developmental Disabilities 0 to 17 Years Old, Pre-ACA (2002–2009) Versus Post-ACA (2011–2018)



Note. ACA = Affordable Care Act; DDs = developmental disabilities.

children with DDs used more low-cost care without apparent increases in some high-cost care. These results are important in light of the overall increase in DD pre-valence rates found in this sample; similarly, Lo and colleagues (2020) reported a 60% increase in pediatric ED visits for all mental health disorders among children with DDs from 2007 to 2016 (Lo et al., 2020).

Our study findings also confirm the complexity of inpatient management, with some mixed results (Bucholz et al., 2019; Connell et al., 2020; Markham et al., 2018). For example, reduced nights of inpatient stays may increase inpatient readmission within 30 days. We did not find a change in the number of inpatient visits, yet found a statistically significant increase in the number of nights of inpatient hospital stays. These results might be related to challenges such as workforce gaps, payment models, and/or policy challenges that are unique to home provider care for children with medical complexities (Foster et al., 2019). For example, pediatric home care nurse shortages post-ACA were associated with a negative impact on the length of inpatient stays and unplanned 90-day readmissions (Maynard et al., 2019). Future research could explore additional factors that might affect nights of inpatient stays such as transitions to community settings, bed management, staffing inefficiency, workflow management, and transportation issues.

Although we found that the number of nights of inpatient hospital stays increased over time, this finding became statistically nonsignificant after we applied a different phase-in period. This highlights the challenges of identifying the effects of specific care coordination policies across overlapping policy changes and variations in implementation timing. These findings may reflect a lag period or need for additional time before care coordination policies take effect.

Study Limitations

There were several limitations to our study. First, no state-level data were available. Many care coordination programs are based on state-level policies, and state-level data can provide information about healthcare utilization and related care coordination policies that can guide specific improvements in the state. As such, we did not evaluate specific policies but relied on the period following implementation of the ACA. Although there is likely spillover between programs, we believe that these healthcare utilization changes are likely the result of care coordination policies associated with the ACA instead of other policies. For example, adult Medicaid expansion may have had little impact on our national study, which focused on children with complex chronic conditions and all types of health insurance. Hence, compared with ACA care coordination policies, there are minimal external factors or other policies (e.g., Medicaid expansion) systematically affecting broader healthcare utilization trends for children with DDs. Further research of a longitudinal or prospective nature is required to evaluate whether the availability of specific valuebased care policies leads to outcomes such as longer hospital stays.

Second, the study included parentreported survey data, DD diagnoses that were not verified by physicians, and limited information about the severity of

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the DDs. We were unable to determine if the increase in DDs was the result of policy changes that led to additional services to previously underserved groups or an increase in the overall population.

Third, our ITS analysis may have been influenced by some population heterogeneity from 2002 to 2018 resulting from certain disease definitions associated with DDs changing over time (e.g., autism). We were unable to identify a control group that would consist of children with other diseases. For example, there was no parallel trend in healthcare utilization when we evaluated children without DDs and children with asthma. Moreover, we used 2010 as a phase-in period to allow time for care coordination policies to take effect. However, this phase-in period may not have captured the length of time needed for all care coordination programs to take effect (Substance Abuse and Mental Health Services Administration, 2019).

Lastly, future studies will need to focus on costs. While we made general, researchbased assumptions regarding definitions of "high-cost" and "low-cost" care, we were cautious to not infer that increasing nights of inpatient stays were equivalent to increasing costs. It is possible that inpatient care is value-based and is an improvement in care that may lead to future reductions in expenditures. Quality improvement and appropriate care may be more precise in assessing long-term costs compared to simply focusing on reductions in the number of inpatient visits due to readmissions or the number of nights of inpatient hospital stays.

Nonetheless, this study presented insights beyond those in previously published studies. We examined multiple outcomes of healthcare utilization using actual numbers of visits or days and compared pre-ACA outcomes with post-ACA outcomes at a national population level before the COVID-19 interruption.

Policymakers, healthcare leaders, and providers need to understand the barriers to effective care coordination policies in the United States. These include fragmented healthcare and payment systems, growing and complex chronic conditions, lack of team-based training and social and cultural competencies among healthcare professionals, and geographic variations (Clarke et al., 2017; Hung, Workman, & Mohan, 2020; Rukadikar et al., 2022). Future research could monitor changes in healthcare utilization over longer periods, as well as explore healthcare utilization with respect to cost. Further, an in-depth analysis of healthcare utilization outcomes could help to elucidate the impact of the ACA on care coordination. For example, outpatient studies might explore details related to mental health services (e.g., counseling, behavioral therapy, and medication treatment) or home care provided by agencies, as well as informal home care.

CONCLUSION

The results of this retrospective study show that the post-ACA care coordination policy period was associated with increased outpatient visits and home care utilization without increases in ED and inpatient visits, despite an increased prevalence of DD diagnoses among relatively disadvantaged groups of children. These findings highlight the importance of continued support for broad care coordination programs among U.S. children with DDs. As underscored by our findings, future care coordination efforts

for children with DDs can continue to reduce high-cost care and/or provide appropriate care to reduce unmet needs. Policymakers and healthcare providers can strive to improve care transitions from inpatient to community or home settings by overcoming barriers such as current payment models and the shortage of home care nurses who can manage complex chronic conditions. This study reported trends in hospital and home care utilization and evidence of the effectiveness of care coordination policies before the COVID-19 interruption. These findings apply to current healthcare management strategies. COVID-19 has incentivized the use of home healthcare, which may minimize the use of high-cost care for people with complex chronic conditions. More research is warranted to continue monitoring care coordination changes over a longer period.

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