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Therapy Use for Children With Developmental Conditions: Analysis of Colorado Medicaid Data

Beth M. McManus, PT, MPH, ScD [Dr.],

Department of Health Systems, Management & Policy, Colorado School of Public Health, Aurora, CO, USA; Department of Physical Medicine and Rehabilitation, University of Colorado, Aurora, CO, USA

Mary Jane Rapport, PT, DPT, PhD [Dr.],

Department of Physical Medicine and Rehabilitation, University of Colorado, Aurora, CO, USA

Mr. Zachary Richardson, MA [Dr.], and

Department of Health Systems, Management & Policy, Colorado School of Public Health, Aurora, CO, USA

Richard Lindrooth, PhD [Dr.]

Department of Health Systems, Management & Policy, Colorado School of Public Health, Aurora, CO, USA

Abstract

Study Purpose—To examine therapy use and spending for Medicaid-enrolled infants and toddlers with developmental conditions.

Methods—Sample infants and toddlers had a diagnosis (DX) (e.g., cerebral palsy) or developmental delay (DD). Colorado Children's Medicaid administrative outpatient therapy claims (2006–2008) were used to estimate differences, by condition type and number of co-morbid chronic conditions (CCCs), of *any* PT/OT and Medicaid PT/OT spending.

Results—The sample included 20,959 children. Children with at least two CCCs had higher odds of PT/OT than children with no CCC. Children with DD had 12-fold higher odds of having any PT/OT compared to children with DX. Children with a DD and two CCCs had the highest PT/OT spending.

Conclusions—Medicaid PT/OT use and spending is higher for children with more CCCs and those with DD because children with DD receive more specialized PT/OT.

Introduction and Purpose

Early intervention (EI) is a system of coordinated developmental and therapeutic services as federally mandated by Part C of the Individuals with Disabilities Education Act (IDEA). Part C authorizes states, with the incentive of federal financial support, to provide EI

Correspondence: Beth McManus, PT, MPH, ScD, Department of Health Systems, Management and Policy, Colorado School of Public Health, 13001 E. 17th Place, MS B119, Aurora, CO 80045. beth.mcmanus@ucdenver.edu.

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services for infants and toddlers with, or who are at risk, for developmental delays (DDs) and developmental diagnoses (DXs).¹ Children qualify for EI based upon the presence of a DX (e.g., autism) or a developmental delay (DD) and up to 40% of EI-enrolled children receive physical or occupational therapy.² We know very little about utilization of EI service by infants and toddlers with either a qualifying diagnosis or with documented developmental delay. One reason is the differences in EI eligibility state to state for children with DD.³ By studying utilization in one state that includes children with a qualifying DX and DD we can gain understanding on the similarities and differences in these two groups.

Previous studies^{5,6,7,8,4} examining therapy access have been limited by parent-reported receipt of services or have focused on the delivery of *any* services. To date, there are limited population studies that evaluate patterns of therapy *use* for children with DX and DD. The existing literature about EI and therapy use for children with DX is equivocal. Previous studies suggest that children with DX, compared to those with DD, face more barriers to accessing therapy services and receive fewer services and have more unmet need for therapy.^{5,6,7} Yet, among EI-eligible children, those with DX (versus DD) are more likely to access EI.⁸ One explanation for these seemingly conflicting findings is that children with DX are accessing EI more than their peers with DDs, but may not be receiving appropriate amounts of therapy.

Multiple variables⁹ influence the level, intensity, and accessibility of children for EI services. The severity of the child's condition likely plays a role and may be a better indicator of therapy needs. While severity of children's conditions might be expected to positively influence receipt of therapy, the reality is more complicated. Previous research suggests that children whose condition (DD or DX) more profoundly affected their function were more likely than their peers with milder conditions to receive EI,⁸ but also have greater unmet need for therapy services.^{5,6,7} Thus, the role of the type *and* severity of a child's developmental condition on therapy service use is unclear.

To address these gaps, we examined therapy access, service use, and spending among infants and toddlers with presumed EI-eligibility (i.e., with a DX or DD) enrolled in one state's Medicaid program. We chose a single state to limit state variability in EI eligibility. In addition, use of Medicaid data allowed us to examine place of therapy service use because Medicaid reimburses for therapy delivered in home and clinic settings. We further examined a proxy for condition severity (i.e., number of co-morbid chronic conditions) to determine its role in receipt of services for type of developmental condition (DD versus DX). To our knowledge, no published studies have examined differences in PT/OT service use by condition type and severity and place of service. Given the ongoing crises with EI funding in most states¹⁰ and uncertainty of Medicaid expansion, understanding and improving the efficiency of therapy service delivery and spending for Medicaid-eligible infants and toddlers with DX and DD, and varying severity, is critical.

The purpose of this study was to examine differences by type of condition (i.e., DX versus DD and associated with presumed EI eligibility) and varying developmental vulnerability on PT and OT service use and spending among a state-wide sample of infants and toddlers, enrolled in Colorado Medicaid.

Methods

Sample Selection

The data source was the Centers for Medicare and Medicaid Analytic Extract data files for Colorado for years 2006-2008. Children were presumed EI-eligible if they had a DX or DD that corresponded to federal IDEA mandates³ and Colorado policy¹¹ for EI eligibility. Our sample's developmental conditions included developmental delay, cerebral palsy, Down syndrome, neurological impairment,¹² autism, and any complex chronic condition(Supplemental Digital Content 1).

The sample was restricted to children with DX or DD who were less than 36 months of age with continuous Medicaid eligibility, defined as 9 of 12 calendar months. This definitional criterion aligns with similar eligibility determinations previously reported in the literature¹³ and accounts for the lack of knowledge about therapy service use when children lose Medicaid eligibility or enrollment.

This study was approved by the Colorado Institutional Review Board.

Independent Variables

Condition severity / Developmental Vulnerability—We included a measure of the number and type of the child's co-morbid complex chronic conditions. Using the algorithm developed by Fuedtner and colleagues,¹⁴ we used ICD-9 codes to classify children as having a complex chronic condition in one of the following systems: neuromuscular, cardiovascular, musculoskeletal, respiratory, renal, gastrointestinal, hematologic / immune, metabolic, and congenital or other genetic. For these analyses, we chose to include the four most prevalent CCC types and those that correspond to the diagnoses associated with automatic EI eligibility in CO. These CCC types (and their overall sample prevalence) were neuromuscular (9.1%), cardiovascular (22.0%), respiratory (8.7%), and genetic conditions (10.0%). We further categorized the number of co-morbid CCCs as 0, 1, and 2 to reflect either the child's primary developmental condition severity and/or developmental vulnerability.

Developmental Condition Type—Since children with one of the study DX often have a co-occurring DD, children were deemed to have a DX if they met the definitional criteria listed previously (regardless of co-occurring DD). Children were deemed to have a DD only if they only met the definitional criterion for DD (i.e., no co-occurring DX).

Measures

Outcome Measures

For each study child, therapy encounters (described below in Outcome measures) were included if they occurred after the child's initial diagnosis and before the child's third birthday.

Utilization—*Utilization* of PT/OT was categorized as access, total claims, and dosage. Children were considered to have accessed PT/OT if they had at least 1 PT/OT claim during

the study years. PT/OT claims were defined according to the following CPT codes (accounting for over 95% of sample CPT codes):

97110 (therapeutic exercise)

97112 (balance, posture, and coordination activities)

97530 (therapeutic activities)

97532 (development of cognitive skills, memory, and problem solving)

97535 (use of assistive devices and adaptive technology)

97533 (sensory integration therapy).

Total number of claims was the sum of PT/OT claims for the study period, for children receiving PT/OT services.

Dosage—Annual PT/OT dosage was estimated by multiplying the annual total PT/OT claims for each child by the total number of service units. Service units are measured as estimates of the total number of 15-minute increments during which the child received PT/OT evaluation or treatment.

Spending—Total annual per study child Medicaid PT/OT spending (i.e., total Medicaid per visit payments) was calculated as the sum of each Medicaid payment amount per PT/OT visit per study year, for study children receiving PT/OT.

Covariates

Child's race and ethnicity was categorized as white, non-Hispanic; black, non-Hispanic; Hispanic; other, non-Hispanic (including Asian, Pacific Islander, and multi-racial families); and children of unknown race or ethnicity. We also included a covariate for child's sex. Child's age was grouped as less than 12 months, 12 months to 23 months, and 24 months to 35 months. To categorize children's social disadvantage, we used a social disadvantage index. Details about this index have been reported previously.¹⁵ In brief, the index includes Census data¹⁶ collected at the ZIP code level, about 4 socio-economic variables (% of female single head of household, % of non-English speaking households, % of families living below the federal poverty level, and % of families participating in the supplemental nutrition assistance program). Social disadvantage index scores were categorized by tertile, with the lowest tertile indicating most social disadvantage. Rural/urban status was categorized according to Rural Urban Commuting Area (RUCA) codes.¹⁷ RUCA codes are determined by the US Census definitions of population density, urbanization, and daily commuting information to characterize all of the nation's Census tracts into rural and urban status. In addition, a ZIP Code RUCA approximation was developed, which was linked to each study child's resident ZIP code.

We categorized the primary place of PT/OT service as home or clinic based upon their relative frequency. For example, if 75% or more of the PT/OT visits occurred in the home setting, the primary place of PT/OT services was deemed to be the home. Type of service was derived from the previously described most common PT/OT CPT codes.

Analytic Approach—Descriptive statistics are presented for the whole sample, and separately, by number of CCCs and by condition type (i.e., DX or DD).

Therapy Access: We first estimated the probability of receiving any PT/OT (i.e., having at least 1 PT/OT claim), by number of CCCs and calculated the difference between CCC groups. We then fit a logistic regression model to estimate the likelihood, or odds ratio, of any PT/OT for each CCC group, adjusting for condition type and other child and family characteristics. We then examined if PT/OT access is different for children with CCCs if they have a DX versus a DD. To assist in the interpretation of this model, we calculated the predicted probability of receiving any PT/OT for each condition type *and* CCC group.

Total PT/OT Claims: We estimated the median annual per child total PT/OT claims and then calculated the differences by CCC groups. These models, are interpreted as the additional total annual median PT/OT claims for children with 1 vs 0 and 2 vs. 0 co-morbid CCCs.

Total PT/OT Dosage: We estimated the median annual per child total PT/OT dosage and then calculated the differences by CCC groups. These models are interpreted as the additional annual median PT/OT total dosage associated with having 1 vs 0 and 2 vs. 0 CCCs.

Total annual Medicaid PT/OT Spending: To estimate the differences in annual median per child Medicaid PT/OT spending by CCC group, we fit two sets of multivariable quantile regression models. We used a quantile regression (also referred to as median regression) because the median is not as sensitive to outliers as the mean. The first model included CCC group, PT/OT dosage, in addition to other child and family characteristics. The second model further included primary place of PT/OT service (home versus clinic), and the 6 most commonly reported PT/OT procedures. For these models, the estimate for the CCC groups is interpreted as the additional annual median Medicaid spending associated with providing PT/OT for children with 1 vs. 0 and 2 vs. 0 CCCs.

We then examined if PT/OT spending is different for children with CCCs if they have a DX versus a DD. To do this, we used a quantile regression model to estimate PT/OT spending for each group of children based on condition type (DX and DD) *and* CCC group (0, 1, 2). To assist in the interpretation of this model, we present the PT/OT spending for each condition type *and* CCC group.

Data management and descriptive statistics were conducted using SAS v9.3¹⁸ and the median quantile regression models were conducted in STATA13.¹⁹

Results

There were 59,323 children with DX or DD between 2006 and 2008. Of those, 30,287 were less than 36 months of age during the study years, and of those, 20,959 were continuously Medicaid-eligible. Among the whole sample, 52.48% of children had no CCC, 36.18% had 1 CCC, and 11.35% had at least 2 CCCs. Nearly 3/4 (71.64%) of the sample had a DX,

29.09% were Hispanic, and 83.31% lived in an urban setting. Approximately 1 in 5 sample children (20.67%) were infants less than 12 months of age (Table 1).

PT/OT Access—Overall, 14.43% received PT/OT. Approximately 11% of children with no (11.55%) or one (11.0%) CCC received PT/OT, whereas 38.73% of children with at least two CCCs received PT/OT (Table 1). Children with one CCC and those with at least two CCCs were more likely (based on an odds ratio) to receive PT/OT than children with no CCC (Table 2). Compared to their peers with DX, sample children with DD were 12-fold more likely to receive any PT/OT (Table 2). Figure 1 graphs the adjusted probabilities of receiving PT/OT for each CCC group, by developmental condition. The highest probability of PT/OT use is for children with a developmental delay and at least two CCCs (72.5%) and the lowest is for children with no CCC who have a DX (5.7%). Overall, number of CCCs is positively associated with receipt of PT/OT. Additionally, there is a difference in this association whereby for each CCC group, children with a developmental delay are significantly more likely to receive PT/OT.

PT/OT Claims and Dosage—Compared to children with no CCC, children with two CCCs had 13 more PT/OT claims and 556 more billable units (i.e., 139 more hours) of PT/OT annually. Compared to children with no CCC, children with one CCC had 6 more PT/OT claims and 177 more billable units (i.e., about 44.5 hours) annually (Table 3).

Spending—Annual per child PT/OT spending for children with at least two CCCs was about \$172 higher than spending for children with no CCC even adjusting for child and family characteristics and PT/OT dosage (Supplemental Digital Content 2). When we further adjusted for place of service (home v. clinic) and type of service (e.g., sensory integration), there was still a significant spending difference of about \$26 between children with two versus no CCCs (Supplemental Digital Content 2).

Median annual per child PT/OT spending was \$108 higher for children with DD compared to their peers with DX even adjusting for child and family characteristics and PT/OT dosage (Supplemental Digital Content 2). When primary place of PT/OT service and PT/OT procedure type are included in the model (Supplemental Digital Content 2), the spending differences between children with a DX versus a DD are no longer statistically significant. Figure 2 shows the adjusted annual per child PT/OT spending for each CCC group, by developmental condition. The highest PT/OT spending occurs among children with a developmental delay and at least two CCCs (\$341.58) and the lowest is for children with no CCC who have a DX (\$117.11). Overall, number of CCCs is positively associated PT/OT spending. Additionally, there is a difference in this association whereby for each CCC group, children with a developmental delay are more likely to receive PT/OT and these differences are statistically significant.

Discussion

In this study we found that EI-eligible children with greater co-morbid CCCs are more likely to receive PT/OT, and at greater doses, than children with no co-morbid CCC. Moreover, EI-eligible children with a DX receiving therapy services funded by Medicaid accessed PT/OT

less often than their peers with a DD; and when they did access PT and OT, they received less intensive and less specialized services. Finally, when condition type and number of co-morbid chronic conditions are examined together, we found that children with DD and at least 2 co-morbid CCCs are most likely to receive PT/OT whereas children with a DX and no co-morbid CCC are least likely to receive PT/OT. This finding is consistent with previous literature^{5,6,7} suggesting therapy access barriers for children with disabilities. Yet, this is the first published paper to demonstrate differences in PT/OT receipt, dosage and spending by condition type and severity.

We found large differences in therapy dosage by condition type even accounting for number of co-morbid chronic conditions. Our results suggest that children with DD typically received 80 minutes of PT/OT weekly, while children with disabilities typically received 15 minutes weekly. Previous research suggests caregivers of children with disabilities experienced greater caregiver stress and related this to coordinating and managing multiple appointments.²⁰ Thus, it is plausible that the psychosocial burden of caring for a child with a disability negatively influences parents' capacity to engage with therapy services as frequently as parents of children with developmental delays. Moreover, it is also possible that the therapy treatment regimens for children with DX are more complex and involved, which precludes many families, particularly those with limited resources, from engaging fully, which has been previously reported.²¹

Another study finding is that annual Medicaid PT/OT per child spending is highest for children with more co-morbid CCCs. Yet, disparities exist by condition type such that, regardless of CCC group, PT/OT spending is higher for children with DD than DX. We have limited extant literature to which to compare our results. However, our results suggesting a median annual spending of \$146 per child with a disability are consistent with spending estimates (\$129 annually) for a similar sample from the National Early Intervention Longitudinal Study (NEILS).^a Yet, while our results indicate annual per child spending of \$309 for children with DD, spending for a similar sample of children with DD (from NEILS) is \$102 per child annually.^a

Moreover, when we account for the location of PT/OT service and PT/OT procedures, we no longer observe differences by condition type in Medicaid PT/OT spending. Thus, our results indicate that children with DD are more likely to receive costly specialized PT/OT (i.e., sensory integration therapy, assistive device training, or neuromuscular re-education) and more clinic-based PT/OT than children with DX. Our findings are consistent with previous literature and suggest that, compared to children with DD, children with DX and those with complex conditions are more likely face barriers to receiving appropriate therapy services.^{5,6,7,22} Indeed, previous research suggests shortages of pediatric PTs and OTs with expertise to treat high-risk infants and high-risk infants are substantially more likely to receive a referral for private physical or occupational therapy services rather than EI. Other research suggests that children with severe conditions are more likely than their counter

^aOur findings are similar to estimates of PT/OT spending for Medicaid EI children in NEILS given assumptions related to therapy use (37% of NEILS children), Medicaid spending (18% of overall Part C spending), and PT/OT reimbursement caps (e.g., 48 units in CO) are applied.

parts with less severe conditions to report lack of availability and affordability of PT/OT services as therapy access barriers.⁷ Taken together, our results suggest that the current EI system may be providing inadequate services to families of children with DX. Thus, it is critical that PTs and OTs are aware of these therapy access disparities and develop family-centered outreach and intervention strategies whether they are providing services in a clinic setting or through a home-based early intervention program.

We acknowledge the study limitations. The data were from one state and represent only three years. It is possible that after 2008, trends in PT and OT utilization and spending differ. When we were moving to a full implementation of the ACA, it appeared that many more children in Colorado (and nationally) would become Medicaid-eligible and a modest proportion of these children would also require PT/OT services. While there is currently greater uncertainty relative to the continuation of the ACA, some form of public support is likely to continue for these vulnerable children. Thus, understanding therapy utilization for this high-risk group has important implications for PT/OT service delivery. Second, we recognize that we cannot confirm eligibility or participation in EI therapy services. In this study we attribute the receipt of PT/OT home visits to EI, particularly given that Part C is the most common source of therapy services for infants and toddlers with DD and DX, yet we cannot confirm this. We acknowledge that we were limited to a child's diagnosis to determine need for PT/OT and had no measure of child's function. We were restricted in our analyses to quantity of PT/OT services because we have no measure of quality.

Our study has several strengths. We created a sample of children with DX and DD who would presumably need PT/OT services. Our study findings have programmatic and policy implications related to the ACA or subsequent public funding for healthcare. Understanding Medicaid therapy spending for EI-eligible children is critical to understand systems coordination, quality, and efficiency. Finally, use of administrative Medicaid billing data in the current study allowed us to examine PT/OT dosage and spending. Furthermore, PT/OT providers of EI services should be acutely aware of the many contributing factors associated with a child receiving services for a DD or DX and work with the family to eliminate as many of those barriers as possible. The goal should always be focused on the child's development, such that therapy services are of the highest quality and delivered with an intensity that maximizes each available interaction.

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Figure 1.

Adjusted* predicted Probability of receiving PT/OT for each CCC group, by developmental condition type, among a sample (n=20,959) of infants and toddlers with a developmental condition in Colorado, 2006-2008

*Adjusted for urbanicity, child's race and ethnicity, sex, age, number of comorbid chronic conditions, social disadvantage, and PT/OT dosage

Figure 2.

Adjusted* median annual Medicaid per child PT/OT spending for each CCC group, by developmental condition type, among a sample (n=20,959) of infants and toddlers with a developmental condition in Colorado, 2006-2008

*Adjusted for child's race and ethnicity, sex, urbanicity, age, and social disadvantage, PT/OT dosage and receipt of any PT/OT

Table 1
Characteristics of the Full Sample of Medicaid Infants and Toddlers, Co-Morbid Complex Chronic Condition Group

Characteristic	Whole Sample (n=20,959)	Number of Comorbid Chronic Conditions		
		No Conditions (n=10,999)	One Condition (n=7,582)	Two or More Conditions (n=2,378)
		%		
Child's race and ethnicity				
White, non-Hispanic	16.97	17.25	16.92	15.85
Black, non-Hispanic	3.75	3.82	3.81	3.24
Hispanic	29.09	32.02	26.72	23.13
Other, non-Hispanic	1.26	1.51	1.08	0.71
Unknown	48.92	45.40	51.46	57.03
Child's sex, Male	56.69	58.12	54.00	58.66
Urbanicity				
Urban	83.31	82.49	84.16	84.43
Rural	16.69	17.51	15.84	15.57
Type of condition				
Diagnosis (DX)	71.64	60.10	87.76	73.68
Developmental delay (DD) only	28.36	39.90	12.24	26.32
Age categories				
Birth to 12 months	20.67	23.08	17.96	18.17
12 months to 24 months	33.26	34.90	31.44	31.50
24 months to 35 months	46.06	42.01	50.59	50.34
Received <i>any</i> PT/OT	14.43	11.55	11.00	38.73
Home	52.89	56.69	44.12	51.47
Clinic	47.11	40.31	55.88	48.53
Disadvantage Index				
0	33.87	33.77	34.05	33.73
1	33.39	33.37	34.42	34.82
2	32.74	33.87	31.52	31.46

Table 2
Odds ratios (OR) and 95% confidence intervals (95% CI) from adjusted logistic regression models estimating *any* PT/OT

Characteristic	Adjusted for Child & Family Characteristics ^A
	OR [95% CI]
Type of condition	
Diagnosis (DX)	Reference
Developmental delay (DD)	12.15 *** [10.94, 13.49]
Child's race and ethnicity	
White, non-Hispanic	Reference
Black, non-Hispanic	1.11 [0.89, 1.38]
Hispanic	0.74 *** [0.66, 0.85]
Other, non-Hispanic	1.06 [0.74, 1.53]
Unknown	0.75 *** [0.67, 0.85]
Child's sex	
Male	Reference
Female	1.14 ** [1.04, 1.24]
Urbanicity	
Rural	0.48 *** [0.41, 0.55]
Urban	Reference
Number of comorbid chronic conditions	
0	Reference
1	2.20 *** [1.97, 2.46]
2 or more	7.39 *** [6.54, 8.36]
Age categories	
Birth to 12 months	Reference
12 months to 24 months	0.77 *** [0.69, 0.87]
24 months to 35 months	1.02 [0.91, 1.15]
Social Disadvantage Index	
0	Reference
1	0.91 [0.82, 1.02]
2	0.73 *** [0.66, 0.82]

^A adjusted for urbanicity, child's race and ethnicity, sex, age, number of comorbid chronic conditions, and social disadvantage

* $p < .05$;

** $p < .01$;

*** $p < .001$

Table 3
Unadjusted probability of using any PT/OT utilization and PT/OT (b) unadjusted annual median per child PT/OT claims, dosage, and spending

Characteristic	(a) Unadjusted
	% ME [95% CI]
Utilized <i>any</i> PT/OT	
No Conditions	11.55
One Condition	11.00
Two or More Conditions	38.73
Difference (One and No Conditions)	-0.55
Difference (Two or More and No Conditions)	27.18
	(b) Median [IQR ^A]
Number of PT/OT claims*	
No Conditions	5 [1, 23]
One Condition	11 [2, 37]
Two or More Conditions	18 [3, 60]
Difference (One and No Conditions)	6
Difference (Two or More and No Conditions)	13
Dosage of PT/OT services (15-min units)*	
No Conditions	60 [1, 960]
One Condition	237 [8, 2754]
Two or More Conditions	616 [12, 6734]
Difference (One and No Conditions)	177
Difference (Two or More and No Conditions)	556
Annual Medicaid PT/OT spending(\$)*	
No Conditions	149 [36, 586]
One Condition	309 [68, 1031]
Two or More Conditions	521 [95, 1686]
Difference (One and No Conditions)	160
Difference (Two or More and No Conditions)	372

A - IQR =interquartile range (75th minus 25th percentile)