[Athletic Training]

Knowledge of and Compliance With Pitch Count Recommendations: A Survey of Youth Baseball Coaches

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Background: Pain and injuries suffered by youth pitchers are ongoing concerns that have been addressed through the institution of rules and recommendations regarding pitch counts and rest periods. The aim of our study was to see if coaches of youth baseball pitchers in our region were aware of the recommended guidelines and if they followed them.

Methods: An Internet-based survey consisting of 18 items including demographic information and questions concerning the USA Baseball Medical and Safety Advisory Committee pitching guidelines was sent to coaches affiliated with a local youth league to assess their knowledge of and reported compliance with these recommendations.

Results: Ninety-five of 228 coaches (41.4%) participated in the survey. On average, coaches answered 43% of questions regarding pitch count and rest periods correctly; 73% reported that they followed the recommendations, while only 53% felt that other coaches in the league abided by the recommendations. Thirty-five percent of coaches stated that their pitchers reported shoulder or elbow pain during the season, and 19% reported that one of their pitchers pitched a game with a sore or fatigued arm during the season. No coaches reported any pitching-related injuries among their players requiring surgery. Fewer than 10% of coaches reported that their players pitched in multiple leagues or participated in showcases, while 91% reported that pitchers attended camps or received specific instruction to improve their pitching form.

Conclusions: This study shows that this subset of youth baseball coaches is deficient with regard to knowledge of the USA Baseball Medical and Safety Advisory Committee pitching guidelines. This situation may put youth pitchers at increased risk for upper extremity pain and injuries.

Keywords: pediatric; baseball; pitcher; injuries; pitch count

Baseball is a sport enjoyed by millions of young athletes worldwide. A growing concern among players, parents, and coaches are injuries suffered by young pitchers. Concern about the health of young pitchers is long-standing, dating back to the 1960s.¹ Epidemiologic data from the late 1970s and early 1980s documented relatively high rates of shoulder and elbow pain in both youth^{6,7} and high school pitchers.⁵ Increasing concern over the effects of pitching on young athletes led to the development of early guidelines regarding pitch number and type in the mid-1990s.²

In spite of the existence of such recommendations, injuries continued to be common in this population. Lyman et al in consecutive cohort studies in the late 1990s noted that nearly a third of players experience shoulder and elbow pain during

the Little League season and again confirmed an association between these symptoms and high pitch counts, pitching while fatigued, and possibly throwing certain types of pitches.^{8,9} More recent studies continue to demonstrate high rates of pain and injury, especially among pitchers who also play catcher, throw with high velocity, and participate in multiple leagues and showcases.^{3,10}

Perhaps more concerning are the relatively high rates of serious injury potentially requiring surgery in these young athletes.³ A recent study from Birmingham, Alabama, noted a fourfold increase in the number elbow surgeries performed on collegiate pitchers and a sixfold increase for high school throwers between 2000 and 2004 compared to 1994 to 1999.⁴

Because of these and other studies, rules defining permitted pitch counts and required days of rest have been put in place

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Table 1. USA Baseball Maximum Pitch Count Recommendations¹²

	Pitcher's Age, Y		
	9-10	11-12	13-14
Pitches per game	50	75	75
Pitches per week	75	100	125
Pitches per season	1000	1000	1000
Pitches per year	2000	3000	3000
Months of pitching per year	9	9	9

by virtually all youth baseball organizations. The USA Baseball Medical and Safety Advisory Committee has developed some recommendations for youth pitchers to help avoid upper extremity injuries,¹² on which many leagues base their rules regarding pitch counts. These recommendations include closely monitoring the number of pitches that are thrown in a game and throughout a season, avoidance of pitching in showcases, simultaneous leagues, or pitching more than nine months out of the year. The committee advised against throwing breaking pitches until puberty and suggested that these throwers should work on proper pitching mechanics.

The aim of our study was to see if coaches of youth baseball pitchers in our region were aware of the recommended guidelines and if they followed them. We hypothesized that they were familiar with and followed the guidelines.

METHODS

All 228 coaches from a community youth baseball league in the Midwest were solicited to complete an anonymous Internet-based questionnaire regarding youth pitching (see Appendix, available at <http://sph.sagepub.com/content/suppl>). These coaches instruct players between 9 to 15 years of age. This survey was voluntary and consisted of 18 items, including demographic information and questions concerning the USA Baseball Medical and Safety Advisory Committee pitching guidelines (Table 1). A subsection of the survey consisted of age-specific questions testing the coaches' knowledge of the recommended pitching guidelines. Their responses were then graded and reported as a percentage of correct answers. The remainder of the questions asked about the practices of the other coaches in the league, whether their players threw breaking pitches or pitched with pain, as well as any pitching-related injuries experienced by their players.

An analysis of variance was used to compare continuous data (score on the graded portion of the survey) among the coaches from the 3 difference age divisions. Fisher exact tests were utilized to compare dichotomous data (whether they or other coaches in the league followed the rules; whether players on their team threw breaking pitches or pitched with pain; whether their pitchers participated in pitching camps, multiple leagues, or showcases; and whether anyone on their

teams required surgery for a pitching-related injury) among coaches from the different age groups. Statistical analysis was performed with Stata (Stata Corporation, College Station, Texas).

RESULTS

A total of 95 Little League coaches (41.4%) responded to the survey. Coaches' response rates varied by age group (9-10 age group, 29%; 11-12 age group, 52%; and 13-14 age group, 26%). Overall, coaches answered 43% of questions correctly. The coaches of the 9-10 age group answered an average of 62% of the graded survey correctly; the coaches of the 11-12 age group scored an average of 35%; and the coaches of the 13-14 age group scored an average of 42%. The coaches of the 9-10 age group scored significantly better than those in the 11-12 and 13-14 age groups ($P < 0.01$).

A total of 73% of coaches reported that they followed the pitching rules. This percentage did not significantly differ by age group (Figure 1). In contrast, only 53% of coaches felt that other coaches in the leagues generally follow the pitching rules. Again this percentage did not differ by age group (Figure 1).

Overall, 29% of coaches reported that their pitchers threw breaking pitches. This percentage increased as age group increased ($P < 0.01$). Thirty-five percent of coaches stated that their pitchers reported shoulder or elbow pain during the season. This incidence was also noted to increase as age group increased ($P < 0.01$). Nineteen percent of coaches reported that one of their pitchers pitched a game with a sore or fatigued arm during the season. No coaches reported any pitching-related injuries among their players requiring surgery. Fewer than 10% of coaches reported that their players pitched in multiple leagues or participated in showcases, while 91% reported that pitchers attended camps or received specific instruction to improve their pitching form.

DISCUSSION

The most significant finding of our study is that in spite of significant efforts to educate coaches regarding youth baseball pitching injuries, knowledge of current recommendations for youth pitchers is poor. Depending on age group with

Figure 1. The reported frequency of coaches following the pitching recommendations themselves and their perception of the practices of other coaches in their league by age of players coached. No significant differences were noted in either measure according to player ages. The difference in coaches reported behavior versus their perception of the practices of their peers was only significantly different in the 9-10 age group.

which the coaches worked, only 35% to 62% of the pitching guideline questions were answered correctly. These results are concerning as it is quite difficult for coaches to accurately follow guidelines with which they are not familiar.

The ultimate goal of these guidelines is to reduce shoulder and elbow pain and injuries in young pitchers. A substantial number (35%) of coaches reported that pitchers experienced shoulder or elbow pain during the season. In fact, 19% reported that players pitched with arm pain. These numbers are likely underestimates given that players themselves were not asked about pain. Fortunately, no injuries requiring surgery were reported. However, these injuries generally present at a later age than that of the patients in this study.¹¹

To our knowledge, no other anonymous surveys of this nature have been performed among youth baseball pitchers. Given the strong correlations that several authors have observed between elevated pitch counts, pitching while fatigued, catching in addition to pitching, and pitching in showcases,^{3,8-10} leagues should potentially take a more active role in enforcement of these rules. Specifically, recommendations regarding pitch counts and time spent catching and pitching are most likely easier to enforce than rules regarding fatigue and arm pain. In our survey, 73% of coaches state that they follow the recognized guidelines; however, 53% felt that the opposition does the same. Improved enforcement may also decrease the temptation of coaches to break the rules by improving their perception of the compliance of other coaches.

A limitation of this study is its reliance purely on questionnaire data in describing coaches' behavior. No observation of actual behavior or correlation of questionnaire results with observed activity was performed. Furthermore, the validity and reliability of this specific questionnaire is unknown; however, the anonymous nature of the questionnaire may improve the accuracy of reported data relative to formal reporting mechanisms utilized by leagues to assess compliance. Similarly, the limitation of data collection to a survey of coaches limits the amount of data that can be collected on pitchers' pain severity and location. Another study limitation is the relatively low response rate (41.6%), potentially contributing to selection bias, as the characteristics of study responders versus non-responders are unknown. Finally, the generalizability of the study to coaches in other geographic areas and competition levels is unknown.

CONCLUSION

Our study has shown that this subset of youth baseball coaches is deficient with regard to knowledge of the USA Baseball Medical and Safety Advisory Committee pitching guidelines. This situation may put youth pitchers at increased risk for upper extremity pain and injuries. A better job must be done of educating players, coaches, and parents of the pitching guidelines and their importance.

REFERENCES

- Adams JE. Injury to the throwing arm: a study of traumatic changes in the elbow joints of boy baseball players. *Calif Med*. 1965;102:127-132.
- Andrews JR, Fleisig GS. Medical and safety advisory committee special report: how many pitches should I allow my child to throw? *USA Baseball News*. April 1996:5.
- Fleisig GS, Andrews JR, Cutter GR, et al. Risk of serious injury for young baseball pitchers: a 10-year prospective study. *Am J Sports Med*. 2011;39(2):253-257.
- Fleisig GS, Kingsley DS, Loftice JW, et al. Kinetic comparison among the fastball, curveball, change-up, and slider in collegiate baseball pitchers. *Am J Sports Med*. 2006;34(3):423-430.
- Grana WA, Rashkin A. Pitcher's elbow in adolescents. *Am J Sports Med*. 1980;8(5):333-336.
- Gugenheim JJ Jr, Stanley RF, Woods GW, Tullos HS. Little League survey: the Houston study. *Am J Sports Med*. 1976;4(5):189-200.
- Larson RL, Singer KM, Bergstrom R, Thomas S. Little League survey: the Eugene study. *Am J Sports Med*. 1976;4(5):201-209.
- Lyman S, Fleisig GS, Andrews JR, Osinski ED. Effect of pitch type, pitch count, and pitching mechanics on risk of elbow and shoulder pain in youth baseball pitchers. *Am J Sports Med*. 2002;30(4):463-468.
- Lyman S, Fleisig GS, Waterbor JW, et al. Longitudinal study of elbow and shoulder pain in youth baseball pitchers. *Med Sci Sports Exerc*. 2001;33(11):1803-1810.
- Olsen SJ 2nd, Fleisig GS, Dun S, Loftice J, Andrews JR. Risk factors for shoulder and elbow injuries in adolescent baseball pitchers. *Am J Sports Med*. 2006;34(6):905-912.
- Petty DH, Andrews JR, Fleisig GS, Cain EL. Ulnar collateral ligament reconstruction in high school baseball players: clinical results and injury risk factors. *Am J Sports Med*. 2004;32(5):1158-1164.
- USABaseball. http://web.usabaseball.com/news/article.jsp?ymd=20090813&content_id=6409508vkey=news_usab&gid=. Accessed November 4, 2011.