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Narrowing Care Gaps for Early Language Delay: A Quality Improvement Study

Courtney M. Brown, MD, MS¹, Andrew F. Beck, MD, MPH¹, Wendy Steuerwald, AuD, MS, CCC-A¹, Elizabeth Alexander, MS, CCC-SLP¹, Zeina M. Samaan, MD¹, Robert S. Kahn, MD, MPH¹, and Mona Mansour, MD, MS¹

¹Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA

Abstract

Background and Objective—Poverty is a risk factor for both language delay and failure to access appropriate therapies. The objective of this study was to increase the percentage of children 0 to 3 years old referred from an urban primary care center who attended an initial appointment with speech pathology or audiology within 60 days from 40% to 60%.

Methods—The Model for Improvement was used to develop and test the intervention, which addressed potential logistical barriers faced by low-income families. Adherence was plotted on run charts in time series to assess overall improvement, and subgroups were analyzed to identify reduction in disparities.

Results—Median referral adherence improved from 40% to 60%. Families from lower income neighborhoods had lower preintervention adherence; these differences were eliminated postintervention.

Conclusions—System-level changes improved access to evaluation and treatment for low-income children with language delay and narrowed the gap in access between families in lower versus higher income neighborhoods.

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Corresponding Author: Courtney M. Brown, Division of General and Community Pediatrics, Cincinnati Children's, Hospital Medical Center, ML 2011, 3333 Burnet Avenue, Cincinnati, OH 45229, USA. courtneym.brown@cchmc.org.

Author Contributions

CMB was involved in conceptualization and design of the study, analysis of the data, drafting of the initial manuscript, and approval of the final manuscript as submitted.

AFB and RSK were involved in analysis of the data, review and revision of the manuscript, and approval of the final manuscript as submitted.

WS was involved in design and implementation of the interventions tested in the study (specifically as pertained to audiology referrals), review and revision of the manuscript, and approval of the final manuscript as submitted.

EA was involved in design and implementation of the interventions tested in the study (specifically as pertained to speech referrals), review and revision of the manuscript, and approval of the final manuscript as submitted.

ZMS and MM were involved in design and implementation of the interventions tested in the study (specifically as pertained to testing and planning for sustainability in primary care), review and revision of the manuscript, and approval of the final manuscript as submitted.

Declaration of Conflicting Interests

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Keywords

language delay; quality improvement; referral adherence; primary care; developmental screening; health disparities; achievement gap

Poverty places children at high risk for language delay,^{1,2} as well as for poor rates of accessing developmental services.^{3,4} Socioeconomic disparities in language delays emerge by 24 months of age.² Delays in the preschool years predict poor reading ability in elementary school,⁵ which in turn, predicts dropping out of high school.⁶ Individuals who fail to complete high school are more likely to face unemployment and poor health status across the life course.⁷ For infants and toddlers with language delay, early intervention can positively impact kindergarten readiness,⁸ positioning individuals for educational success and better health. Unfortunately, because poverty is a risk factor for failing to access developmental services,^{3,4} those most likely to need early testing or therapy are least likely to receive it. The American Academy of Pediatrics recommends standardized developmental screening during well-child visits,⁹ and several improvement initiatives have increased screening rates.¹⁰⁻¹² However, less progress has been made in effectively connecting children with developmental services once identified.^{13,14}

National benchmarks for referral adherence for children with language delay have not been established. Pediatricians make referrals to multiple types of services, depending on the child's clinical presentation and local availability of services. For example, the options can include speech pathologists and/or audiologists at medical centers or in private practice or government-funded, home- or community-based early intervention services. This heterogeneity in available services, as well as in the feedback mechanisms that pediatric practices have established with those services,¹⁴ have made it difficult to measure adherence to developmental referrals. Estimates range from 20% to 53%,^{15,16} with past improvement efforts achieving adherence rates of 43% to 75%.^{4,17} More general studies of healthcare utilization have shown an income gradient in access to care, such that even within low-income populations, those on the lower end of the income spectrum are more likely to have difficulty accessing specialists after referral.¹⁸

As a step toward improving access to early evaluation and treatment for the most vulnerable children, we conducted a quality improvement (QI) initiative in a primary care center serving a predominantly low-income population. Our aim was to increase the percentage of children 0 to 3 years old referred from primary care who attended an initial appointment with speech pathology or audiology within 60 days from a baseline of 40% to a goal of 60%. By targeting barriers faced by the lowest-income families, we also hypothesized that we would reduce socioeconomic disparities in referral adherence.

Methods

Study Design

This QI study used a time-series design. The study was deemed exempt by the institutional review board.

Study Population and Setting

The study included patients 0 to 3 years old who were referred to a Midwestern medical center's speech and audiology services during a primary care visit at a medical center–affiliated primary care center (PCC) between April 1, 2012 and March 31, 2013. The PCC is the medical home for 18,000 children (85% Medicaid). The PCC is staffed by 36 attending physicians (10 full-time equivalents) and 150 resident physicians (each seeing patients 1 half-day per week). The medical center's divisions of Speech-Language Pathology and Audiology provide services in the same building as the PCC but operate independently. Each also provides services in 8 satellite locations throughout the metropolitan area, all scheduled through a central system. During the study, time to third-next-available appointment ranged from 5 business days for Audiology to 15 business days for Speech-Language Pathology. Other services available locally for developmental delay include Part C Early Intervention and private therapists. Individual physicians make decisions about where to refer; our study focused solely on those referred within the medical center system. Prior to our intervention, referrals were typically made by placing orders in the electronic health record (EHR) and instructing parents to call for appointments. Speech-Language Pathology and Audiology sent letters to the PCC if an appointment was not scheduled or attended; however, processes for reviewing and acting on these letters were not reliable.

Planning the Intervention

The Model for Improvement was used to develop and test the intervention.¹⁹ The improvement team consisted of a pediatrician, nurse, medical assistant, and registration specialist from the PCC, a speech pathologist and business director from Speech-Language Pathology, and a clinical manager from Audiology. The team applied clinical experience and relevant literature to identify barriers to referral adherence: (1) Communication was poor among the multiple people involved with ordering referrals, scheduling appointments, and documenting outcomes of referrals. (2) The process for scheduling appointments was not well explained to parents, leading to difficulties navigating the health care system.²⁰ (3) Inadequate transportation or telephone access interfered with parents' ability to schedule or attend appointments.^{20,21} (4) Parents doubted the diagnosis of language delay or did not see value in following through with the referral.^{22–24}

The team then developed a key driver diagram (Figure 1) to organize the theory behind the proposed intervention. The team hypothesized that the following system-level factors would drive improvement: (1) a reliable system for identifying incomplete referrals, (2) timely reminders about referrals, (3) convenient appointment options, (4) convenient and flexible scheduling processes, and (5) a standardized referral process. The team also considered family-level factors: (1) parental knowledge and motivation regarding the referral and (2) parental self-management skills.

The team limited the scope of the intervention to system-level drivers, as these were most amenable to rapid tests of change. A series of plan-do-study-act (PDSA) cycles were used to test the following interventions: tracking referrals, telephoning families who needed to schedule appointments, offering same-day access for speech and audiology evaluations, and assisting families with scheduling appointments prior to discharge from the PCC. Plans for

communicating changes with staff included announcements at staff meetings, in-person coaching before clinic sessions, and attaching reminders to developmental screening tools.

Methods of Evaluation

Patient Characteristics—Patient-level variables, including race, gender, and insurance, were collected from the EHR. To estimate additional sociodemographic characteristics, each patient address was geocoded (mapped), allowing for home census tracts to be identified. Patients were then linked to census tract variables from the 2008-2012 American Community Survey, chosen a priori to estimate socioeconomic conditions and access to resources.²⁵ Specifically, we identified census tract median household income, poverty (percentage of individuals living below the poverty line), extreme poverty (below 50% of the poverty line), educational attainment (percentage of adults with less than a high school education), and transportation access (percentage of households without car access).

Percentage of Referred Patients Attending Initial Appointments—The primary outcome measure was percentage of referred patients attending an initial appointment with the department to which they were referred within 60 days. The 60-day threshold was considered clinically desirable during early childhood when children should achieve new developmental milestones every 2 to 3 months. Considering third-next-available appointment times, the 60-day threshold would also allow patients to cancel and reschedule appointments at least 3 times.

To generate outcome data from the EHR, an analyst created weekly automated reports of referrals made from the PCC to speech and audiology services, as well as the status of all appointments resulting from those referrals. Initial versions of the reports were compared with manual reviews of the EHR to ensure accuracy and completeness of the data, and the programming was iteratively corrected.

The primary outcome measure was plotted in time-series on run charts in subgroups of 10 consecutive referrals. Subgroups of 10 were used given variability in number of referrals per week (range: 1-16).²⁶ The baseline adherence rate was calculated as the median of adherence rates of all subgroups in the preintervention period (prior to August 1, 2012). Standard probability-based rules were used for interpretation of the run chart.²⁷ Given wide variation in baseline data, a stringent definition for a “shift” in the data was applied. It was determined a priori that the median would be recalculated when a shift of 8 consecutive points above or below the median was observed, as there is <1% chance of observing this pattern by chance.

Socioeconomic Disparities in Referral Adherence—Despite the relative homogeneity of our population (ie, mostly publicly insured), we expected that families facing extreme poverty would be more meaningfully impacted by barriers to referral adherence. Our interventions, therefore, focused on creating a more user-friendly system for patients in poverty (eg, those with inadequate phone service or transportation). We performed post hoc analyses to identify whether socioeconomic disparities in referral adherence were reduced. We used variables publicly available at the census tract level to estimate depth of poverty among patients studied.²⁵ These variables (poverty rate, extreme

poverty rate, adult educational attainment, transportation access) were all dichotomized at the sample median. Chi-square tests were then used to compare referral adherence rates for patients from census tracts with socioeconomic characteristics above versus below the sample median.

Qualitative Data on Intervention Feasibility and Success—Throughout testing, the team collected qualitative data from front-line clinical staff on whether interventions had been tested with eligible patients, barriers to testing interventions, and barriers to patients scheduling or completing appointments.

Results

Baseline Data and Patient Characteristics

At baseline, 40% of patients referred to speech or audiology attended an initial appointment within 60 days of referral. Patient characteristics are displayed in Table 1. Patients were predominantly Medicaid insured.

Testing the Intervention

Beginning in September 2012, the pediatrician on the team used the automated referral reports to identify referred patients without scheduled appointments. In initial tests, telephone calls were attempted to all families referred to speech or audiology after August 1, 2012 without scheduled appointments. To gain insight into barriers, the caller asked parents why they had not scheduled an appointment. The most common reasons were not understanding the referral process, parent's work schedule, and transportation difficulties. Parents were then transferred to schedule appointments. Approximately 30% of families could not be reached due to nonworking telephone numbers. Next, to better serve parents and reduce the number of telephone calls needed, medical assistants were asked to assist parents in scheduling appointments for speech and audiology referrals at the time of discharge from the PCC visit. In January 2013, the task of making follow-up telephone calls was transitioned from the pediatrician to a temporary staff member to build a prototype for a more cost-effective model.

In October 2012, the team began testing same-day access for audiology evaluations. When a patient was referred to audiology, PCC staff asked parents if they would like to get the evaluation immediately on discharge from their primary care visit. Audiologists were frequently available due to cancellations or no-shows, in which case families were guided to the audiology department for immediate evaluation. After completing five successful same-day audiology evaluations, the intervention was spread to speech referrals in November 2012.

Studying the Intervention

Percentage of Referred Patients Attending Initial Appointments—We studied a total of 470 referrals. We observed an increase in the median percentage of referred patients attending an appointment with speech or audiology from 40% to 60% (Figure 2). Considerable variation in adherence rates persisted after interventions began. In the last 3

months of data collection, a majority of data points were below 60%, though this decline did not meet run chart rules for a statistically significant change in the system at <1%.

Socioeconomic Disparities in Referral Adherence—Figure 3 shows adherence rates among subgroups of patients referred to speech or audiology in the pre- and postintervention periods. In the preintervention period, significant disparities in adherence were observed based on socioeconomic variables (eg, census tract poverty rate). In the postintervention period, some disparities were no longer seen. For example, before interventions were put into place, 30% of patients living in census tracts with higher rates of extreme poverty adhered to speech or audiology referrals, compared with 53% of those living in census tracts with lower rates ($P = .001$). After interventions were put in place, there was no longer a significant difference in adherence rates (44% vs 53%; $P = .15$).

Qualitative Data on Intervention Feasibility and Success—Clinic staff reported several challenges during testing. First, transient staff members (resident physicians and part-time staff) reported they had not tested the interventions because they had not received adequate information about new processes. These staff members did not reliably offer scheduling at time of clinic discharge or same-day evaluations to all referred patients. In addition, staff members who did test the interventions reported parents were more reluctant than expected to participate in same-day evaluations. After January 2013, when the task of follow-up phone calls was transitioned to a temporary staff member, the staff member reported some calls were delayed or missed due to competing job responsibilities.

Discussion

Language delays have adverse educational effects and disproportionately affect low-income children, yet low-income children are least likely to be identified and treated. Previous studies have improved screening but have demonstrated little improvement in connecting children to services. In our QI study, we tested a novel model for same-day access and observed modest improvements in adherence to speech and audiology referrals (from 40% to 60%). We also found a reduction in disparities in referral adherence among patients living in census tracts with higher compared with lower rates of poverty. Our interventions addressed system-level barriers to adherence by identifying incomplete referrals, reminding families about referrals, offering convenient appointment times, and offering a convenient scheduling process.

Our multifaceted intervention and large sample size add valuable insights to a small existing body of literature that has demonstrated modest improvement in the complex challenge of promoting early use of developmental services. A QI study by Marks et al¹⁷ tracked referrals to developmental specialists and achieved a follow-up rate of 75%. This work, however, was limited by a sample size of only 24 referrals.¹⁷ McKay et al⁴ achieved Early Intervention referral adherence rates of 43% with multiple phone calls to families. Russ et al²⁸ published on a learning collaborative to reduce loss to follow-up after failed newborn hearing screens and found most practices had difficulty sustaining results.

Our interventions appeared to narrow the gap in referral adherence between children from lower- and higher-income census tracts. To our knowledge, ours is the first study to analyze socioeconomic subgroups in the assessment of an initiative to improve access to developmental therapies. Surprisingly, we observed a disparity based on car access in the postintervention period that was not present in the preintervention period. This may indicate the persistence of transportation difficulties as an important barrier for patients who did not participate in same-day evaluations. Disparities based on census tract adult educational attainment persisted in the postintervention period, perhaps due to a lack of interventions to address perceived need for treatment among less educated parents.

Overall, there remained wide variation in adherence rates, likely due to complex reasons for low adherence.

Our interventions focused only on system-level drivers of adherence. Interventions that impact family-level drivers are likely needed to achieve more dramatic improvement. Prior studies have shown that parents who disagree with the pediatrician about need for treatment are less likely to access early intervention.²² Future work targeting family-level barriers to adherence will be crucial to closing care gaps for language delay. Motivational interviewing,²⁹ community health workers,³⁰ and public awareness campaigns³¹ are strategies that could be tested to engage parents in earlier identification and treatment.

Our study had several limitations. First, we used attendance at an initial appointment as an outcome measure; this may not reflect meaningful participation in developmental services. We could not collect data on whether patients had obtained services from developmental specialists outside the medical center's system after being referred to a specialist within the system. Therefore, our measure may underestimate the rate at which developmental delays were actually addressed. Second, our interventions may not be generalizable to other settings. Same-day evaluations, for example, were possible because the specialists were located in the same building as the PCC. Additionally, our interventions were not implemented with all eligible patients because of difficulties communicating with our large staff. Implementation may be easier in smaller clinics. The use of the pediatrician's time to make follow-up calls was neither sustainable nor cost-effective. The decline in adherence when this task was transitioned to a temporary staff member suggests that (1) these calls were perhaps the most important component of the intervention, and (2) the staff member may have needed further training in counseling families about the importance of the referrals. Future studies using factorial design may be useful in identifying critical components of effective telephone follow-up. Finally, our subgroup analysis may be limited by ecological fallacy. The ecological nature of the data used to estimate poverty, educational attainment, and car access may mean that it does not reflect true characteristics of our patients.

Local efforts are underway to address continued improvement and sustainability. Concurrent with our testing, a large-scale Primary Care Redesign was starting in the PCC. This included developing a standardized discharge process for all patients, into which we are incorporating our enhanced referral process. In addition, a new Population Outreach position was created

as part of a National Committee for Quality Assurance certification process, with a job description that includes telephone follow-up for incomplete referrals.

Conclusion

Overall, the intervention was associated with modest improvement in referral adherence for patients with early signs of language delay, with reduction in poverty-related disparities. This represents an important step toward earlier intervention for children who need it most. These interventions could be adapted for other settings through multidisciplinary collaborations to establish open-access scheduling and/or colocation of primary care pediatricians and developmental therapists. Future studies should seek to overcome attitudinal barriers to follow-up for language delay.

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Figure 1.

A Key Driver Diagram organized the team's theory of change and proposed interventions.

Figure 2.

Percentage of primary care patients 0 to 3 years old referred to speech pathology or audiology who attend an initial appointment within 60 days. *Date displayed indicates the date of the first of 10 consecutive referrals in the subgroup.

Figure 3.

Disparities in percentage attending an appointment with speech pathology or audiology in the pre- and postintervention periods, based on census tract (CT) socioeconomic factors (dichotomized at sample median).

All patients were assigned income, % below poverty, % below 50% poverty, % with no car, and % adults with less than high school education variables based on those values in the census tract in which they lived. Patients were assigned to high and low groups for these variables by dichotomizing at the sample median (median of entire study population).

Poverty sample median = 25.9%.

Extreme poverty sample median = 12.7%.

% with no car access sample median = 20.0%.

% of adults with less than high school (HS) sample median = 17.0%.

Table 1

Characteristics of Patients Referred to Speech Therapy or Audiology (n = 470).

Characteristic	n (%)
Male	294 (62.6)
Race	
Black/African American	326 (69.4)
White/Caucasian	100 (21.3)
Multiracial/other	41 (8.7)
Medicaid-insured ^a	364 (97.1)

Characteristic	Mean (SD)
Census tract (CT) median household income, \$ ^b	31 538 (18 018)
CT % below poverty ^b	31.7 (21)
CT % below 50% poverty line ^b	18.0 (15.3)
CT % with no car ^b	24.0 (17.6)
CT % adults with less than high school education ^b	22.3 (119.1)

^a Seventeen percent data are missing.

^b Four percent data are missing. All patients were assigned income, % below poverty, % below 50% poverty, % with no car, and % adults with less than high school education variables based on those values in the census tract in which they lived. Means and medians reported are the means and medians of those values for all patients in each group.