

Increasing Primary Care Follow-up after Preparticipation Physical Evaluations

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Abstract

Background: Preparticipation physical evaluations (PPEs) strive to prevent injuries and sudden death in athletes. Ideally, the medical home is the best setting for completion. However, many school systems request large PPE screenings for their student-athletes. This quality-improvement project aimed to increase primary care provider (PCP) follow-up for athletes “cleared with recommendation” (CR) or “disqualified” (DQ) during our mass PPEs. **Methods:** Our team evaluated prior PPE data for athlete clearance and PCP follow-up for CR or DQ athletes. The prominent gaps in our PPEs were resident education, PCP or medical home identification, and communication. Our team implemented interventions during the 2018 PPEs to increase both CR and DQ athlete follow-up at the medical home. **Results:** Retrospective baseline data revealed that physicians categorized 11% (67/582) of athletes at our PPEs as CR or DQ. Of these athletes, the PCP and specialist follow-up rate was 13% (9/67). Our process changed to enhance athlete follow-up, but the rate only increased slightly to 15% (18/120). Medical home identification improved. Successful interventions included resident education, medical home identification, and increased communication. **Conclusions:** Despite our interventions, this quality-improvement initiative was unsuccessful in reaching the aim. This project found small achievements in educational opportunities, improved documentation, medical home identification for student-athletes, and led to local changes in our standard operating procedures. Although our aim was ambitious, 100% athlete follow-up with the PCP or medical home ensures athletic safety and decreases liability for all. (*Pediatr Qual Saf* 2020;6:e358; doi: 10.1097/pq9.000000000000358; Published online October 26, 2020.)

INTRODUCTION

Background Knowledge

Over 7.8 million students are estimated to play high school sports in the United States each year.¹ Sports participation has many health benefits, but risks of musculoskeletal injuries and sudden cardiac arrest are concerning for participants, families,



schools, and communities. The primary goal is to detect conditions that may impact an athlete's participation or predispose the athlete to life-threatening injuries or sudden death.² The secondary goals of preparticipation physical evaluations (PPEs) are to serve as an entry point into the healthcare system, provide an opportunity to discuss general health maintenance, and fulfill legal and sport participation requirements.³

The Preparticipation Physical Evaluation Monograph, Fifth Edition (PPE-5), published in April 2019 as a collaboration between the American Academy of Pediatrics and many other leading medical organizations, outlines the most recent PPE recommendations.⁴ The collaboration bases the recommendations on a comprehensive review of literature, position and consensus statements, policies, and expert opinion, including the American Heart Association's recommendations for cardiovascular screening in young athletes.⁵⁻⁷ The monograph details how to perform an appropriate preparticipation history and physical examination and determine clearance for athletic participation and recommends that the medical home conduct the PPEs.⁴

Despite the recommendations, no uniformity exists for PPEs at the national, state, or local school level. Most states require a PPE for high-school athletics. However, in 2015, only 27 states designate which form to use, and 23 states used a form that supports all of the recommendations in the PPE-4 monograph.⁸ There is also a significant variation regarding which medical providers can

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conduct PPEs. An analysis by Caswell et al⁸ determined that 74% of states allow a nonphysician to perform the examination. Similarly, a list of competency in cardiovascular screening or sports medicine is not required by any state, and knowledge likely varies widely across providers.⁸ Because of the considerable variation, it has been challenging to study the efficacy of PPEs in preventing injuries and sudden death.^{9–15} A uniform process for PPEs at the national, state, and local level would facilitate further research and outcome measures.

Ideally, the PPE should be conducted 6 weeks before the start of the athletic season to allow student-athletes to complete any further workup before participation.⁴ The best setting for the PPEs is the athlete's medical home with a provider practicing current PPE-5 recommendations.^{4,16,17} Providers should obtain the athlete's full medical, surgical, and family history for the PPE and get confirmation from a guardian.^{4,18} Unfortunately, barriers can prohibit an athlete from seeing their primary care provider (PCP). These include lack of medical insurance, inability to schedule a timely appointment, and cost. PPEs conducted in a group setting provide many students access to care at a minimal cost. However, large-scale screenings rely on accurate completion of PPE forms, truthful documentation, and adherence to the clearance recommendation by the student, school, and responsible provider.^{4,9,11,19–21}

Local Significance

The Division of Sports Medicine at Nationwide Children's Hospital (NCH) provides large-scale PPEs at their contracted high schools in surrounding Columbus, Ohio. The high school leaders request NCH providers perform the PPEs on behalf of their student-athletes. A retrospective review of the 2017 PPE data from NCH revealed a surprisingly low rate of documented follow-up for athletes "cleared with recommendations" (CR) or "disqualified" (DQ) from athletic participation. This quality-improvement project aimed to increase primary care follow-up for both groups (CR and DQ athletes) screened during large-scale PPEs from 13% (9/67) to 100%.

METHODS

Ethical Consideration

This initiative involved a retrospective review of 2017 PPE data from 5 high schools and proposed changes to the 2018 PPE process for 10 high schools. Nationwide Children's Hospital Institutional Review Board reviewed and designated this project as a quality-improvement (QI) initiative and not a human subject research. Therefore, Institutional Review Board approval was not required.

Setting

Pediatric sports medicine is an outpatient subspecialty medical service and provides additional sports coverage to local high schools throughout Columbus, Ohio. The

sports coverage is contracted and includes a certified athletic trainer and a team physician. Additionally, all contracted schools request PPEs for their student-athletes annually. The PPEs occur at the end of the academic year, typically May through June, in anticipation of the upcoming academic year, which exceeds the recommended 6 weeks. Overall, the division completed PPEs for 582 athletes in 2017 and 836 athletes in 2018.

Context

Any medical recommendations made during PPEs require integration and effective communication. The school's athletic department, certified athletic trainers, sports medicine physicians, student-athletes, families, PCPs, and pediatric subspecialists all played a role in final medical clearance. The flow diagram (Fig. 1A) depicts our process during the 2017 PPEs. In our process, the physician may designate a student-athlete as CR or DQ. This result triggers the performing physician to complete and sign an abnormal preparticipation physical form with the athlete's name, date of birth, examination date, PCP, abnormal findings, and clearance status. The checkout athletic trainer provides a copy of the abnormal form to the athlete, the school athletic trainer, and the school athletic department. Additionally, an athletic trainer documents all CR and DQ athletes at discharge and mails a copy of the abnormal form to the PCP. The school athletic office handles the final sports clearance and participation.

Interventions

We established a multidisciplinary QI team composed of attending and fellow pediatric sports medicine physicians, athletic trainers, and resident physicians. All team members worked in past divisional PPEs. The team identified potential error points in our PPE flow (Fig. 1B). Three predominant issues drove the QI initiative. First, physicians incorrectly labeled athletes as CR or DQ. Second, providers and athletic trainers did not identify a PCP or medical home. Third, a lack of communication existed between the school athletic office, student-athletes, and the athletic trainer.

The first area of focus was inappropriate CR/DQ status during PPEs. Specifically, the CR or DQ recommendations for abnormal vision screens and blood pressure screens did not meet PPE-5 monograph criteria.⁴ Resident physicians made the majority of these improper CR or DQ recommendations and received minimal prior PPE education. The resident examined student-athletes independently at PPEs. Attending physicians were available for questions, but they were examining athletes simultaneously. It was unclear if the residents discussed any of these CR or DQ athletes with their attending physicians before finalizing the PPE forms in 2017.

Next, student-athletes did not document PCPs and medical homes on the PPE forms. Lack of a medical home is detrimental to athlete follow-up. A retrospective review of 2017 PPE forms highlighted the omissions on

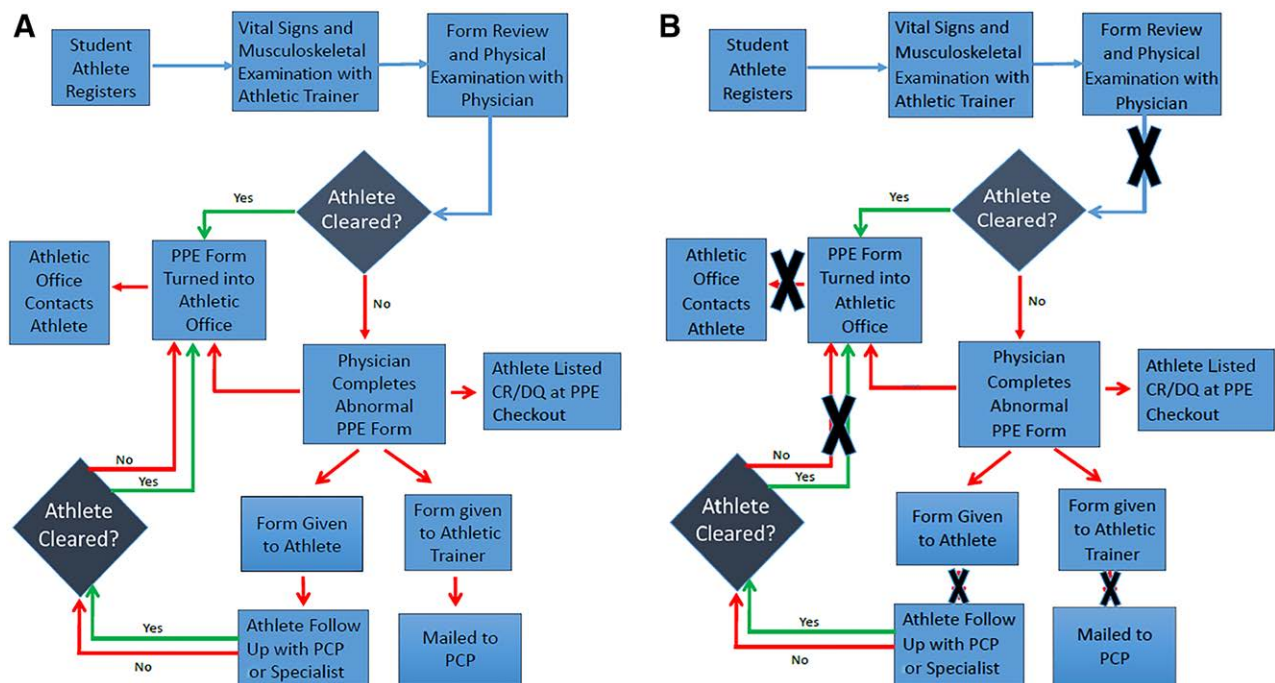


Fig. 1. Process map. Patient flow depicted during mass preparticipation physical evaluations. The QI team utilized this process map to identify key drivers and formulate initiatives for the project. A, The process map outlines athlete flow from check-in to checkout. B, The process map denotes potential sources of error marked with a black “x”.

the final PPE documents. It was unclear if the omissions represented a real lack of PCP/medical home or just not recorded.

Finally, a lack of communication existed with school athletic offices. There was no facilitated communication about CR or DQ athletes from the school athletic office. The athletic offices did not update student-athlete status and relay that information to the coach or certified athletic trainer. Student-athletes participated in sports despite the DQ status.

The QI team constructed a key driver diagram to address 3 specific drivers surrounding the PPEs (Fig. 2). Resident education was the first driver needing QI. The sports medicine fellow presented an additional educational session 30 minutes before PPEs and a 1-hour lecture given annually during resident didactics. The fellow specifically reviewed acceptable vision screens and blood pressure parameters and was available for questions during the mass PPE sessions. The fellow reviewed PPE forms for any CR or DQ athlete with each resident before discharge. This discussion between the sports medicine fellow and resident had 2 benefits: educational reinforcement and correct classification for the student-athlete.

The next key driver focused on the student-athlete and their medical home. Medical home identification is paramount to the success of mass PPEs. Athletes should have a medical home if further workup is necessary following the PPE. An athletic trainer verified the PCP at check-in. If a student-athlete did not have a PCP, the check-in athletic

trainer provided a list of NCH community physicians. Moreover, athletic trainers at checkout verified PCP information of all CR or DQ athletes before discharge.

The final key driver focused on global communication. The performing physician (attending or fellow) discussed any DQ athlete directly with a parent or guardian before discharge. The sports medicine fellow contacted all DQ athletes by phone 1 and 4 weeks after the PPE. The phone call was to reinforce concerns, answer questions, and encourage student-athletes to schedule appropriate follow-up appointments. The school athletic trainers took a more active role; they followed up with any DQ athlete and their school athletic office 4 months later. Last, NCH Sports Medicine developed an updated policy for all contracted schools to address all DQ athletes and further clearance after PPEs.

Study of Interventions

Our team analyzed percentages of CR or DQ athletes before and after the above QI interventions. Fisher’s exact test examined differences between the percentage of PPEs with incorrect CR and DQ classification that the residents completed. χ^2 analyses computed the differences in proportions of DQ athletes, which provided follow-up information and the proportion of CR and DQ athletes with PCP information.

Measures

NCH physicians examined 582 pediatric athletes at mass PPEs in 2017. The baseline found 50 athletes categorized

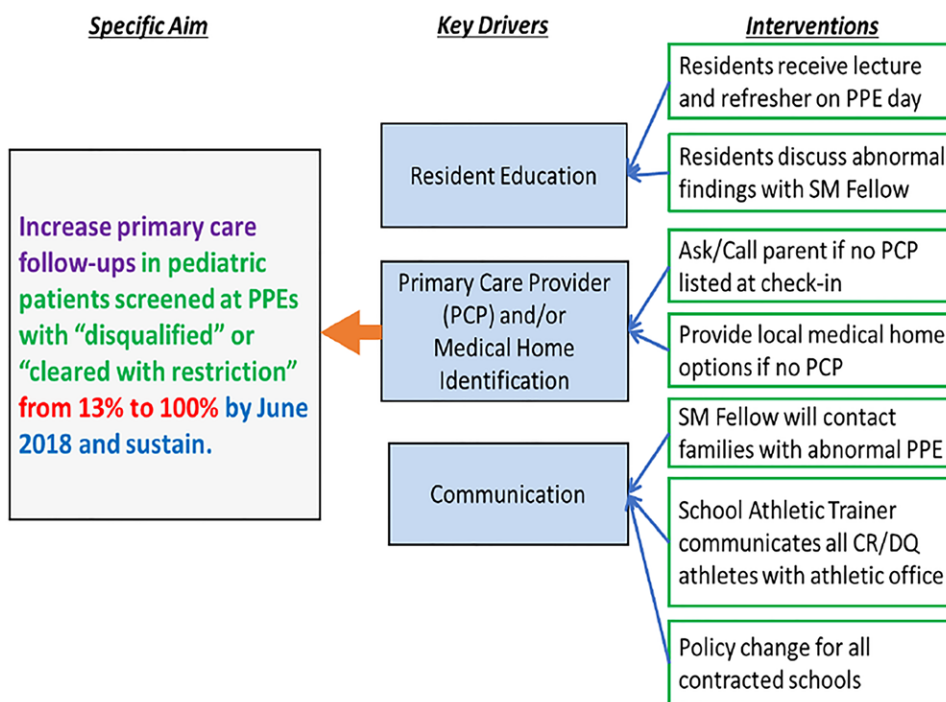


Fig. 2. Key driver diagram. The key driver diagram demonstrates 3 drivers for this quality-improvement initiative: resident education, primary care provider/medical home identification, and communication.

as CR and 17 athletes as DQ. NCH physicians misclassified 7 student-athletes: 4 inappropriately CR for normal vision screens and 3 inappropriately DQ for blood pressures below the 95th percentile.⁴ Athletic trainers documented PCP information only at 1 mass PPE event in 2017. Subsequently, only 7 (10%) of the CR/DQ student-athletes had an identifiable PCP recorded. School athletic trainers received 0% follow-up from CR athletes and only 53% (9/17) from DQ athletes. Therefore, athletic trainers never received updated or proper clearance forms for 47% DQ athletes (8/17).

RESULTS

While gathering baseline data, we identified that most school athletic offices did not review completed PPE forms until school commenced in August. Furthermore, 1 high school misplaced the list of CR and DQ athletes, and these student-athletes never had follow-up regarding their clearance status. We also found many school athletic departments kept incomplete records of prior, current, and updated PPEs and status for each student-athlete.

During the 2018 PPE process, NCH sports medicine examined 836 athletes and identified 94 CR athletes and 26 DQ athletes. Two student-athletes received inappropriate clearances. A resident physician classified 1 student-athlete as CR for a vision screen that was normal. Additionally, another resident disqualified a student-athlete for blood pressure in the 90th percentile. Residents did not discuss either case with the sports medicine fellow. However, in the second circumstance, the error

was identified during a debriefing session after the PPE and remedied promptly. It was not counted in the total. Resident education led to a decreased total number of incorrect classification (CR/DQ) from 7 to 1 but was not statistically significant compared to 2017 ($P = 0.18$).

PCP documentation for both CR and DQ athletes significantly increased. Overall, NCH sports medicine documented PCPs for 85/120 CR/DQ athletes compared to 7/67 ($P < 0.001$). However, 3 high schools still lacked PCP information. It is unclear if the information was simply omitted or the student-athlete did not have a PCP. This accounts for 20 athletes (15 CR athletes and 5 DQ athletes). In 2018, no DQ athlete continued to participate without proper clearance. Also, the school athletic trainers received no information that outside providers later disqualified any CR athlete.

One month later, the sports medicine fellow called all CR/DQ athletes and obtained additional follow-up information for 1% (1/94) of CR athletes and 31% (8/26) of DQ athletes. Nineteen percent (5/26) of DQ athletes scheduled appointments with a PCP or specialist in subsequent weeks, as recommended during the PPEs. At 4 months, athletic trainers received no further follow-up for the remaining CR athletes. Thus, at 4 months, the DQ athletes with proper clearance and follow-up increased to 65% (17/26), and a PCP upheld the disqualification of 1 student-athlete. The certified athletic trainers were unable to provide information on the remaining 9 DQ athletes. There was no statistical difference between 2017 and 2018 on the proportion

Table 1. Comparison of 2017 and 2018 PPE Data

	2017	2018
Total athletes	582	836
Athletes cleared with recommendations (CR)	50	94
Follow up for CR athletes	0 (0%)	1 (1%)
Athletes disqualified (DQ)	17	26
Follow up for DQ athletes	9 (53%)	17 (65%)
CR + DQ athletes	67	120
Follow up for CR/DQ athletes	9 (13%)	18 (15%)
PCP recorded for CR/DQ athletes	7 (10%)	85 (71%)
Inappropriate clearance	7 (10%)	1* (0.8%)

This table outlines the overall results for PPEs conducted by Nationwide Children's Hospital Sports Medicine Division during the 2017 and 2018 mass PPEs.

*One additional student was inappropriately disqualified, but the error was found by the sports medicine fellow and corrected before the form being turned in the athletic office.

of DQ athletes who provided follow-up information ($P = 0.44$), as detailed in Table 1.

DISCUSSION

Our team did not achieve the aim of the study. CR athletes are cleared to participate in sports, and the athletic office does not need further documentation, which likely contributes to our very low follow-up for CR athletes. It is possible that student-athletes provided additional follow-up documentation to the athletic office, which was not relayed to the athletic trainer.

All key drivers found small wins. Supplemental learning and oversight enhanced resident education, resulting in only 1 athlete inappropriately labeled as CR. The additions provided residents with appropriate knowledge for performing PPEs and deciding medical eligibility, which is vital for proper examinations.⁴ The percentage of DQ and CR athletes aligns with that in the current literature; historically, providers disqualify 1% of student-athletes and refer 1%–13% further evaluation during PPEs.^{22,23} Similarly, in 2018, NCH sports medicine disqualified 3% of our student-athletes and recommended further follow up for 11%. In the end, only 1 student-athlete remained disqualified at 4 months.

PCP documentation for CR or DQ athletes rose from 10% to 71%. Intuitively, large-scale PPEs are convenient

for athletes to meet specific school athletic department requirements. However, large-scale PPE's often do not achieve PPE-5 goals and objectives.⁴ Accurate history is a critical component of the PPE and identifies over half of disqualifying conditions.²⁴ This deficiency is concerning for PPEs done outside of the medical home, as studies have shown that 80% of parents and athletes provide different responses on the medical questionnaire.²⁵ Continuity of care and discussion of sensitive topics in a familiar and trusted environment support the recommendation that the medical home completes PPEs.⁴ Adolescents are evaluated less frequently than children, and the sports physical may be the only annual visit with a health care provider.^{18,25,26} Likewise, insurance may only cover 1 preventive visit per year. Thus the PPEs should be incorporated into a health maintenance visit rather than replace it.⁴

Communication between medical providers, athletic directors, student-athletes, and families increased but did not achieve the aim. The enhanced communication offered educational and anticipatory guidance, yet required significant time and resources from the performing physicians. Given the volume of athletes and physician time, we ponder the sustainability of this intervention. The fellow follow-up phone calls become unnecessary if the medical home, who has access to the medical record, performs PPEs.

The issues uncovered in this QI initiative led to changes within the standard operating procedure for mass PPEs conducted by our sports medicine division. The flow of the PPE changed to include verification of PCP and increased resident oversight and education. Additionally, our division instituted a policy change for all contracted schools. The policy requires communication and follow-up between certified athletic trainers and disqualified athletes. The policy also required the school athletic department to obtain proper documentation once a provider disqualifies a student-athlete.

LIMITATIONS

There were several limitations to this project. The delicate relationship between NCH and the contracted high schools

Table 2. 2018 Individual High-school PPE Data

High School	Athletes Evaluated	Athletes Cleared with Recommendations (CR)	Follow Up for Athletes CR	Athletes Disqualified (DQ)	Follow Up for Athletes DQ	CR or DQ Athletes with PCP Recorded
A	67	8	0	3	1	0*
B	85	14	0	1	1	14
C	28	3	0	1	0	0*
D	203	25	0	7	2	29
E	153	14	1	5	5	16
F	15	0	—	0	—	—
G	38	4	0	1	1	0*
H	180	19	0	6	6	17
I	22	4	0	1	0	5
J	45	3	0	1	1	4
Total	836	94	1	26	17	85

This table shows the distribution of athletes across the 10 high schools for 2018 performed by Nationwide Children's Hospital Sports Medicine Division.

*The 3 schools without PCP data were likely omitted at checkout, and it is unclear how many of those athletes truly lacked a PCP.

limited interventions. This project focused on changes the sports medicine team could remedy rather than those controlled by local school policies and procedures for PPEs as dictated by the Ohio High School Athletic Association. Therefore, NCH sports medicine updated all contracted schools' policies regarding any DQ athlete identified during PPEs. The school has a responsibility and liability to ensure the DQ athletes produce proper documentation and clearance to begin sports participation.

Communication between all parties proved to be a fundamental weakness, along with being a driver. Internally, an unanticipated issue arose during a follow-up phone conversation. Specifically, this QI initiative identified that another medical provider might inappropriately release a DQ athlete. In particular, a PCP released a student-athlete with blood pressure over the 99th percentile without additional evaluation, which is a contraindication to participation.⁴ The parent stated that the clearing physician felt there was no concern for sports participation with this level of hypertension. This anecdote highlights the need for education regarding PPEs and that all medical providers do not have the same knowledge regarding sport participation and clearance. Although this was an unanticipated result, the fellow provided anticipatory guidance to the family and encouraged follow-up.

Another limitation was incomplete data and documentation. The majority of the follow-up appears to remain in the hands of the school athletic office after PPEs. Student-athletes might have provided documented clearance directly to the athletic office without notifying school athletic trainers, team physicians, and coaches. Athletes deemed CR do not legally need to provide additional clearance documentation.⁴ Direct phone follow-up with CR athletes may have increased proper documentation but involved significantly more time and resources than were available.

Last, the main outcome measure was challenging to achieve. We were genuinely unable to control if an athlete had a medical home or returned to the medical home based on the recommendation from PPEs. This complexity was the ultimate barrier to fully achieving the aim. Despite reviewing the goals and new process of this QI initiative, information obtained at the mass PPEs was inconsistent. For 3 high schools, athletic trainers did not record any of the PCPs. Table 2 depicts these data for these 3 schools. A uniform PPE document mandated at the state or national level and the requirement of a medical home for completion would provide consistency and accuracy of forms for all student-athletes.⁴

CONCLUSIONS

This QI initiative did not achieve the primary aim. The complicated relationship between the sports medicine team and the school athletic office made appropriate PPE clearance challenging. Increased resident education, resident oversight, and PCP verification were positive outcomes, but further changes are needed. Follow-up is

paramount for the success of large-scale PPEs and for the safety of student-athletes. This project highlights the challenges of mass PPEs and supports conducting sports physicals within the medical home.

DISCLOSURE

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

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