PEDIATRIC MEDICAL HOME CARE COORDINATION

by

Joanna W. Meyers

Under Supervision of

Mary Ellen Connolly, DNP, CRNP

Second Reader

Dr. Karen Clark PhD., RN, Graduate Certificate in Informatics
Alumna CCRN

A DNP Project Manuscript
Submitted in Partial Fulfillment of the Requirements for the
Doctor of Nursing Practice Degree

University of Maryland School of Nursing
May 2019

Abstract

Background: Socioeconomic and social complexities are associated with delays in children receiving a timely evaluation for behavioral health treatment and developmental delays. The American Academy of Pediatrics recognizes the complex needs of these children and the key role of primary care providers in the referral process and care coordination to ensure the timely start of services and treatment. This recommendation is also supported by the Individual and Disability Education Act Part C, that requires children identified with developmental delays to be evaluated for services within 45 days of referral.

Local Problem: The purpose of this QI project was to evaluate and implement the care coordination of children referred for early intervention services and behavioral health treatment at a primary care practice in the Mid-Atlantic Region.

Interventions: The Care Coordination Measurement Tool was approved by Dr. Antonelli at Boston Children's Hospital and implemented to quantitatively measure care coordination tasks completed during the 12-week project timeline. The tool was used to track the volume of referrals sent, care plans and consults received, and communication that occurred between providers and specialists. During project implementation, the electronic medical record at the project site received a system upgrade, allowing for real-time interface and data exchange with specialists. This system upgrade allowed for referrals to be sent and care plans to be received electronically.

Results: An overall 14-day reduction from referral to evaluation for both behavioral health and early intervention services, and a 16-day reduction for children referred for delayed speech was achieved. The pre-project mean (37.0) for days to evaluation vs. project mean (22.8) was shown to be statistically significant using an alpha of 0.05 and a two-independent sample T-test with unequal variance. Data outliers included maternal drug history and parents not responding to early intervention services. The care coordination tool captured a total of more than 200 care coordination needs, activities, and outcomes over the 12-week project timeline. Over 70 care plans-consults were received through electronic interface, and staff completed greater than 13 behavioral health paper forms.

Conclusions: The role of the electronic medical record in primary care can reduce the average number of days from referral to evaluation, improving patient outcomes. Collaboration and communication among specialists and providers will also improve as care plans and consult reports are received electronically. These findings indicate that the communication feedback loop was completed, as referrals were sent, evaluations were completed, services were started, and patient care plans were received.

Pediatric Medical Home Care Coordination

Children with special needs may face many barriers to timely evaluation and treatment. Socioeconomic position, ethnicity, education, and social complexities are associated with a delay in children receiving special services for behavioral health (BH) treatment and hearing or speech concerns (Adams & Tapia, 2013). Some children with speech and language delays also have co-morbid behavioral health conditions, creating a vulnerable population in need of care coordination (Gleason, Goldson, & Yogman, 2016). It is estimated that up to 30% of pediatric referrals for early intervention (EI) services and 50% of behavioral health referrals are never completed due to parental perceptions of developmental needs, as well as feelings of shame associated with parenting a child with a disability (Moore, Zamora, Patel Gera, & Williams, 2017). The American Academy of Pediatrics (AAP) recognizes the key role that the primary care provider (PCP) plays in the referral process to ensure uptake of EI services and BH treatment for at-risk children (Adams & Tapia, 2013; Rose et al., 2014).

The PCP in the Medical Home (MH) provides standardized care as recommended by The National Committee for Quality Assurances (NCQA) through the use of the Electronic Medical Record (EMR) access to coordinate patient care (Zickafoose et al., 2013). In 2014, the NCQA recommended the integration of Behavioral Health into the MH model to ensure care coordination was provided by a PCP with access to shared care plans (SAMHSA-HRSA Center for Integrated Health Solutions 2014). Integration of BH care into the MH is associated with early intervention and treatment of BH diagnosis in childhood. All children who receive early intervention for BH diagnosis are less likely to engage in high-risk behaviors such as alcohol and drug use as adolescents. The adolescent who receives services for a BH diagnosis is at a decreased risk of developing a sexually transmitted disease and has an increased likelihood of

graduating from high school (Asarnow, Kolko, Miranda, & Kazak, 2017). The MH provides family-centered care coordination through the creation of care plans, referral tracking, interdisciplinary collaboration and enhanced communication between specialists to ensure appropriate follow-up care (Asarnow et al., 2017; National Center for Medical Home Implementation, 2017). This high level of care coordination results in a reduction in healthcare costs, illness severity and increased parental satisfaction (NAPNAP, 2016).

Implementation of care coordination and patient-specific care plans are effective tools for enhancing the care of children identified with special needs in primary care practice (Berry, Barovechio, Mabile, & Tran, 2017). The MH model ensures clear communication between providers and specialists through the provision of a closed-loop communication process. Historically, parents have been responsible for acting as the primary communication liaisons between the PCP and specialists creating gaps in care and communication (Cadey & Belew, 2017). Across the United States, the lack of care coordination for children identified with speech and language delays occurs in 50-80% of children referred for EI services (Coker, Shaikh, & Chung, 2012; Moore et al., 2017). This lack of coordinated care leads to delayed EI services evaluation and start of speech therapy.

An EI state-agency in the Mid-Atlantic region conducted a parent survey in 2016 to evaluate parental satisfaction and the quality of patient care coordination provided. The survey results revealed that parents found deficits in communication, feedback, and collaboration between EI and their child's PCP (Delaware Health and Human Services, 2016). These identified barriers contribute to the delayed start of EI services due to lack of provider and EI follow-up (Moore et al., 2017). This information conveys that the lack of care coordination is a national and regional problem for these at-risk children. Care coordination for children less than three

years of age with identified speech and language delays and also children under twelve years of age with un-met BH needs was a recognized challenge for providers at the project site of this project implementation. The Individuals and Disabilities Education Act (IDEA) Part C, The Early Intervention Program for Infants and Toddlers with Disabilities, requires the primary care provider to refer within seven days after identifying a child with a delay and an EI evaluation within forty-five days from the day of referral (IDEA, n.d.). The health care team at the project was interested in ensuring that these goals were being met.

 The purpose of this DNP project was to implement and evaluate care coordination in the context of the family-centered MH model among children under three years of age with identified developmental delays eligible for state-provided EI services and children under 12 years of age referred for BH services. This implementation took place at a pediatric primary care practice in the Mid-Atlantic Region. This nursing staff-led care coordination implementation evaluated and tracked the number of days from referral to start of services and the care coordination activities completed by December 2018 Short-term quality improvement goals included a 25% decrease in the number of days from referral to evaluation for the at-risk populations of children less than three years of age receiving EI services for identified speech delays and children less than twelve years of age referred for BH treatment. The long-term goals of care coordination include MH certification and the implementation of care coordination to another patient population with chronic medical conditions, demonstrating care coordination sustainability.

Theoretical Framework

The theoretical framework identified to implement the AAP recommended care coordination involves the four-part Plan-Do-Study-Act (PDSA) Cycle. The Institute for Health

Care Improvement (2016) model for PDSA provided not only a framework to make changes but also allowed for confirmation of project objectives, improvement changes, and outcome measurements. The PDSA model includes four action-oriented steps in planning development: testing, data collection, data analysis, and modifications (Institute for Health Care Improvement, 2016). Prior to project implementation, a key objective was to create a team that would implement the practice change and provides a timeline with measurable goals. In return, these changes could be implemented or modified based on the scientific method (Institute for Health Care Improvement, 2018). The use and appeal of the PDSA Cycle was the adaptability and proven success it provided in other pilot studies that also implemented a practice change.

The PDSA Cycle has been effective in studies focused on implementing care coordination in primary care practices and therefore was a logical selection for this quality improvement project (Brown, Perkins, Blust, & Kahn, 2014; McManus, White, Barbour, Downing, Hawkins, Quion & McAllister, 2015; Van Cleave, Boudreau, McAllister, Cooley, Maxwell, & Kuhlthau, 2015). Due to the limited 14-week quality improvement project implementation time-frame, the PDSA Cycle allowed for an expedited, cyclical, and sequential process of planned activities. These activities included identification of a practice site, gaining copyright access to the Care Coordination Measurement (CCM) Tool, staff training on use and implementation of patient registries and the referral form for the designated patient population. Project implementation began once the PDSA was developed. Data was collected, tracked, and evaluated. Incorporation of the Antonelli Care Coordination Measurement Tool allowed for evaluation and outcome analysis that measured the effectiveness of the projected outcomes and modifications of the projects both short and mid-term (i.e. six-week goals) (Antonelli, 2017).

Literature Review

The role of the MH in relation to care coordination for at-risk children identified with speech and language delays is the focus of the evidence in this literature review. The review will begin with the overall evidence supporting the advantages of implementing care coordination in the MH. Next, the supporting evidence of patient population specific care plans will be discussed. Lastly, the benefits of implementing an electronic patient referral tracking form to improve patient outcomes will be reviewed.

Evidence from studies indicate that care coordination provided in the context of the medical home increases parental satisfaction and decreases medical costs and the severity of illness (Farmer, Clark, Drewel, Swenson, & Ge, 2011; Mosquera, Avritscher, Samuels, Harris, Pedroza., & Evans, 2014; Talmi, Bunik, Asherin, Rannie, & Watlington, T., Beaty, 2014). A study conducted by Harder, Long, Varni, Samuelson, & Shaw, (2017) concluded that the benefit of care coordination in the pediatric MH was not only in the reduction of unmet health care needs but also in the enhancement of communication and collaboration among providers and families that is family-centered and culturally effective. The Randomized Control Trial (RCT) conducted by Mosquera, Avritscher, Samuels, Harris, & Pedroza, (2014) evaluated outcomes of care provided at a MH vs. standard of care. The researchers noted a significant ($p<.001$) decrease in the severity of illness and emergency room department utilization in the MH population. It was also noted that clinicians in the MH setting devoted more time to patients and families and were more knowledgeable of individualized patient histories. Boudreau et al. (2014) conducted a secondary data analysis from the 2009-2010 National Survey of Children with Special Health Care Needs and found increased parental satisfaction when MH provided enhanced communication and coordinated referrals sent to specialists.

Patient care plans provide a documented and guided individualized standard of care. Farmer et al. (2011) conducted a Randomized Control Trial (RCT) to evaluate the impact of care coordination for children with complex health care needs. The study participants were divided into randomized blocks which allowed for decreased variability in demographic characteristics as chronic health conditions varied among participants. The researchers report improved parental satisfaction (p<0.05) through both the provision of parental resources and also the creation of individualized care plans for their children. Although the study had a small randomized blocked sample (n=61), the impact of care plans in the context of care coordination in the MH is promising. Van Cleave et al. (2014) conducted a mixed-methods study collecting both qualitative and quantitative data to evaluate care plan utilization in the context of a MH. The researchers found the completion of care plans with documentation of patient goals and referrals to enable tracking of the patient's progress resulted in a 13.9% increase in patient referrals and follow-up appointments. In the MH the use of a patient-specific care plan allows for a communication feedback loop for the provider and specialist when a patient referral is made.

The Rea et al. (2018) study evaluated the use of an electronic referral and consulting system that not only allowed for tracking of referrals but also improved communication and decreased wait times for a specialist appointment (P<0.001). The patient referral is a digital form that is sent to EI services and BH providers from the MH indicating the reason for the referral and providing a communication loop with the specialist. The referral form sent from the PCP to the specialist confirms the start of services and asks for an update to the patient's plan of care. Talmi et al. (2014) conducted a quasi-experimental study that revealed when patient referrals were documented by the PCP, referral tracking improved by 50% (p<.0001). King et al. (2010) conducted both a qualitative and quantitative research study on the use of tracked referrals

revealing increased identification and entry of children eligible for EI services. The qualitative interviews of the study were insightful in providing the parental perspective as families lacked the education or understanding of the referral process. The parental insight gained through interviews revealed shame and societal stigmatism to a delay in the evaluation and treatment of their child.

Lack of parental education on the importance of EI and also cultural considerations are key components in the uptake of EI services as identified in the study conducted by Moore et al. (2017). In this study barriers to children not receiving timely EI services were contributed to parental perspective and gaps in the referral process when EI and provider follow-up did not occur. These findings highlight the fact that this at-risk population is placed at a greater risk for lack-of- care coordination when identified with a health disparity, lack of parental education, and lower socioeconomic status. Moore et al. (2017) recommends that these identified barriers to timely treatment for children can be removed when EI sends the PCP a care plan completing the referral process.

Implementation

This quality improvement (QI) project was implemented at a large primary care pediatric practice in the Mid-Atlantic region. The pre-project sample size (n=32) was a retrospective analysis of children under three years of age, that had been identified with speech and language developmental delays and children under twelve that were referred for BH concerns. The pre-project sample were EI and BH referrals sent and evaluations received from May 1, 2018, to August 26, 2018. The projected sample size varied as it was dependent on the children identified with developmental delays and BH concerns during this time period. Developmental screenings were performed at the project site on patients during routine intervals of nine, eighteen, and

thirty-six months of age. The project criteria for the patient population included all children up to thirty-six months of age with an International Classification of Diseases (ICD) diagnostic code for speech and language developmental delays and behavioral health disorders with childhood onset. Additional criteria included if the child failed the developmental screening and had been referred to EI services for further evaluation. The project time-frame for this care coordination project over a twelve-week period allowed for the accrual of adequate sample size, feedback from the EI specialist referral, and care plan implementation.

Approval for this QI improvement project was obtained by the University of Maryland as well as this project site. Measures to protect the identity of the sample population included using de-identified patient health information (PHI) when transferring data to the audit tool. The audit tool did not include any identifiable data but collected the summation of data for interventions and noted the number of days for the uptake of services after a BH or EI referral was completed. The first week of project implementation included educating the care coordination team. The care coordination team included providers, staff nurses, a clinical-site representative, and the project leader. The project leader educated the care coordination team in utilizing the Care Coordination Measurement Tool (CCM) (Appendix A).

During the first two weeks, the project leader made bi-weekly site visits to reinforce education, answer questions, and aide in facilitating project implementation. Data retrieval and a pre-project chart audit were also completed during this time period from the electronic medical record (EMR) of referrals made from May 1, 2018-August 27, 2018 to provide a retrospective analysis. The nursing staff was educated on their role in documenting care coordination activities and outcomes on the CCM tool. The target patient population of EI and BH and corresponding ICD codes were reviewed. The CCM tool documented the communication between providers

and parents, BH and the EI referrals sent and completed, hearing screen referrals, and care plans

received (Appendix B). The care coordination tool was kept at both the nurse's station and their

phone triage room to allow for accessibility. The project binder included copies of the CCM tool

and informational resources on MH care coordination.

During weeks two-through-four, the project went "live" by implementing the CCM tool

and documenting when patients were referred for EI or BH services. Necessary modifications for

this QI project were made using the Plan-Do-Study-Act cycle as project challenges did arise.

Weekly site visits were made during project implementation by the project leader to observe and

support the care coordination interventions. During weeks four-through-five, data were retrieved

from both the CCM and the EMR. Data analysis on week five indicated that the tool had not

been as effective in collecting data compared to the new upgraded EMR system. The system

upgrade occurred at the start of the project, and referrals could now interface between systems.

On week five, providers were asked to add BH or EI referrals to the patient's EMR problem list

and to red-flag patients who needed follow-up activities during project implementation.

During week six, statistical analysis from chart audits, the number of documented care

coordination tool activities, and their outcomes were shared with staff. Nursing staff expressed

again that the tool was time-consuming and staff turnover had occurred that week. They were

encouraged to continue the use of the care coordination tool when time allowed. Plans were

modified: the tool remained to collect data but on a smaller scale. The staff nurses documented

BH school referral forms, incoming or outgoing calls from specialists or parents, and referrals

that the staff completed. During weeks seven-through-eight, data from the de-identified sample

population were evaluated utilizing the CCM tool and the EMR to audit data for a mid-project

progress report. Mid-project data analysis revealed that the upgraded EMR allowed for system

interface capabilities that increased feedback communication between EI/BH and providers. During weeks nine-through-twelve, follow-up referrals were updated using the care coordination tool. During weeks 13 through 14, the project concluded with electronic data audits and the CCM tool to ensure that all data had been collected for analysis.

Permission to use the tool was given by Dr. Richard Antonelli at Boston Children's Hospital (Appendix C). The modified tool included five categorical columns that start with the patient's level of care and contributing social complexity. The care coordination team relied upon the CCM tool to document the volume of care coordination interventions completed for patients identified with developmental delays. The Care Coordination Needs section included hearing screens, referral and appointment management, connection to community resources, and prior authorization for outside referral services. The Activity to Fulfill Needs section of the tool was used to document listed interventions. The Outcomes Occurred section allowed for documentation of completed interventions or outcome goals achieved.

The data measuring plan and collection of data for this QI project included electronic data that was pulled from the EMR in conjunction with the CCM tool to collect, audit, and analyze data. The data collected were kept protected under data encryption in the EMR. Weekly electronic patient audits were completed with the identified ICD codes and tasks completed on the CCM tool during the 14-week period. An Excel spreadsheet was updated weekly to audit the de-identified sample data from the CCM tool (Appendix D). The data in Excel were then used to run statistical analysis and a run chart to track and run data. Data analysis included two biostatistical measures of audited data at the end of the 14th week of project implementation. The first quantitative data-set analyzed and compared completed referrals with the number of children referred to EI and BH and the number of days from referral to the evaluation of services.

These data were compared pre and post-chart audits using a two-independent-sample t-test to analyze whether the interventions provided a statistical difference. Data results would reveal if care coordination activities improved patient outcomes in the context of the medical home.

Results

Pre-project chart audits and referrals were tracked from May 2, 2018-August 16, 2018. These pre-implementation data were collected to calculate the number of days from provider referral to specialist evaluation for children with BH (n=3) and DD (n=29) diagnoses. The pre-project chart audit population characteristics included children less than 3 years of age referred for speech (69%), physical and occupational therapy (22%) and children under 12 referred for BH treatment (9%). Pre-Descriptive statistics were completed by running univariate frequencies for pre-project and post-project referral data tracking. The number of days from referral to the upstart of services for both EI and BH had a mean of 37.0 (SD=19.8, median=30.5, range=13.0-95.0). The wide range in data was contributed to outliers. The outliers with the greatest number of days from EI referral to evaluation were associated with children of mothers with an illicit drug history, with a pre-project mean (45.7) and post-project mean (44.5). During project implementation, an EI referral lacked follow-up due to a parent-death with a maternal drug history.

The number of EI and BH referrals tracked for the project (n=30) had a mean of 22.8 (SD=7.9, median=23.0, range=6.0-39.0) that indicated a normal distribution of data. A run chart was completed of post-project data providing a visual representation in the reduction and downhill trend in the number of days from referral to evaluation after the EMR upgrade (Appendix H). The pre-project and post-project means were compared before and after care coordination activities. The average number of days between the referral and evaluation

completed by both EI and BH was examined to determine if the care coordination activities decreased the delays in the uptake of services. The mean-percentage difference between the pre-project and post-project referral tracking had a 35.3 % difference, which decreased the number of days by 14.2. The number of days from referral to speech evaluation decreased by 16.6 days and improved by 43.5% (SD=7.5, mean=38.2, median=32.5, range=6.0-35.0) after project implementation (Appendix I). Using inferential statistics, the pre-project and post-project data for the number of days were examined using a two independent T-test with an unequal variance to compare the means of the two independent groups of the pre-project and post-project groups. The significance level was set at alpha 0.05 with a pre-project mean (37.6) and mean post-project (22.6) (t=2.02, df=40, p= 0.0003<0.05), indicating statistical significance.

The CCM tool tracked and measured the number of care coordination activities and outcomes (Appendix K). A brief overview delineates the care coordination activities, needs, and outcomes for September (n=88) October (n=83), and November (n=40). The decline in the use of the tool is reflective of the decline in staff and time to record care coordination completed. Outcomes on the CCM tool that received the highest volume of care coordination activities documented (n=94, 42.0%) included referrals sent and care plans received by BH and EI services. Hearing screens (6.6%) and communication (1.8%) among the providers and families received the lowest documentation of activities completed over the 14-week project timeline. The hearing referrals (n=7) were sent to audiology but the feedback loop with results was not completed during project implementation. Documentation of hearing screens in both the tool and the EMR was an identified project barrier.

Discussion

The project design for this QI project was supportive, as the use of the PDSA Cycle allowed for modifications when barriers occurred during project implementation. A small sample (n=30) of at-risk children in this primary care setting was chosen to implement and evaluate AAP recommended care coordination. Prior to project implementation, referrals were sent via fax, which not only slowed the process but also created an additional time-intensive task for staff. The pre-project chart audit indicated the average number of days from referral to evaluation for speech (n=38.2) was less than IDEA Part C's recommended (n=45.0), however the project site still desired further improvement. During project implementation, referrals were sent electronically in real-time, which reduced the number of days by 35.3%. Brown et al. (2014) utilized the EMR for patient appointment tracking and improved newborn appointments for a high-risk patient population. Their QI project also improved communication and collaboration focused on parental inclusion and education. Parental education delivered by providers and staff was not formally documented and measured with this QI project. However, a qualitative QI project could be completed to evaluate parental perspective and satisfaction of care coordination received.

Project limitations included the inability to complete referral tracking data in a timely manner for patients with a maternal drug history. These parents took longer to make evaluation appointments which increased the time from referral to evaluation, and two of the four referrals could not be completed. To facilitate this identified barrier during implementation, patients' charts were red-flagged in the EMR to remind staff/providers to educate parents on the importance of having their children evaluated if they returned for a sick visit.

Collaboration and communication among providers and specialists are important components of care coordination. During project implementation, collaboration and communication increased as the exchange of data coincided with system upgrades at the practice and EI. The EMR upgrade allowed for inter-practice data exchange of communication between BH/EI (n=69), providing care plans (n=74), medication recommendations for BH, and notification of parents not responding. Similar benefits of EMR usage were reported by Van Cleave et al. (2015) as providers had the ability to review a patient's care plan or consult report. BH referrals and consult reports reflected the largest decrease in days (43.8%) from 43.0 days to 24.2 days. Data results indicated an improvement, although the BH sample size (n=6) was small and a limitation to this QI project.

Time restraints and available staff remain common theme barriers to care coordination in the pediatric primary care setting as revealed by a study conducted by Tschudy, Raphael, Nehal, O'Connor, & Kowalkowsi (2016). During project implementation, the CCM tool was identified both as the most prevalent project barrier and was also was not well received by staff due to the constructs of staff turnover and time restraints. However, the volume of care coordination activities documented on the CCM tool provided staff with an awareness of their role in care coordination. Gaining staff's perspective and buy-in on care coordination is essential when the clinical setting is intending to achieve MH status as a long-term goal.

This project highlighted the enhanced capabilities of the EMR to electronically send and receive patient data, and the potential to decrease staff workload. The greatest project facilitator and one that will provide project sustainability was the upgraded EMR system. Prior to an EMR upgrade, referrals and care plans were shared via the standard fax. Care plans are now sent electronically from the EI specialist and BH therapists updating the PCP on the child's treatment

progress and developmental goals to be achieved. The upgraded EMR now provides a real-time system interface with EI/BH services that provide closed-loop communication. This real-time closed-loop communication facilitated by the upgraded EMR resulted in a statistically significant reduction in the number of days from referral to evaluation for this at-risk population. Care coordination will not only aid in improved patient outcomes but will potentially contribute to MH certification of this Mid-Atlantic pediatric practice by the year 2020.

Conclusion

The purpose of this QI project was to evaluate and implement the care coordination of at-risk children referred for EI services and BH treatment at a busy pediatric primary care practice. The project findings revealed that care coordination enhanced by the capabilities of the EMR, aided in facilitating care coordination needs, activities, and outcomes. The success of care coordination was measured by the reduction in the number of days from referral to evaluation. The results revealed a pre-project and post-project difference of 35.3%, which surpassed the 25% short-term quality improvement goal. The reduction in days from referral to evaluation allowed these children to start BH treatment and EI services in less time, leading to improved outcomes for this patient population.

The benefits of this project were two-fold as the systems interfacing which allowed for data exchange and increased communication and collaboration among specialists and providers. The sustainability of the project will improve through EMR system upgrades as more providers and specialists have the capabilities to electronically interface. These outcomes indicated that when referrals are sent electronically, evaluations were completed, patient care plans are received, and the communication feedback loop was achieved. The use of the EMR facilitating care coordination will continue to support this patient population and additional patient

populations at the practice. The continued use of red-flags on the patient's EMR will allow enhanced communication among staff and remind providers and staff of a patient's complicated social history. Additional project findings revealed that children with a maternal drug history had an above average number of days from referral to evaluation, indicating that they remain at higher risk for a delay in services. It is recommended that children with a maternal drug history or complicated social history referred for services remain flagged, as they will need additional follow-up.

The dissemination of these findings along with the AAP recommended the use of health information technology may prove beneficial to other primary care practices as they look to enhance their referral tracking process and care coordination (Adams & Tapia, 2013). When the beneficial use of the EMR is viewed on a broader scale, state policies could be made to encourage providers and practices on the utilization of the EMR.

References

Adams, R. C., & Tapia, C. (2013). Early Intervention, IDEA part c services, and the medical

 home: Collaboration for best practice and best outcomes. *Pediatrics*, *132*(4), e1073-

 e1088. doi:10.1542/peds.2013-2305

Antonelli, R. (2017). Care coordination measurement tool. Retrieved from

 https://medicalhomeinfo.aap.org/tools-resources/Documents/CCMT_2017.pdf

Asarnow, J. R., Kolko, D. J., Miranda, J., & Kazak, A. E. (2017). The Pediatric Patient-Centered

 Medical Home: Innovative models for improving behavioral health. *American

 Psychologist*, *72*(1), 13-27. doi:10.1037/a0040411

Berry, S., Barovechio, P., Mabile, E., & Tran, T. (2017). Enhancing state medical home

 capacity through a care coordination technical assistance model. *Maternal and Child

 Health Journal*, *21*(10), 1949-1960. doi:10.1007/s10995-017-2312-1

Brown, C. M., Perkins, J., Blust, A., Kahn, R.S. (2014). A neighborhood-based approach to

 population health in the pediatric medical home. *Journal of Community Health*, 40(1), 1-

 11. doi:10.1007/s10900-0149885-z

Boudreau, A., Goodman, E., Kurowski, D., Perrin, J. M., Cooley, W. C., & Kuhlthau, K. (2014).

 Care coordination and unmet specialty care among children with special health care

 needs. *Pediatrics*, *133*(6), 1046-1053. doi:10.1542/peds.2013-2174

Coker, T. R., Shaikh, Y., & Chung, P. J. (2012). Parent-reported quality of preventive care for

 children at-risk for developmental delay. *Academic Pediatrics*, *12*(5), 384-390. doi:

 10.1016/j.acap.2012.05.003

Delaware Health and Human Services (DHHS), (2016). Child development watch primary care

 provider outreach pilot statewide survey data. Retrieved from

http://dhss.delaware.gov/dhss/dms/epqc/birth3/files/appendixLChildDevelopment.pdf

Farmer, J. E., Clark, M. J., Drewel, E. H., Swenson, T. M., & Ge, B. (2011). Consultative care

coordination through the medical home for CSHCN: A randomized controlled trial.

Maternal and Child Health Journal, *15*(7), 1110-1118. doi:10.1007/s10995-010-0658-8

Gleason, M. M., Goldson, E., & Yogman, M. W. (2016). Addressing early childhood emotional

and behavioral problems. *Pediatrics*, *138*(6), e20163025-e20163025.

doi:10.1542/peds.2016-3025

Harder, V. S., Long, W. E., Varni, S. E., Samuelson, J., & Shaw, J. S. (2017). Pediatric-informed

facilitation of patient-centered medical home transformation. *Clinical pediatrics*, *56*(6),

564-570. doi:10.1177/0009922816669788

Individuals and Disabilities Education Act (IDEA). (n.d.). Part 303 (Part C)— Early intervention

program for infants and toddlers with disabilities. Retrieved from

https://sites.ed.gov/idea/regs/c/a

Institute for Health Care Improvement (2016). How to improve. Retrieved

from http://www.ihi.org/resources/Pages/HowtoImprove/default.aspx

Jimenez, M. E., Fiks, A. G., Shah, L. R., Gerdes, M., Ni, A. Y., Pati, S., & Guevara, J. P. (2014).

Factors associated with early intervention referral and evaluation: A mixed methods

analysis. *Academic pediatrics*, *14*(3), 315-323. doi:10.1016/j.acap.2014.01.007

King, T. M., Tandon, S. D., Macias, M. M., Healy, J. A., Duncan, P. M., Swigonski, N. L., &

Lipkin, P. H. (2010). Implementing developmental screening and referrals: Lessons

learned from a national project. *Pediatrics*, 125(2), 350-360. doi:10.1542/peds.2009-0388

Lail, J., Fields, E., & Schoettker, P. J. (2017). Quality improvement strategies for population

management of children with medical complexity. *Pediatrics*, *140*(3), e20170484.

doi:10.1542/peds.2017-0484

Lynch, B. A., Weaver, A. L., Starr, S. R., Ytterberg, K. L., Rostad, P. V., Hall, D. J., &

Tucker, S. J. (2015). Developmental screening and follow-up by nurses. *MCN, The*

American Journal of Maternal/Child Nursing, *40*(6), 388-393.

doi:10.1097/nmc.0000000000000179

McManus, M., White, P., Barbour, A., Downing, B., Hawkins, K., Quion, N., & McAllister, J.

W. (2015). Pediatric to adult transition: A quality improvement model for primary care.

The journal of adolescent health: Official publication of the society for adolescent

medicine, 56(1), 73-78. doi: 10.1016/j.jadohealth.2014.08.006

Moore, C., Zamora, I., Patel Gera, M., & Williams, M. E. (2017). Developmental screening and

referrals: Assessing the influence of provider specialty, training, and interagency

communication. *Clinical pediatrics*, *56*(11), 1040-1047. doi:10.1177/0009922817701174

Mosquera, R. A., Avritscher, E. B., Samuels, C. L., Harris, T. S., Pedroza, C., Evans, P., …

Tyson, J. E. (2014). Effect of an enhanced medical home on serious illness and cost of

care among high-risk children with chronic illness. *JAMA*, *312*(24), 2640.

doi:10.1001/jama.2014.16419

National Center for Medical Home Implementation (2017). Medical home information.

Retrieved from

https://medicalhomeinfo.aap.org/overview/Pages/Whatisthemedicalhome.aspx

Rea, C. J., Wenren, L. M., Tran, K. D., Zwemer, E., Mallon, D., Bernson-Leung, M., & Toomey,

S. L. (2018). Original article: Shared care: Using an electronic consult form to facilitate

PCP-specialty care coordination. *Academic Pediatrics,* doi: 10.1016/j.acap.2018.03.010

Tschudy, M. M., Raphael, J. L., Nehal, U. S., O'Connor, K. G., Kowalkowski, M., & Stille, C. J.

    (2016). Barriers to care coordination and medical home

    Implementation. *Pediatrics*, *138*(3), e20153458-e20153458. doi:10.1542/peds.2015-3458

Talmi, A., Bunik, M., Asherin, R., Rannie, M., Watlington, T., Beaty, B., & Berman, S. (2014).

    Improving developmental screening documentation and referral completion. *Pediatrics*,

    134(4), e1181-e1188. doi:10.1542/peds.2012-1151

Van Cleave, J., Boudreau, A. A., McAllister, J., Cooley, W. C., Maxwell, A., & Kuhlthau, K.

    (2015). Care coordination over time in medical homes for children with special health

    care needs. *Pediatrics*, *135*(6), 1018-1026. doi:10.1542/peds.2014-1067

Zickafoose, J. S., Clark, S. J., Sakshaug, J. W., Chen, L. M., & Hollingsworth, J. M. (2013).

    Readiness of primary care practices for medical home

    certification. *Pediatrics*, *131*(3), 473-482. doi:10.1542/peds.2012-2029

Evidence Review Table

Author, year	Study objective/intervention or exposures compared	Design	Sample (N)	Outcomes studied (how measured)	Results	*Level and Quality Rating
Boudreau et al., 2014	Would coordinated care improve unmet needs of children with special health care needs (CSHCN) when facilitated through a medical home (MH) vs. no MH?	Cross-sectional study	(n=18,905) children with health special health care needs participated in the 2009-2010 National Survey of CSHCN.	Association of unmet needs using CSHCN survey data using a multivariable logistic regression model. Study variables: unmet needs, Care Coordination, and MH. Control variables: age, language, gender, and ethnicity.	Association between medical home vs. no medical home and unmet needs (6.2% vs. 18.5%) utilizing care coordination. CSHCN were 1/3 less likely to have unmet needs when receiving coordinated care in a Medical Home.	4 C
Brown, Perkins, Blust, & Kahn, 2015	Comparison of a care coordination model in the low-income area utilizing patient registry and care coordination between three clinics	A quasi-experimental design with intervention and control group without randomization	(n=550) infants born in one-year intervention neighborhood	Clinic 1 implemented a Plan-Do-Study-Act (PDSA) for referral tracking and patient registry. Compared to Clinic 2 (intervention neighborhood). Chi-square test for intervention. Nurse care coordinator was given 1.5 hrs. a week to update the patient registry.	Four strategies were identified in medical home coordination of infants born in this low-income neighborhood; nurse coordinator, a partnership between PCP and community agencies, data support of automated patient registry to keep track of newborn visits, and shared EHR between the clinics. 16% increase of on-time 2-month check-ups with the utilization of care coordination and a 69% increase at the four-month visit.	3 C
Coker, Shaikh, & Chung, 2012	Evaluate the quality of care for children at risk for developmental delays (DD)	A cross-sectional study utilizing data	(n=22, 269)	Bivariate analysis for reduction of sample bias (p=<0.001) and	At-risk children were less likely to receive coordinated care (50%) and referrals (74%) for DD's. High-risk	4 B

		through surveillance and intervention to EI services.	from the 2007 National Survey of Children's Health (NSCH) and Parent's Evaluation of Developmental Status (PEDS).	Children 10 months to five years of age.	logistic regression to evaluate the four Measures of Quality: Comprehensive and coordinated care, Family-centered and culturally effective care, Medical Home, and Elicitation of parental developmental concerns and developmental screening.	children were less likely to have a medical home (38%) vs. low risk (69%).	
Farmer, Clark, Drewel, Swenson, & Ge, 2010	Evaluate Care Coordination intervention in the context of the MH for children with special needs.	Randomized Control Trial completed in two phases (0-6 months, and 6-12 months)	Randomized blocks (n=70) Group 1 (n=36) Care coordinator for the intervention group and Group 2 (n=34), 6month delay of coordinated care services.	Wilcox signed rank test of pre and post-intervention to compare treatment intensity, met with a pre-post intervention survey on categories of parental satisfaction of health services, family functioning, and child functioning. Group 1 received care coordination intervention.	Group 1, parents reported increased parental satisfaction of needs met with coordinated care interventions (p<0.05), parents reported fewer information needs after the intervention (p=0.04), written care plan (p=.003), and increased communication (p<.0001) compared with Group 2 at end of the intervention.	2 B
Jimenez, Fiks, Shah, Gerdes, Ni, Pati, &Guervara, 2014.	Identify socioeconomic factors of families and the effectiveness of phone vs. faxed referrals as related to care coordination in the MH	Mixed method analysis secondary to data from an RCT	(n=434) children identified with developmental concerns	Logistic regression and qualitative interviews	Out of the (n=434) identified with developmental concerns, (n=253) were referred to EI services and of those (n=129) received an evaluation. The method of the referral process of faxing the referral vs. giving the number to the parents improved EI completion rate (58% vs 33%) (AOR 2.94, 95%, CI 1.48-5.84)	4B

King, Tandon, Macias, Healy, Duncan, Swigonski, Skipper, & Lipkin, 2010	1. Quantitative analysis of pediatric practices participating in the Developmental Surveillance and Screening Policy Implementation Pilot (D-PIP) implementing the AAP recommended developmental screening and referral. 2. Qualitative analysis of stakeholder's viewpoints on screening and referral system.	Mixed Methods with Longitudinal Qualitative study and Quantitative interrupted time series design	(N=17) pediatric practices with (N=9) Practices' participated in referral tracking efforts	Quantitative analysis data from chart reviews and only stratified analysis of subgroups. Extraction of qualitative data using semi-structured interviews five months post-D-PIP implementation with coded text responses	Improvements needed in PCP placing and tracking referrals. Quantitative Study: 14% failed developmental screening (P<.001) PEDS screen vs. ASQ. Decreased referral rates with PEDS screen vs. failed ASQ (P<0.01). Qualitative themes included 15/17 practices indicated need for a practice-wide implementation system. 10/17 recommended stratified referrals. 9/9 of referral tracking had no system to track referrals. At 9 months 17/17 practices implemented AAP algorithm	6 B
Lail, Fields, & Schoettker, 2017	Implement the use of patient registries for patient risk stratification	Quality improvement	(n=582) for patients receiving well-child visits, (n=108 received immunizations)	Baseline data compared with collected data and analyzed using statistical process control charts, Pareto charts using the plan-do-study-act cycle	Baseline data included 48% of patients with chronic care conditions had yearly well-child visits. Post registry identification increased to 9	5 A
Lynch, Weaver, Starr, Ytterberg, Rostad, Hall, & Tucker, 2015	Evaluate a nurse-led screening and follow-up referral system in a pediatric office to increase the number of qualifying children to EI services	Prospective cohort study	(n=529) 18-months of age who returned developmental evaluation surveys, and of those, (N=109) required an intervention	Descriptive statistics for the completion rate of ASQ and M-CHAT	ASQ survey return was 59% indicating additional methods other than mail are needed to ensure questionnaires are completed Only 2.3% of the 109 who failed either the M-CHAT or ASQ, were referred for EI services. In addition, 73.4% of developmental delay follow-up was accessed through the EHR.	4 B
Moore, Zamora, Gera,	Evaluation of provider perception (pediatricians	Cross-sectional survey	(n=60) families	Pearson Correlations between survey items and Chi-square	Pediatricians were more likely than family medicine to screen for developmental delays (p=.012).	4 C

& Williams, 2017	vs. family physicians) EI referral practices			between training and screening practices		
Mosquera, Avritscher, Samuels, Harris, Pedroza, Evans, & Tyson, 2014	To assess if providing comprehensive care from the MH model would decrease cost, prevent serious illness, and hospital stays including ED visits.	RCT	(n=105) randomized comprehensive care and (n=96) standard care using a power level of 80.	Bayesian analysis for reduced costs and comprehensive care using 2-sided $P < 0.05$.	Medicaid patients increased visits under MH care (P=.007). A decrease in serious illness (10 per 100) vs. standard care (22 per 100), decreasing hospital costs from $16, 523 to $26, 781.	1 A
Talmi, Bunik, Asherin, Rannie, Watlington, Beaty, & Berman, 2014	Evaluate the effectiveness of a quality improvement project to improve screening and referral outcomes for children with developmental delays utilizing a developmental screening template.	Quasi-Experimental with pre and post-intervention without a randomized control group	(n=2610) up to 36 months of age in a large urban hospital outpatient clinic setting.	Mantel-Haenszel chi-square tests and Fisher's exact tests compared data of demographic and outcome variables. The clinic utilizes ages and stages questionnaire (ASQ), starting at six-month visit.	Referral screening and template intervention vs. baseline (P<.0001). Phone follow-up (P<.05). Bi-monthly report of interventions on screening outcomes, phone follow-ups were an effective form of care coordination (P<.0001, 48%) for abnormal screening, and improved referral outcomes, compared to baseline. EHR documentation of children qualifying for EI services increased with phone follow-up (P<.05).	3 B
Van Cleave, Boudreau, McAllister, Cooley, Maxwell, & Kuhlthau, 2015	Explore care coordination implementations in a pediatric MH and investigating what changes successful practices make in creating an MH.	Mixed method quantitative study (no control group) and qualitative study	(n=60 patients with health care needs) of and (n=48 clinician interviews) out of six pediatric medical practices MH programs and (n=508) care coordinated activities for 60 children with a medical condition, i.e.	Data collection of EHR review of codes for care coordination, patient registries, and staff reimbursement. Descriptive statistics of medical conditions. letters, and phone calls.	Care coordination activities; follow-up on referral (13.9%). Successful care coordination themes of MH included; financial grant to support care coordination, creating a care coordination team in the practice, use of electronic medical records (EMR), proactive care coordination activities, and MH certification creating a tracking system for referrals as well as finical incentives was indicated to increase care coordination.	6 B

			developmental delay (14.2%).			
Zickafoose, Clark, Sakshaug, Chen, & Hollingsworth, 2013	Evaluate Pediatric Primary Care office infrastructure and MH certification needs as required by the National Committee for Quality Assurance's (NCQA)	Cross-sectional study	(n=222) unweighted pediatric practices	Multivariate linear regression to assess associations using Stata 11.0 and 2011 NCQA standards for measurement of MH criteria including access and continuity, identify and manage patient populations, planned care, self-care, and community resources, track and coordinate care, and performance improvement	38% of pediatric practices met MH infrastructure requirements. Smaller practices had decreased MH infrastructure points and 2/3rd of practices are 2 partner models. <50% of practices met NCQA standards for coordinated care, tracking, and improved performance.	4 C

Appendix A

DEVELOPMENTAL DELAYS AND BEHAVIORAL HEALTH CARE COORDINATION

Care Coordination Measurement Tool © CCMT 2017 Version 1.1

	Patient Level	Care Coordination Needs	Activity	Outcomes Occurred	Staff
1					
2					

Patient Level
1a. ICD-10-F80.9 Speech delay
1b. ICD-10 F82 Fine motor/Gross motor (OT/PT)
1c. ICD- 10-F90-F98 Behavioral Health (ADD/ADHD/ODD/ANXIETY/DEPRESSION)

Care Coordination Needs
2a..Referral and Appointment Management
2b. Prior Authorization needed for speech, physical, or occupational services
2c. Completed school BH evaluation forms

Activity to Fulfill Needs
3a. Communication with family [telephone/email]
3b. Communication with specialist [via telephone/email]
3c. Communication with a community agency/school [via telephone/email]

3d. Reviewed hearing test and diagnostic testing was completed in past thirty days.
3e. Development/modification of care plan
3f. Secured prior authorization for patient

Outcomes Occurred
4a. Hearing screen completed
4b. DD delay referral completed and faxed/EHR
4c. BH/MH Referral sent for behavioral health
4d. Referral/communication feedback from behavioral health specialists
4e. Referral/communication feedback received from early intervention specialists

4f. Referral/treatment plan/communication feedback from behavioral health specialists
4g. Referral/care plan/communication feedback received from early intervention specialists

© Boston Children's Hospital, 2017. For permission to use, please contact: Richard.Antonelli@childrens.harvard.edu
The National Center for Care Coordination Technical Assistance is working in partnership with the National Center for Medical Home Implementation (NCMHI) in the American Academy of Pediatrics.

Appendix B

Care Coordination Team Training and Resources

- **Week 1:**
  - Care coordination team meeting to discuss the roles of each team member during project implementation over the next 14 weeks.
  - The project team leader will be making bi-weekly or weekly visits to the practice site during this QI implementation project.
  - Nurses will be educated on the use of the CCM tool in the paper form prior to going "live" with project implementation.
  - Both the nurse and provider will work as a team to implement the Developmental Action Care Plan. The nurse's role in reviewing the care plan with the parents at their follow-up appointment which will then be reviewed by the provider.
  - The office staff care coordination team member will also review the CCM tool and their role in documenting care.
  - The office manager will be educated on the patient registry and will provide education on the extraction of ICD codes
  - The team will also review the PHI to ensure the patient's privacy is not exposed.
  - All the forms will be reviewed to all team members to facilitate a global understanding of the project and the integral role each member plays to ensure success.
- **Week 2:**
  - Care coordination team meeting will be held to reinforce education, answer questions answered, and review any concerns that have arisen.
  - Hand out will be given and posted at the nurse's station that will state each week objectives, project leaders phone number and email, and site visit dates.

Appendix C

Care Coordination Measurement Tool Permission

Hi Joanna, Thanks for reaching out.
You have our permission to use the tool. Please keep us posted about your progress.
Good luck.
Rich

Medical Director of Integrated Care
Medical Director of Physician Relations and Outreach
Boston Children's Hospital/ Harvard Medical School
300 Longwood Avenue
Boston, MA 02115
Telephone 617-919-4269

Executive Assistant: Erika Norkus
erika.norkus@childrens.harvard.edu
Telephone 617-919-7456

Appendix D

Table 1 *Excel Audit Tool*

| Categorical Data	BH referral sent	BH feedback received	EI Referral Form Sent	EI Referral Feedback Received	Time spent in minutes coordinating activities	Uptake of EI or BH services	Hearing screen completed
	1 or 2	1 or 2	1 or 2	1 or 2	0-60	1 or 2	1, 2, or 3

Categorical data with corresponding numerical values will be entered weekly as a running tally of bulk data gathered.
- **Referral form faxed, emailed, or electronically sent**
  - 1=yes
  - 2=no
- **Referral feedback received**
  - 1=yes
  - 2=no
- **Time spent in minutes (0-60)**
- **Uptake of services**
  - 1=yes
  - 2=no
- **Hearing Screen**
  - 1=passed hearing screen
  - 2=failed hearing screen
  - 3=Did not complete hearing screen

Appendix H

Project Results Run Chart

Figure 1. Electronic health care record tracking referral project run chart. (n=30). Days from referral to the evaluation of EI and BH services.
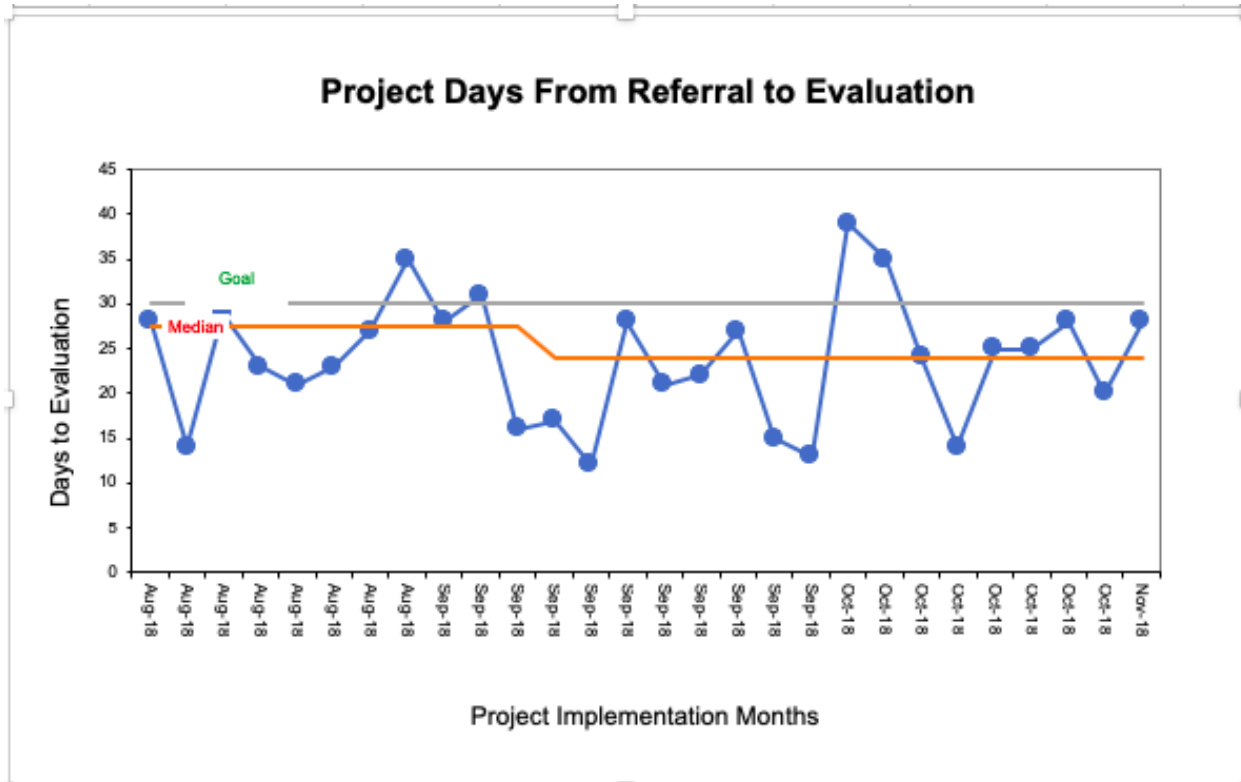
Appendix I

Number of Days from Referral to Evaluation of Services before and after EMR Upgrade

Table 1
The Difference in Number of Days from Referral to Evaluation after EMR Upgrade.

Days to Evaluation	EI and BH Pre-Project Referral Tracking (n=32)			EI and BH Project Referral Tracking (n=30)			Mean Days % Difference
	Mean (SD)	Range	Median	Mean (SD)	Range	Median	Mean %
EI/BH	37.0 (19.8)	13-95	30.5	22.8 (7.9)	6-39	23.0	35.3%
Speech	38.2(19.9)	16-95	32.5	21.6 (7.5)	6-35	22.0	43.5%
PT/OT	30.4(21.7)	13-76	24.0	26.5(10.3)	14-38	27.0	12.9%
BH	43.0 (17.3)	28-62	39.0	24.2 (8.4)	13-39	23.0	43.8%

Appendix J

Care Coordination Measurement Tool Results

Table 2.
Care Coordination Measurement Tool Needs, Activities, and Outcomes Completed During Project Implementation.

Care Coordination Tasks	September (n=88)	October (n=83)	November (n=40)
Needs	(9) 10.2%	(6) 7.2%	(16) 40.0%
Referrals	8	5	3
BH Forms	1	1	13
Activities	(40) 45.5%	(35) 42.2%	(12) 30.0%
Communication Family	2	5	1
Communication BH/EI	30	29	10
Hearing Screen Referrals	5	1	1
Outcomes	(39) 44.3%	(43) 51.8%	(12) 30%
Hearing Screens Completed	4	3	0
Referrals Sent	9	3	1
Care Plans Received	26	37	11

Appendix K

Figure 2. Pre-Project and Post-Project Comparison of the Average Number of Days from EI/BH Referral to Evaluation

Pre-Project and Project Days from Referral to Evaluation