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Preschool Vision Screening Collaborative: Successful Uptake of Guidelines in Primary Care

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Abstract

Introduction: Preschool vision screening rates in primary care are suboptimal and poorly standardized. The purpose of this project was to evaluate pediatric primary care adherence to and improvement in preschool vision screening guidelines through a learning collaborative environment. **Methods:** Thirty-nine Ohio primary care providers interested in preschool vision screening self-selected to participate in an Institute for Healthcare Improvement Breakthrough Series learning collaborative that spanned 18 months. Charts of patients attending 3-, 4-, and 5-year well-child visits were randomly selected and reviewed for documentation of vision screening attempts, referrals, and need for rescreening. **Results:** Practitioners improved evidenced-based screening attempts for distance visual acuity and stereopsis of 3–5-year-old patients from 18% at baseline to 87% ($P < 0.001$) at 6 months; improved screening rates were sustained through completion of the collaborative. Baseline referral rates (26%) of abnormal vision screens improved by 59% ($P < 0.001$) during the first 6 months and were maintained through month 18. Rates for children with incomplete screens that were scheduled for a repeated screening increased during the first 6 months. However, changes in this metric did not reach statistical significance ($P = 0.265$), nor did it change during the remainder of the collaborative. **Conclusions:** Rapid integration and maintenance of preschool vision screening guidelines are feasible across primary care settings utilizing a structured learning collaborative. Challenges with the rescreening processes for children with incomplete vision screens remain, with the 3-year age group having the greatest room for improvement. *(Pediatr Qual Saf 2019;4:e241; doi: 10.1097/pq9.0000000000000241; Published online November 28, 2019.)*

INTRODUCTION

The American Academy of Pediatrics encourages routine vision screening at all well-child visits. Additional vision screening guidelines are established for children 3 years and older that include distance visual acuity testing using age-appropriate optotypes.[1] Upwards of 4% of preschoolers have amblyopia, with similar percentages identified for other vision-related impairments such as strabismus and refractive errors; these impairments prompted national organizations, including the US Preventative Services Task Force and Bright Futures, to develop policies that promote early detection and treatment of vision problems in preschool-aged children.[2–4] Evidence suggests that success of amblyopia treatment is influenced by a child's age, with children younger than 7 years old being more responsive to amblyopia treatment.[5] Improved child development and school readiness is a potential outcome of early optical correction of refractive error.[6–8]

Uptake and consistency of vision screening in the pediatric setting are inadequate. According to the 2008 and 2011 National Health Interview Surveys, only 40% of children 6 years old and younger had a vision screening completed by their primary care physician or other healthcare professional.[9,10] Additionally, the 2016–2017 National Survey of Children's Health demonstrated nationwide and in the state of Ohio that, collectively, 69.7% of children (0–17 years old) have either had their vision tested with pictures, shapes, or letters ever (0–5 years old) or in the past 2 years (6–17 years old), but does not specify who tested the child's vision.[11] Parents reported similar rates for younger children: 64.9% of their 3- to 6-year-olds received at least 1 vision screening, and only 42.6% of 3-year-olds, 63.7% of 4-year-olds, and 72.5% of 5-year-olds receiving yearly screenings.[12] A national sample of surveyed pediatricians reported routine visual acuity testing for preschoolers

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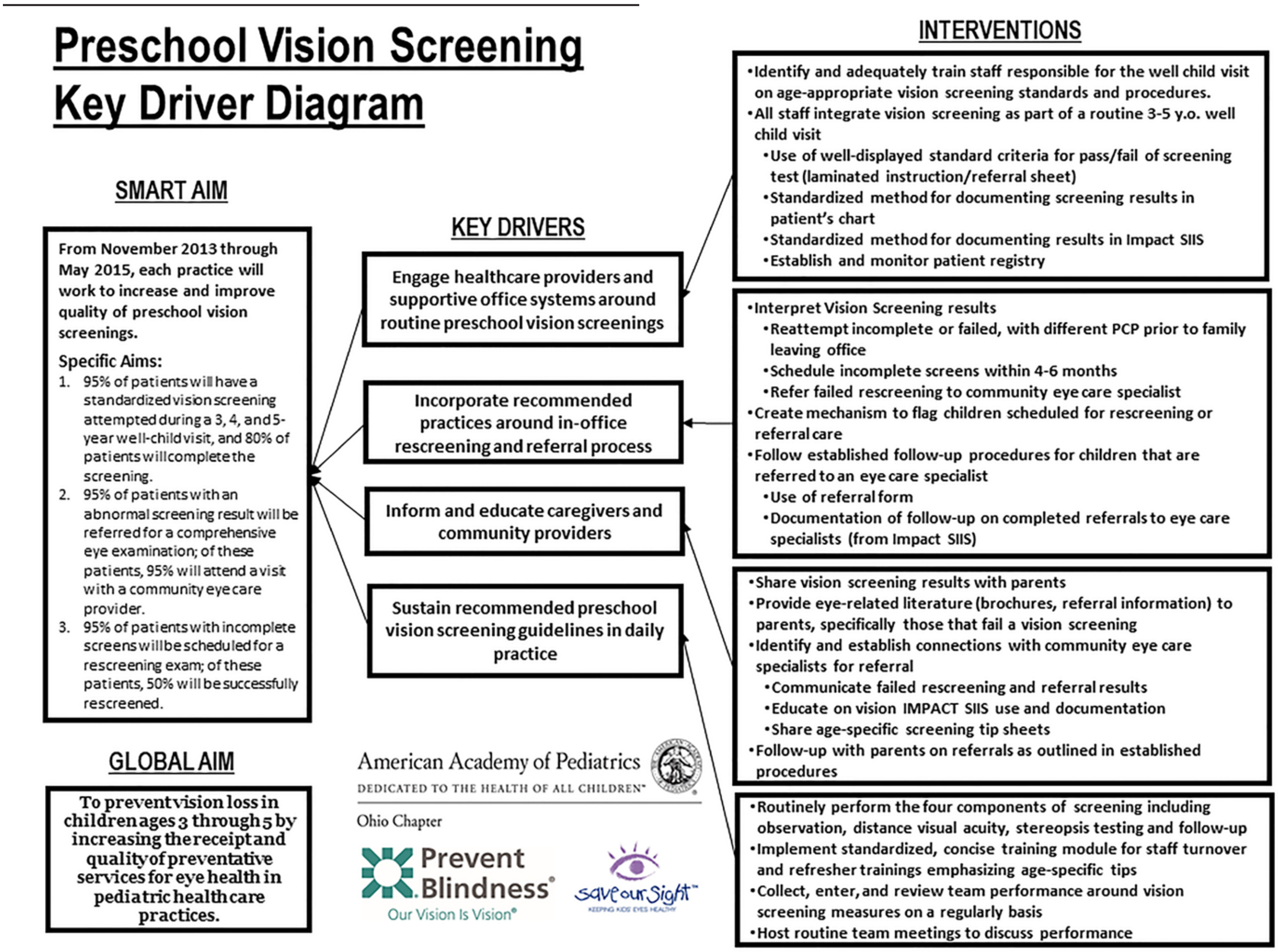

Fig. 1. Preschool vision screening key driver diagram, which depicts the program's change package.

at only 37% of 3-year-old, 79% of 4-year-old, and 91% of 5-year-old well-child visits.[13]

The objective of this paper is to demonstrate the success of the Ohio Chapter, American Academy of Pediatrics' (Ohio American Academy of Pediatrics [AAP]) Preschool Vision Screening Quality Improvement Learning Collaborative (QILC) on uptake of and adherence to preschool vision guidelines within Ohio pediatric practices. The learning collaborative facilitated implementation of an evidence-based, standardized, age-appropriate, and developmentally appropriate vision screening at all 3-, 4-, and 5-year-old well-child visits. The key driver diagram (Fig. 1) included 3 specific aims:

1. Ninety-five percent of patients will have a standardized vision screening attempted during a 3-, 4-, and 5-year well-child visit, and 80% of patients will complete the screening.
2. Ninety-five percent of patients with an abnormal screening result will be referred for a comprehensive eye examination; of these patients, 95% will attend a visit with a community eye care provider.
3. Ninety-five percent of patients with incomplete screens will be scheduled for a rescreening examination; of these patients, 50% will be successfully rescreened.

METHODS

The Ohio AAP partnered with the Ohio Affiliate of Prevent Blindness and the Ohio Department of Health in the spring of 2013 to create a learning collaborative modeled after the Institute for Healthcare Improvement's Breakthrough Series.[14] The project leadership team consisted of a program manager, content expert, physician lead, quality improvement (QI) consultant, 3 Prevent Blindness Vision Screening coordinators, and an Ohio Department of Health representative. The project team worked with 11 Ohio practices, composed of 39 pediatric providers, from December 2013 to May 2015. Twenty-six providers elected to participate in the initial 6-month collaborative (cohort 1), and 13 providers opted to extend participation by an additional 12 months (cohort 2), completing an 18-month collaborative (Fig. 2).

Recruitment of Pediatric Practitioners

We recruited pediatric practitioners registered in the Ohio AAP membership database (approximately 1,400 practitioners) for the QILC. Provider incentives included American Board of Pediatrics Maintenance of Certification Part IV credit, preschool vision screening

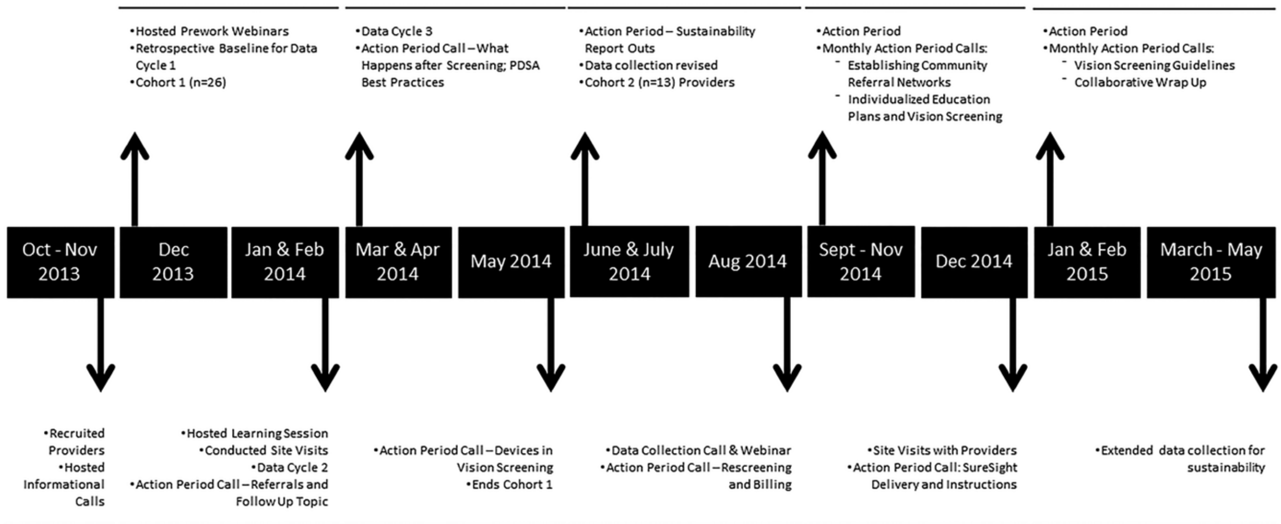

Fig. 2. Timeline of the preschool vision screening learning collaborative. Participating provider cohorts 1 and 2, data systems, and timing components are depicted.

equipment (lightbox, LEA Symbol Chart at 10 ft. and Random Dot E Stereopsis test), and a $1,000 practice stipend. Several informational calls occurred in October 2013 to discuss the learning collaborative. Interested providers volunteered to participate, and each attended a mandatory prework webinar that outlined the requirements for participation, retrospective baseline data collection, and the data collection system.

Eleven practices with 39 primary care providers participated in the QILC. Participants served a diverse patient population of approximately 45% Medicaid and 49% private insurance, seeing, on average 70 preschool-aged well-child visits a month. All practices had electronic medical records. Practices were geographically located throughout the State of Ohio and represented a variety of practice locations: urban (3 out of 11), rural (3 out of 11), and suburban (5 out of 11). Two practices were solo practitioners.

Preschool Vision Learning Session and the Collaborative Process

On January 7, 2014, the project leadership team hosted a learning session and encouraged the core QI practice team (a physician leader, a nurse/nurse practitioner or medical assistant, and an administrative staff/office manager) from each participating practice to attend. The learning session provided a review of baseline data and the QI concepts of office flow and plan–do–study–act cycles. The session also introduced the key driver diagram and change package.

Prevent Blindness staff discussed preschool vision screening procedures, strategies to improve child cooperation with the screenings, and billing and coding information. Practices received a *Preschool Vision Screening for Healthcare Professionals* book, a set of preschool vision screening equipment, and pass/fail criteria (Table 1). In mid-February 2014, collaborative leadership conducted practice site visits with each practice core QI team to aid in the setup and

Table 1. Preschool Vision Screening Testing Components and Pass, Fail, and Referral Criteria Used during the Collaborative

Preschool Vision Screening Clinical Content	To pass, the Child	Fail/Referral Criteria
Observation: pediatrics vision risk factors (appearances, behaviors, complaints)	Must not have any of the risk factors present or reported at the time of the screening	A referral must be made if a child has 1 or more of the risk factors present or reported at the time of screening
Distant visual acuity: vision screening procedures for the LEA symbols chart at 10 ft. manufactured by Good-Lite (Elgin, IL, USA)	Must read the 20/40 line on the LEA chart with each eye separately (and correctly identify 3 out of 5 symbols on the line) at a distance of 10 ft	A referral must be made if the child is unable to identify 3 out of 5 symbols on the 20/40 line of the LEA chart with each eye separately at a distance of 10 ft
Stereopsis: Random Dot E test for stereopsis manufactured by Stereo Optical Co (Chicago, IL, USA).	Must identify the correct card 4 out of 6 times at a distance of 16 inches	A referral must be made if the child is unable to identify the correct card 4 times out of 6 presentations at a distance of 16 inches
Welch Allyn SureSight Vision Screeners	Must remain still and focused on the SureSight device in order for the screener to receive a proper reading	A referral must be made if the there is an asterisk next to a reading on the LCD screen

Terms used to define patient's screening attempts: successfully completed, when a child passes all elements of a screening; incomplete, when a screening is attempted but the child does not complete all elements of that screen; abnormal, when a child completes all elements of a screen but does not pass.

proper use of the screening equipment. Project leadership instructed providers to screen all 3–5-year-old patients at each well-child visit; children were omitted from screenings if they had previously established vision care.

Mandatory, live, 1-hour action period webinars were hosted monthly to provide education on topics related to vision care, share data, reinforce QI concepts, troubleshoot challenges, and share successes. Practices completed monthly narratives to provide insight regarding practice-specific challenges, successes, and potential topics for action period calls.

Twelve months into the collaborative (December 2014), the Ohio Department of Health acquired additional funds to purchase SureSight Vision Screeners (Welch Allyn, Skaneateles, NY) which were furnished to providers to supplement current vision screening practices; at the start of the collaborative, practices were not aware that they would be receiving this equipment. Prevent Blindness staff trained practices on the proper use of the SureSight during an additional practice site visit. Providers had the option to complete the distance visual acuity test with the SureSight or to use the 10-foot LEA symbols.

For initial data collection, participating providers collected 3 cycles of data from 3-, 4-, and 5-year well-child visits using the American Board of Pediatrics Preschool Vision Screening Performance Improvement Module. Each cycle consisted of 20 randomly selected charts reviewed for preschool vision screening attempts, completed screenings, and the need for referral and/or rescreening. Cycle 1 comprised baseline data from well-child visits attended in November and December 2013. Cycle 2 consisted of chart audits from January and February 2014, and cycle 3 consisted of audits from March and April 2014 of the action period; data collection coincided with the collaborative's action period.

Data collection was revised in June 2014 to allow for monthly data collection and collection of 3 additional variables: child's discrete age, observation, and method of vision screen (traditional vision screen or SureSight Vision Screener for distance visual acuity testing). Providers reviewed 2 randomly selected well-child visits for each age group (3-, 4-, and 5-year-olds) and all patients with a referral for an abnormal screen or those needing a rescreen because their initial screening was incomplete. Data collection was HIPAA compliant, and only de-identified information was received and analyzed to calculate frequencies for each specific aim. We reported data back to practices as run charts on each action period call.

Comparisons of study outcome frequencies were made between (1) cycle 1 and cycle 3 collected during the first 6 months, (2) age groups in the latter 12 months, and (3) use of 10-foot LEA symbols or SureSight vision screener for data collected in the final 12 months. Comparisons were made with Chi-square tests or Fisher's exact tests when expected cell frequencies were less than 5, with $P < 0.05$ considered statistically significant. Analyses were performed using SPSS v.25 for Windows (IBM Corporation, Armonk, NY).

The project was submitted and reviewed by the Dayton Children's institutional review board, which determined that the project qualifies as being a nonresearch QI project. The project team supplied a practice agreement form, which all participating and supporting providers signed; the agreement made note that in case of publication, all practice collected data would be de-identified and presented in aggregate form.

RESULTS

Aim 1: *95% of patients will have a standardized vision screening attempted during a 3-, 4-, and 5-year well-child visit, and 80% of patients will complete the screening*. At baseline, 18% of patients (113 out of 620) had a complete vision screen (distance visual acuity and stereopsis testing) attempted. At the end, the first 6 months of data collection, 87% (477 out of 550, $P < 0.001$ versus baseline), had an attempted vision screening. Practitioners maintained this success throughout the remainder of the collaborative with an additional mean shift to 93% 10 months after the start of the collaborative (Fig. 3).

The second portion of aim 1 was to evaluate the practice frequency of completing vision screenings (Fig. 4). Of the 477 attempted screenings, 83% were successfully completed (n = 396 patients, $P = 0.002$ versus baseline). Data were evaluated by age; there was no change in 4-year-olds (mean 82%) or 5-year-olds (mean 96%) completing the screenings. The mean for fully completed vision screens in the 3-year-old group was 47% and changed to 64% by the end of the collaborative. Three-year-olds were less likely to complete standardized screens, averaging rates 30% less than 5-year-olds ($P < 0.001$).

Data were also stratified by screening method utilized for distance visual acuity testing: LEA symbols at 10 ft. (n = 113) or the SureSight vision screener (n = 76) from January to May 2015. Use of the SureSight Vision Screener did not notably increase or decrease distance vision acuity screening attempts (97% SureSight versus 99% LEA, $P = 0.566$) or success rates for any age group rates (80% SureSight versus 83% LEA, $P = 0.568$) relative to the standardized screening tests.

Aim 2: *95% of patients with an abnormal screening result will be referred for a comprehensive eye examination; of these patients, 95% will attend a visit with a community eye care provider*. Collectively, 6.7% of patients had abnormal distance visual acuity screens (91 out of 1,355), and 4.4% of patients were abnormal for stereopsis (45 out of 1,027). Providers improved referrals for an abnormal screen (distance visual acuity and/or stereopsis) to an eye care specialist from 26% at baseline (6 out of 23) to 85% (29 out of 34) during the first 6 months of the collaborative ($P < 0.001$). There was a second mean shift to 90% after month 11 of the collaborative. Data for completion of the attendance for follow-up with the eye care specialist were not available.

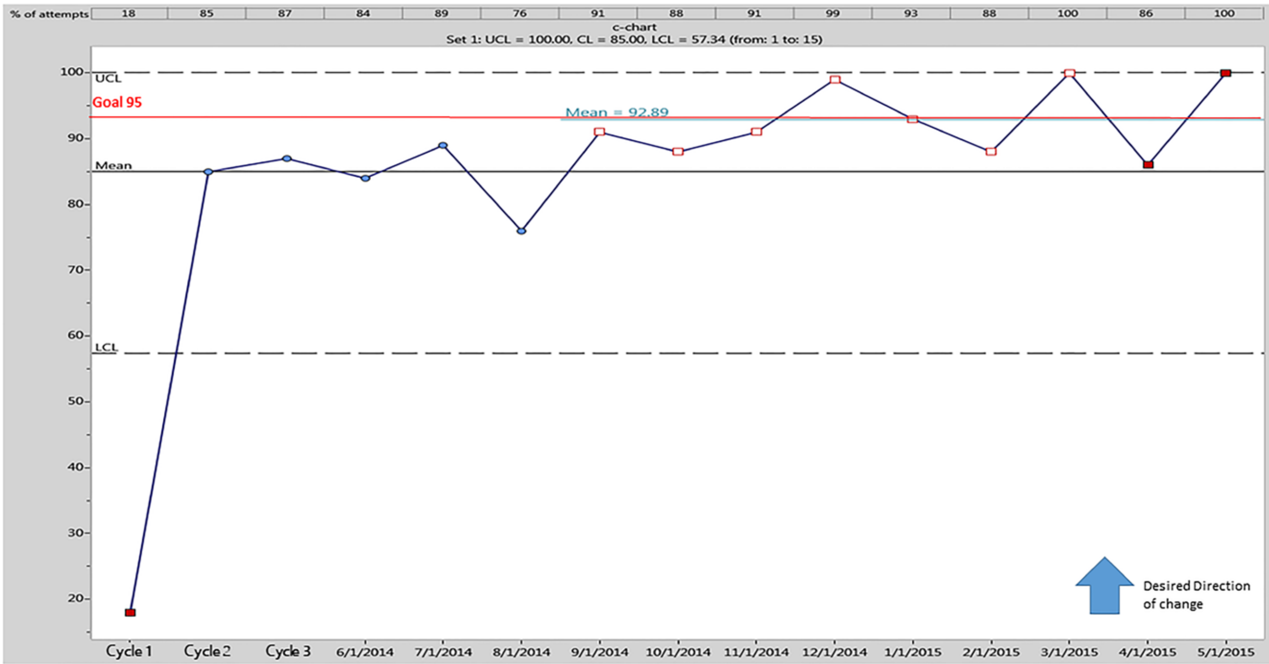

Fig. 3. Control chart for attempted vision screening of patients 3-, 4-, and 5-year-olds attending well-child visits. UCL, upper control limit; LCL, lower control limit; CL, central line.

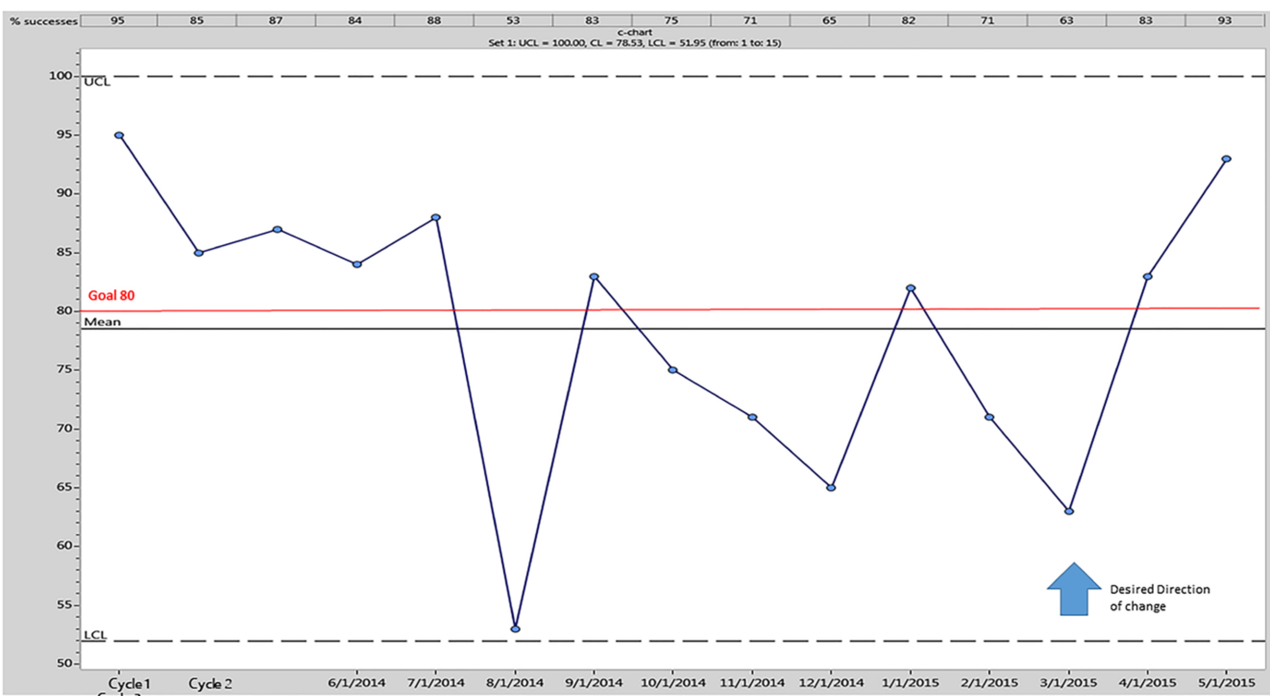

Fig. 4. Control chart for completed vision screens of patients 3-, 4-, and 5-year-olds attending well-child visits. UCL, upper control limit; LCL, lower control limit; CL, central line.

Aim 3: *95% of patients with incomplete screens will be scheduled for a rescreening examination; of these patients, 50% will be successfully rescreened.* At baseline, 42% of patients who were unable to complete the initial vision screening (8 out of 19) had a rescreening visit scheduled. Scheduling follow-up visits to repeat the vision screen changed to 56% (56 out of 100) by the end of the first 6 months of the collaborative (P = 0.265). During the remaining 12 months, patients with incomplete screens (n = 123) were scheduled for a rescreening visit approximately 30% of the time.

Providers completing the 18-month collaborative (cohort 2) were able to capture data from rescreening visits (n = 46). Sixty-one percent of patients attending a rescreening visit had a repeated standardized vision screening attempted, and 64% were successfully rescreened. Appropriate referrals occurred for all abnormal screens (n = 3) that resulted during rescreening visits.

DISCUSSION

This project demonstrates key items regarding quick integration and maintenance of standardized preschool vision screening by pediatric providers using QI methodology and confirms the challenges previously noted in the literature. The collaboration between the Ohio AAP, Ohio Department of Health, and Prevent Blindness Ohio Affiliate allowed improved access to resources, equipment, and practice support in an environment that engaged pediatric practices via monthly interactions, fostering collaboration among peers to create solutions, and insights to preschool vision screening at 3-, 4-, and 5-year well-child visits.

The first project aimed to attempt and complete standardized vision screening increased in patients attending 3-, 4-, or 5-year-old well-child visits, but especially in the 3-year-old population, a population noted in the literature as particularly challenging.[15,16] Despite this challenge, providers not only increased standardized screening attempts and completed screenings but also reduced the frequency of incomplete vision (new success rate of 64% by the end of the collaborative). Although we could not collect discrete patient age during the first 6 months, anecdotally, providers reported routine vision screening only with 4- and 5-year-olds; this may have artificially inflated attempts and successful vision screens during this time, but collective rates improved during the final 12 months.

The second project aim emphasized provider referral of abnormal screens to community eye care providers—this improved over baseline rates within the collaborative despite infrequent abnormal presentations. Rates of abnormal screenings solely informed us of how many children did not pass a vision screening and not necessarily the rates of diagnosed vision abnormalities. Participating providers easily collected data on referral of abnormal screens, but gathering data on patient completion of those referrals proved to be more difficult (n = 0). The referral process to community eye care specialists and communication of patient attendance of referral visits warrants investigation and requires improvement. Some families report time and location as a barrier to referral visit attendance, but wait time to appointment is relatively short; 95% of optometrists and 75% of ophthalmologists accept new preschool-aged patients within 1 month.[17] Providers easily made the referral but continuity of care and follow-up were difficult to evaluate for this second portion of this aim. The above would suggest that more attention to patient and family education about the results of the vision screening, the importance of completing the referral, and improved communication between providers may be needed.

The third project aim evaluated how patients with incomplete screens were scheduled for rescreening. Providers participating in the 18-month collaborative worked to determine best practices for scheduling patients for repeated screening, networking with their local community vision resources, and vision specialists. Although providers were instructed to review all charts for patients who attended a rescreening visit (n = 46), the subset of charts entered was small. Guidelines at the time of the collaborative recommended rescreening children with incomplete screens within 4–6 months of the initial screening, permitting adequate time to review charts for children with incomplete screens. The small sample size does not allow us to generalize results for all patients attending rescreening visits, nor does it define the patient population that may have attended rescreening visits during the collaborative. However, for the charts entered, 61% of patients received a standardized vision screening, with 64% completing that screening. However, nearly 14% of children screened abnormally. This rate of abnormal screens in those initially unsuccessful emphasizes the importance of striving to have parents return to the office for repeated screening until a complete vision screen is successful or eye care with a specialist is established. This observation is a challenge noted by other studies of this type.[18]

Limitations

There are several limitations to this study. The small sample of providers that opted and were compensated for participating in the project may not be reflective of all Ohio pediatric primary care settings whether in their preschool vision screening practices or QI experience. Further, the project design allowed practices to choose which interventions to test from the change package (Fig. 1) as plan–do–study–act cycles and eventually implement. This flexibility allowed practices to tailor improvement efforts based on QI experience and foundational vision screening processes but did not allow us to determine which components of the change package were most impactful to shifts in collaborative data.

Regarding data, baseline on our control charts is a single point—a limitation of the data collection system required by our funding. Revisions to address shortcomings in this system had to be cognizant of the participating providers and the ambulatory practice environment, carefully balancing meaningful use to inform improvement efforts with data entry burden, staff time, and provider ability to abstract and enter quality data. A second limitation regarding data is that only a small subset of the initial 11 practices continued participation. Finally, attempts to capture data for rescreening and referral visits proved challenging. Provider comfort with data identification and abstraction and patient attendance of these visits may have limited the charts entered into our data system and, therefore, generalizability in the interpretation of incomplete and abnormal results for this patient population.

Preschool vision screening guidelines recommended at the time of this project were published in 2011.[19] The QILC sought to evaluate adoption to these recommendations, but a complication to this project's timing was that national recommendations were revised and published in January 2015 that included new, scientifically validated screening techniques and tools.[20] This change, however, does not detract from the success of the collaborative process for facilitating practice adherence to vision screening guidelines. It does highlight the difficulty practitioners face in trying to be current on the plethora of guidelines that they have to maintain.

CONCLUSIONS

Substantial improvements can be made in vision screening attempts and completed vision screens at well-child visits during a short-term learning collaborative. A multiagency learning collaborative model seems to aid in overcoming typical barriers in implementing clinical guidelines for vision screening, maintaining initial improvements for several months after change efforts. This method was successful as it integrated current vision screening guidelines into the preschool population and promoted basic QI skills for physicians and practices to use in future endeavors. Results of this collaborative support that the same process could be utilized to implement updated vision screening recommendations throughout a variety of practice locations.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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